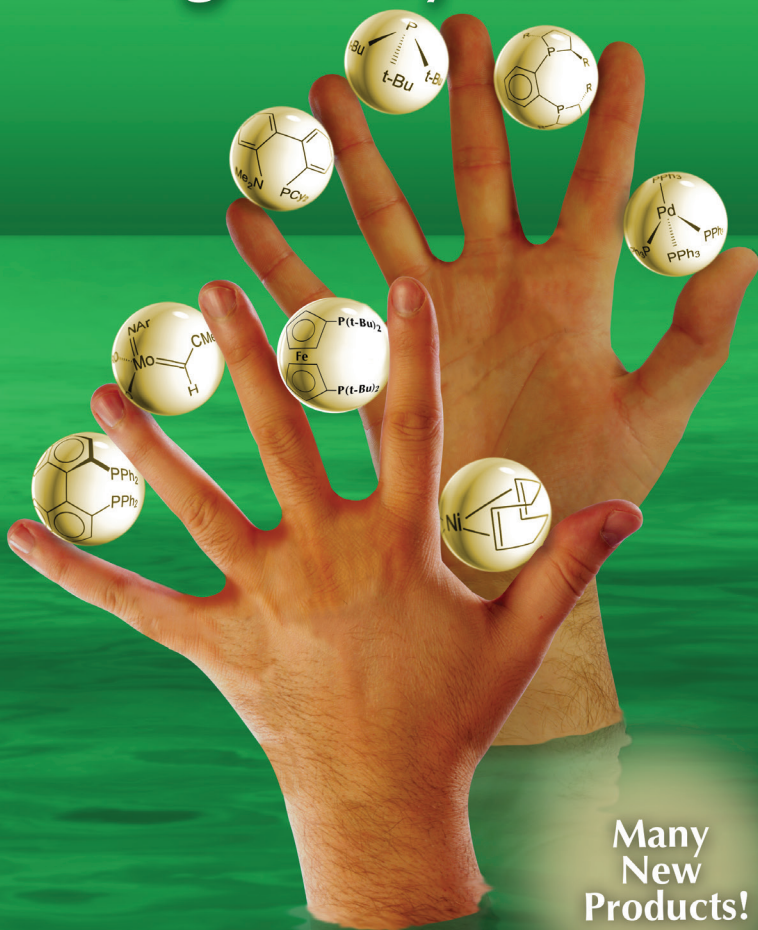


Metal Catalysts for Organic Synthesis



Many
New
Products!

Including Organocatalysts



STREM

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- Biocatalysts
- Buchwald Ligands and Precatalysts
- Carbon-Base Nanomaterials & Elemental Forms
- Gold Elements & Compounds
- Heterogeneous Catalysts
- Kits
- Materials for Energy Applications
- Metal Catalysts for Organic Synthesis
- MOCVD, CVD & ALD Precursors
- MOFs and Ligands for MOF Synthesis
- Nanomaterials
- New Products
- Other Ligands
- Phosphorous Ligands and Compounds
- Photocatalysts
- PURATREM: High Purity Inorganics



MCOS 03/18

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Glossary of Terms

[α]_D	Specific rotation
AAS	Atomic Absorption Standard
ACS	Conforms to American Chemical Society specifications
air sensitive	.....	Product may chemically react with atmospheric oxygen or carbon dioxide at ambient conditions. Handle and store under an inert atmosphere of nitrogen or argon.
amp	.....	Ampouled
b.p.	.....	Boiling point in °C at 760mm, unless otherwise noted
d.	.....	Density
dec.	.....	Decomposes
elec. gr.	.....	Electronic Grade, suitable for electronic applications
f.p.	.....	Flash point in °F
gran.	.....	Granular
heat sensitive	.....	Product may chemically degrade if stored for prolonged periods of time at ambient temperatures or higher. Store at 5°C or lower.
hydrate	.....	Unspecified water content which may vary slightly from lot to lot
hygroscopic	.....	Product may absorb water if exposed to the atmosphere for prolonged periods of time (dependent on humidity and temperature). Handle and store under an inert atmosphere of nitrogen or argon.
light sensitive	.....	Product may chemically degrade if exposed to light
liq.	.....	Liquid
m.p.	.....	Melting point in °C
moisture sensitive	.....	Product may chemically react with water. Handle and store under an inert atmosphere of nitrogen or argon.
NMR grade	.....	Suitable as a Nuclear Magnetic Resonance reference standard
optical grade	.....	For optical applications
pwdr.	.....	Powder
primary standard	.....	Used to prepare reference standards and standardize volumetric solutions
PURATREM	.....	Product has a minimum purity of 99.99% (metals basis)
purified	.....	A grade higher than technical, often used where there are no official standards
P. Vol.	.....	Pore volume
pyrophoric	.....	Product may spontaneously ignite if exposed to air at ambient conditions
reagent	.....	High purity material, generally used in the laboratory for detecting, measuring, examining or analyzing other substances
REO	.....	Rare Earth Oxides. Purity of a specific rare-earth metal expressed as a percentage of total rare-earths oxides.
SA	.....	Surface area
store cold	.....	Product should be stored at -18°C or 4°C, unless otherwise noted (see product details)
subl.	.....	Sublimes
superconductor grade	.....	A high purity, analyzed grade, suitable for preparing superconductors
tech. gr.	.....	Technical grade for general industrial use
TLC	.....	Suitable for Thin Layer Chromatography
v.p.	.....	Vapor pressure mm of Hg
xtl.	.....	Crystalline

About Purity

Chemical purity	.....	is reported after the chemical name, e.g. Ruthenium carbonyl, 99%
Metals purity	.....	is reported in parentheses with the respective element, e.g. Gallium (III) bromide, anhydrous, granular (99.999%-Ga) PURATREM where 100% minus the metal purity is equal to the maximum allowable percentage of trace metal impurity

Notable References & Review Articles

Palladium-catalyzed reactions have become increasingly important in the field of organic synthesis. Among the most important are Heck arylations and vinylations, additions to π -allyls (Tsuji-Trost reaction) and cross-coupling reactions such as Suzuki, Stille, Negishi, Sonogashira and aromatic carbon-heteroatom bond-forming procedures. Given below is a compilation of some review articles and general references.

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Metal Catalysts for Organic Synthesis

INDEX OF REACTION TYPES

Sorted by Key Element

Amination

24-0850	(1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]chromium(III) chloride...	13
24-0851	(1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]chromium(III) chloride ..	14
27-4010	lambda-Tris[(1S,2S)-1,2-diphenyl-1,2-ethanediamine]cobalt(III) chloride tetrakis[3,5-bis(tri-fluoromethyl)phenyl]borate dihydrate SKJ-1	22
27-4011	delta-Tris[(1S,2S)-1,2-diphenyl-1,2-ethanediamine]cobalt(III) chloride tetrakis(2,3,4,5,6-pentafluorophenyl)borate trihydrate SKJ-3	22
29-7050	μ -Benzenebis[N,N'-(1,3-dimethyl-1,3-propanediylidene)bis(2,6-dichlorobenzenaminato)]dicopper(I), benzene adduct, min. 98%	22
29-5000	Copper(II) trifluoromethanesulfonate, 98% (Copper triflate)	26
29-6700	Tetrakis(acetonitrile)copper(I) hexafluorophosphate, 98+%	29
79-0340	Chloro[2-(di-t-butylphosphino))-1,1'-biphenyl]gold(I), 99%	39
79-5000	Methyl(triphenylphosphine)gold(I), 99%	46
96-3660	Solvias Josiphos Nickel Catalyst Kit	
03-2010	Lithium tris(S-(-)-1,1'-binaphthyl-2,2'-diolato)yttrate(III) tetrahydrofuran adduct, min. 97%	81
07-0283	1-[3,5-Bis(trifluoromethyl)phenyl]-3-[(1R,2R)-(-)-2-(dimethylamino)cyclohexyl]thiourea (R,R-TUC)	103
07-0284	1-[3,5-Bis(trifluoromethyl)phenyl]-3-[(1S,2S)-(+)-2-(dimethylamino)cyclohexyl]thiourea (S,S-TUC)	104
07-0380	(11bR)-4,4-Dibutyl-2,6-bis(3,4,5-trifluorophenyl)-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]azepinium bromide	106
07-0381	(11bS)-4,4-Dibutyl-2,6-bis(3,4,5-trifluorophenyl)-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]azepinium bromide	107
07-0414	(5aS, 10bR)-(-)-5a,10b-Dihydro-2-(pentafluorophenyl)-4H,6H-indeno[2,1-b][1,2,4]triazolo[4,3-d][1,4]oxazinium tetrafluoroborate, min. 98%	108
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46-0040	Allylchloro[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-ylidene]palladium(II), 98%	115
46-0045	Allylchloro[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]palladium(II), 98%	115
46-0210	Bis(dibenzylideneacetone)palladium(0)	118
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46-0364	Chloro[[t-BuXPhos][2-(2-aminoethylphenyl)palladium(II)]]/[t-BuXPhos] admixture (molar Pd/P = 1:1)	128
46-0264	Chloro(2-di-t-butylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl]palladium(II), min. 98% [t-BuXPhos Palladacycle Gen. 1]	128
46-0283	Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) min. 98% [SPhos Palladacycle Gen. 2]	129
46-0269	Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)[2-(2-aminoethylphenyl)]palladium(II) methyl-t-butylether adduct, min. 98% [SPhos Palladacycle Gen. 1]	129
46-0292	Chloro(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 2]	130
46-0267	Chloro[2-(dicyclohexylphosphino)-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl][2-(2-aminoethyl)phenyl]palladium(II), min. 98% [BrettPhos Palladacycle Gen. 1]	130

46-0232	Chloro[2-(dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [DavePhos Palladacycle Gen. 2]	131
46-0286	Chloro[2-(dicyclohexylphosphino)-2',6'-di-i-propoxy-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 2]	131
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46-2128	Methanesulfonato[1,1'-bis(diphenylphosphino)ferrocene]](2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [DPPF Palladacycle Gen. 3]	154
46-0959	Methanesulfonato[4,6-bis(diphenylphosphino)phenoxazine](2'-amino-1,1'-biphenyl-2-yl) palladium(II), 98% [NiXantphos Palladacycle Gen. 3].....	155
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46-0980	Methanesulfonato(2-dicyclohexylphosphino-1,1'-biphenyl)(2'-methylamino-1,1-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% CyJohnphos Palladacycle Gen. 4.....	164
46-0487	Methanesulfonato(2-dicyclohexylphosphino-2',6'-bis(dimethylamino)-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), 98% [CPhos Palladacycle Gen. 3].....	164
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46-0380	Methanesulfonato(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct min. 98% [SPhos Palladacycle Gen. 4].....	165
46-0322	Methanesulfonato(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri- <i>i</i> -propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 3].....	165
46-0333	Methanesulfonato(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri- <i>i</i> -propyl-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 4]..	166
46-0237	Methanesulfonato[2-(dicyclohexylphosphino)-2'-(<i>N,N</i> -dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II) CH ₂ Cl ₂ adduct, min. 98% [DavePhos Palladacycle Gen. 3].....	166
46-0314	Methanesulfonato(2-dicyclohexylphosphino-2',6'-di- <i>i</i> -propoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 3]	167
46-0395	Methanesulfonato(2-dicyclohexylphosphino-2',6'-di- <i>i</i> -propoxy-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 4]....	168
46-0353	Methanesulfonato{(R)-(-)-1-[(S)-2-(dicyclohexylphosphino)ferrocenyl]ethyl-di- <i>t</i> -butylphosphine}(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [Josiphos Palladacycle Gen. 3]....	168
46-0320	Methanesulfonato(2-dicyclohexylphosphino-2',4',6'-tri- <i>i</i> -propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [Xphos Palladacycle Gen. 3]	168
46-0327	Methanesulfonato(2-dicyclohexylphosphino-2',4',6'-tri- <i>i</i> -propyl-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [XPhos Palladacycle Gen. 4].....	169
46-0348	Methanesulfonato[2-diethylphosphino-2',6'-bis(dimethylamino)-1,1-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [EtCPhos Palladacycle Gen. 3].....	169
46-0345	Methanesulfonato{[4-(<i>N,N</i> -dimethylamino)phenyl]di- <i>t</i> -butylphosphino}(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [Amphos Palladacycle Gen. 3]	170
46-0957	Methanesulfonato[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene][2'-amino-1,1'-biphenyl]palladium(II) dichloromethane adduct, min. 98% [Xantphos Palladacycle Gen. 3]....	170
46-0388	Methanesulfonato[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene](2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98% [Xantphos Palladacycle Gen. 4].....	171
46-0392	Methanesulfonato(1,3,5,7-tetramethyl-8-phenyl-2,4,6-trioxa-8-phosphaadamantane)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [MeCGPPH Palladacycle Gen. 3]	171
46-0387	Methanesulfonato(tri- <i>t</i> -butylphosphino)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), 98% [P(<i>t</i> -Bu) ₃ Palladacycle Gen. 3]	172
46-0385	Methanesulfonato(tri- <i>t</i> -butylphosphino)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98% [P(<i>t</i> -Bu) ₃ Palladacycle Gen. 4]	172
46-0239	Methanesulfonato(tricyclohexylphosphino)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [PCy ₃ Palladacycle Gen. 3]	173
46-0379	Methanesulfonato(tricyclohexylphosphino)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98% [PCy ₃ Palladacycle Gen. 4].....	173
46-1780	Palladium(II) acetate, min. 98% (99.9+%-Pd)	174
46-1781	Palladium(II) acetate, 99+% (99.95+%-Pd)	174
46-3000	Tris(dibenzylideneacetone)dipalladium(0).....	178
46-3010	Tris(dibenzylideneacetone)dipalladium(0) chloroform adduct.....	179
45-0190	1,4-Bis(diphenylphosphino)butane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, dichloromethane adduct, min. 98%	198
45-0380	Chloro(1,5-cyclooctadiene)rhodium(I) dimer, 98%	204
44-0085	Carbonylchlorohydridotris(triphenylphosphine)ruthenium(II), 99%.....	236
44-0102	Chloro{(R)-(-)-5,5'-bis[di(3,5-di- <i>t</i> -butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)(R)-dtbm-segphos®]Cl	241
44-0103	Chloro{(S)-(+)-5,5'-bis[di(3,5-di- <i>t</i> -butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)(S)-dtbm-segphos®]Cl	242

Amination

44-0098	Chloro{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene) ruthenium(II) chloride [RuCl(p-cymene)(R)-dm-segphos®]Cl	247
44-0099	Chloro{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene) ruthenium(II) chloride [RuCl(p-cymene)(S)-dm-segphos®]Cl	247
44-0525	Chlorocarbonylhydrido[4,5-bis-(di-i-propylphosphinomethyl) acridine] ruthenium(II), min. 98% Milstein Acridine Catalyst	249
44-0181	Diacetato{(S)-(+)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(S)-dtbm-segphos®]	258
44-0180	Diacetato{(R)-(-)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(R)-dtbm-segphos®]	257
44-0176	Diacetato{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(S)-dm-segphos®]	261
44-0174	Diacetato{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(R)-dm-segphos®]	260
44-0215	Dichloro{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}[(2S)-(+)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) RuCl ₂ [(S)-dm-segphos®] [(S)-daipen]	273
44-0214	Dichloro{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}[(2R)-(-)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) RuCl ₂ [(R)-dm-segphos®] [(R)-daipen]	273
44-0229	Dichloro{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}[(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II) RuCl ₂ [(S)-dm-segphos®] [(S,S)-dpem]	274
44-0228	Dichloro{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole} [(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II) RuCl ₂ [(R)-dm-segphos®] [(R,R)-dpem]	273
44-0510	Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][RuCl((R)-binap)] ₂ (μ-Cl) ₃	283
44-0511	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][RuCl((S)-binap)] ₂ (μ-Cl) ₃	285
44-0780	1-Hydroxytetraphenylcyclopentadienyl(tetraphenyl-2,4-cyclopentadien-1-one)-μ-hydroxytetracarbonyldiruthenium(II), 98% SHVO'S CATALYST	288
44-1850	Ruthenium carbonyl, 99%	290
39-1500	Tris[N,N-bis(trimethylsilyl)amide]yttrium(III), min. 98% (99.9%-Y) (REO)	311

Aziridination

29-4050	Chloro[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-ylidene]copper(I), 98%	24
29-5000	Copper(II) trifluoromethanesulfonate, 98% (Copper triflate)	26
29-5001	Copper(II) trifluoromethanesulfonate, 99% (99.9%-Cu) (Copper triflate)	27
45-1730	Rhodium(II) acetate dimer, 99%	213

Carbon-carbon bond formation-Cross coupling

27-0478	1,2-Bis(diphenylphosphino)ethanedichlorocobalt(II), min. 97%	15
27-0554	Dichloro[1,1'-bis(diphenylphosphino)ferrocene]cobalt(II), 99%	20
29-4050	Chloro[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-ylidene]copper(I), 98%	24
29-0225	Copper(I) bromide, dimethyl sulfide complex, 99%	25
29-6700	Tetrakis(acetonitrile)copper(I) hexafluorophosphate, 98+%	29
28-0010	Bis(1,5-cyclooctadiene)nickel(0), 98+%	91
28-0091	Bis(tricyclohexylphosphine)nickel(II) chloride, 99%	94
28-0095	Bis(triphenylphosphine)nickel(II) chloride, 99%	95
28-1095	Chloro(cyclopentadienyl)[1,3-bis[2-(diphenylmethyl)-4,6-dimethylphenyl]1H-imidazolium]nickel(II)	98
28-0165	Chloro(2-methylphenyl)(N,N,N',N'-tetramethyl-1,2-ethylenediamine)nickel(II), 99% (contains about 5% o-chlorotoluene) NiCl(o-tolyl)(TMEDA)	99

Carbon-carbon bond formation-Cross coupling

28-0500	Dichloro[1,1'-bis(diphenylphosphino)ferrocene]nickel(II), 98%	99
07-0299	1,3-Bis(2,4,6-trimethylphenyl)imidazolium chloride, min. 97%	105
46-0039	Allylchloro[1,3-bis(2,6-di-i-propylphenyl)-4,5-dihydroimidazol-2-ylidene]palladium(II), 97%	115
46-0040	Allylchloro[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-ylidene]palladium(II), 98%	115
46-0045	Allylchloro[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]palladium(II), 98%	115
46-0100	Allylpalladium chloride dimer, min. 98%	116
46-0210	Bis(dibenzylideneacetone)palladium(0).....	118
46-0220	1,3-Bis(2,6-di-i-propylphenyl)imidazol-2-ylidene(1,4-naphthoquinone)palladium(0) dimer, 96%	121
46-0252	Bis(tri-t-butylphosphine)palladium(0), 98%.....	123
46-0265	1,3-Bis(2,4,6-trimethylphenyl)imidazol-2-ylidene(1,4-naphthoquinone)palladium(0) dimer, 96% ...	125
46-0367	Chloro[[BrettPhos][2-(2-aminoethylphenyl)palladium(II)]/[BrettPhos] admixture (molar PdP/P = 1:1)	126
46-0435	Chloro(1-t-butylindenyl)[2-(dicyclohexylphosphino)-2',6'-dimethoxy-1,1'-biphenyl]palladium(II).....	126
46-0440	Chloro(1-t-butylindenyl)[2-(dicyclohexylphosphino)-2',6'-di-i-propoxy-1,1'-biphenyl]palladium(II) ..	127
46-0437	Chloro(1-t-butylindenyl)[2-(dicyclohexylphosphino)-2',4',6'-tri-i-propyl-1,1'-biphenyl]palladium(II) .	127
46-0815	Chloro(1-t-butylindenyl)[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-yl]palladium(II), 98%	127
46-0364	Chloro[[t-BuXPhos][2-(2-aminoethylphenyl)palladium(II)]/[t-BuXPhos] admixture (molar PdP/P = 1:1)	128
46-0264	Chloro(2-di-t-butylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II), min. 98% [t-BuXPhos Palladacycle Gen. 1].....	128
46-0283	Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II) min. 98% [SPhos Palladacycle Gen. 2]	129
46-0269	Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)[2-(2-aminoethylphenyl)] palladium(II) methyl-t-butylether adduct, min. 98% [SPhos Palladacycle Gen. 1].....	129
46-0292	Chloro(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 2]	130
46-0267	Chloro[2-(dicyclohexylphosphino)-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl][2-(2-aminoethyl)phenyl]palladium(II), min. 98% [BrettPhos Palladacycle Gen. 1].....	130
46-0232	Chloro[2-(dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl][2'-amino-1,1'-biphenyl-2-yl]palladium(II), min. 98% [DavePhos Palladacycle Gen. 2]	131
46-0286	Chloro(2-dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 2]	131
46-0266	Chloro(2-dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-biphenyl)[2-(2-aminoethylphenyl)] palladium(II), methyl-t-butylether adduct, min. 98% [RuPhos Palladacycle Gen. 1]	132
46-0281	Chloro(2-dicyclohexylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [XPhos Palladacycle Gen. 2]	132
46-0268	Chloro(2-dicyclohexylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II) methyl-t-butylether adduct, min. 98% [XPhos Palladacycle Gen. 1].....	133
46-0342	Chloro[[4-(N,N-dimethylamino)phenyl]di-t-butylphosphino)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [Amphos Palladacycle Gen. 2].....	134
46-0270	Chloro(di-2-norbornylphosphino)(2'-dimethylamino-1,1'-biphenyl-2-yl)palladium(II), min. 97%	135
46-0274	Chloro[(1,2,3- η)-3-phenyl-2-propenyl][1,3-bis(2,6-di-i-propylphenyl)-4,5-dihydroimidazol-2-ylidene]palladium(II), min. 97%	138
46-0276	Chloro[(1,2,3- η)-3-phenyl-2-propenyl][1,3-bis(2,6-di-i-propylphenyl)imidazol-2-ylidene] palladium(II), min. 97%	138
46-0366	Chloro[[RuPhos][2-(2-aminoethylphenyl)palladium(II)]/[RuPhos] admixture (molar PdP/P = 1:1) ..	138
46-0369	Chloro[[S-Phos][2-(2-aminoethylphenyl)palladium(II)]/[S-Phos] admixture (molar PdP/P = 1:1)	139
46-0285	Cyclopentadienyl[(1,2,3- η)-1-phenyl-2-propenyl]palladium(II), 98%	139
46-0355	Di- μ -bromobis(tri-t-butylphosphino)dipalladium(I)	141
46-0370	Dichlorobis(acetonitrile)palladium(II), 99%	142

Carbon-carbon bond formation-Cross coupling

46-0400	Dichlorobis(benzonitrile)palladium(II), 99%	143
46-0825	Dichlorobis[4-(N,N-dimethylamino)phenyl]di-t-butylphosphino)palladium(II), min. 98% PdAmphos	145
46-0450	Dichloro 1,1'-bis(diphenylphosphino)ferrocene palladium (II) dichloromethane, 99%.....	146
46-0460	Dichloro[1,1'-bis(di-i-propylphosphino)ferrocene]palladium(II), 99%.....	148
46-0530	trans-Dichlorobis(triphenylphosphine)palladium(II), 99% (99.9+%-Pd).....	150
46-0959	Methanesulfonato[4,6-bis(diphenylphosphino)phenoxazine](2'-amino-1,1'-biphenyl-2-yl) palladium(II), 98% [NiXantphos Palladacycle Gen. 3].....	155
46-0340	Methanesulfonato[2-bis(3,5-di(trifluoromethyl)phenylphosphino)-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [JackiePhos Palladacycle Gen. 3].....	156
46-0365	Methanesulfonato[di-t-butyl(n-butyl)phosphine](2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [P(t-Bu) ₂ (n-Bu) Palladacycle Gen. 3].....	159
46-0325	Methanesulfonato(2-(di-t-butylphosphino)-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl) (2'-amino-1,1'-biphenyl-2-yl)palladium(II), dichloromethane adduct, min. 98% [t-BuBrettPhos Palladacycle Gen. 3].....	160
46-0335	Methanesulfonato(2-(di-t-butylphosphino)-3-methoxy-6-methyl-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RockPhos Palladacycle Gen. 3].....	162
46-0323	Methanesulfonato(2-di-t-butylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [t-BuXPhos Palladacycle Gen. 3].....	163
46-0487	Methanesulfonato(2-dicyclohexylphosphino-2',6'-bis(dimethylamino)-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), 98% [CPhos Palladacycle Gen. 3].....	164
46-0318	Methanesulfonato(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct min. 98% [BrettPhos Palladacycle Gen. 3].....	165
46-0380	Methanesulfonato(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct min. 98% [SPhos Palladacycle Gen. 4].....	165
46-0322	Methanesulfonato(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl) (2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 3].....	165
46-0333	Methanesulfonato(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl) (2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 4].....	166
46-0237	Methanesulfonato[2-(dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II) CH ₂ Cl ₂ adduct, min. 98% [DavePhos Palladacycle Gen. 3].....	166
46-0314	Methanesulfonato(2-dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 3].....	167
46-0395	Methanesulfonato(2-dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-biphenyl) (2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 4].....	168
46-0320	Methanesulfonato(2-dicyclohexylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [Xphos Palladacycle Gen. 3].....	168
46-0327	Methanesulfonato(2-dicyclohexylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [XPhos Palladacycle Gen. 4].....	169
46-0348	Methanesulfonato[2-diethylphosphino-2',6'-bis(dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [EtCPhos Palladacycle Gen. 3].....	169
46-0345	Methanesulfonato[4-(N,N-dimethylamino)phenyl]di-t-butylphosphino)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [Amphos Palladacycle Gen. 3].....	170
46-0239	Methanesulfonato(tricyclohexylphosphine)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [PCy ₃ Palladacycle Gen. 3].....	173
46-0379	Methanesulfonato(tricyclohexylphosphino)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98% [PCy ₃ Palladacycle Gen. 4].....	173
46-1553	(2'-Methylamino-1,1'-biphenyl-2-yl)methanesulfonatopalladium(II) dimer, min. 98%	173
46-1780	Palladium(II) acetate, min. 98% (99.9+%-Pd)	174
46-1781	Palladium(II) acetate, 99+% (99.95+%-Pd)	174
46-1850	Palladium(II) chloride (99.9%-Pd).....	175
46-2150	Tetrakis(triphenylphosphine)palladium(0), 99% (99.9+%-Pd)	176
46-3000	Tris(dibenzylideneacetone)dipalladium(0).....	178

Carbon-carbon bond formation-Cross coupling

46-3010	Tris(dibenzylideneacetone)dipalladium(0) chloroform adduct.....	179
46-3015	Tris(dibenzylideneacetone)dipalladium(0)/tri-t-butylphosphonium tetrafluoroborate admixture (molar Pd/P = 1:1.2).....	181
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46-1660	Palladium on carbon - 1 wt % loading, activated synthetic carbon pellet.....	114
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46-1630	Palladium on carbon - 5 wt % loading, activated synthetic carbon powder.....	114
45-0380	Chloro(1,5-cyclooctadiene)rhodium(I) dimer, 98%	204
45-2160	Tris(acetonitrile)pentamethylcyclopentadienylrhodium(III) hexafluoroantimonate, min. 98%... ..	220
44-0092	Chloro((R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl](p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-xylinap)]Cl.....	248
44-0167	Diacetato((S)-(-)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl) ruthenium(II) Ru(OAc) ₂ [(S)-H ₈ -binap]	259
44-0166	Diacetato((R)-(+)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl) ruthenium(II) Ru(OAc) ₂ [(R)-H ₈ -binap]	259
44-0510	Dimethylammonium dichlorotri(μ-chloro)bis((R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl)diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-binap)} ₂ (μ-Cl) ₃].....	283

Carbon-carbon bond formation-General

13-5801	(1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]aluminum(III) chloride, 98%	2
13-5800	(1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]aluminum(III) chloride, 98%	1
24-0180	Chromium carbonyl, sublimed, 99%.....	13
24-0850	(1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]chromium(III) chloride	13
24-0851	(1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]chromium(III) chloride	14
27-0478	1,2-Bis(diphenylphosphino)ethanedichlorocobalt(II), min. 97%	15
27-1050	Chlorotris(triphenylphosphine)cobalt(I), min. 98%.....	15
27-0400	Cobalt carbonyl (Dicobalt octacarbonyl) (Stabilized with 1-5% hexanes)	16
27-0525	(1R,2R)-(-)-1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)cobalt(II)	19
27-0526	(1S,2S)-(+)-1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)cobalt(II).....	20
27-1950	Tetracobalt dodecacarbonyl, min. 98%.....	21
29-4050	Chloro[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-ylidene]copper(I), 98%.....	24
29-5000	Copper(II) trifluoromethanesulfonate, 98% (Copper triflate).....	26
29-5001	Copper(II) trifluoromethanesulfonate, 99% (99.9%-Cu) (Copper triflate)	27
29-6720	Trifluoromethyl(1,10-phenanthroline) copper(I), 95% Trifluoromethylator®	30
29-2955	Tris(triphenylphosphine)(trifluoromethyl)copper(I), 99%	31
79-0300	1,3-Bis(2,6-di-i-propylphenyl)imidazol-2-ylidene(acetonitrile)gold(I) tetrafluoroborate, 95%....	33
79-0245	[1,3-Bis(2,6-di-i-propylphenyl)imidazol-2-ylidene][bis(trifluoromethanesulfonyl)imide]gold(I), min. 95%.....	33
79-0205	1,3-Bis(2,6-di-i-propylphenyl)imidazol-2-ylidene gold(I) hydroxide, min. 97%.....	35
79-1230	Chloro[1,3-bis[2,6-bis(1-methylethyl)phenyl]-1,3-dihydro-4,5-dimethyl-2H-imidazol-2-ylidene]gold(I), 98% IPrMeAuCl	37
79-0340	Chloro[2-(di-t-butylphosphino)-1,1'-biphenyl]gold(I), 99%.....	39
79-0343	Chloro[2-(dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl]gold(I), 98%	42
79-0740	Chlorotri-t-butylphosphinegold(I), 99%.....	43

Carbon-carbon bond formation-General

79-0352	2-(Di- <i>t</i> -butylphosphino)-1,1'-biphenyl(acetonitrile)gold(I) hexafluoroantimonate, 99%	44
79-3615	Triphenylphosphinegold(I) bis(trifluoromethanesulfonyl)imidate, min. 98%	48
77-0453	(2,2'-Bipyridine)bis[3,5-difluoro-2-[5-trifluoromethyl-2-pyridinyl-kN)phenyl-kC]iridium(III) hexafluorophosphate, 99%	53
77-0465	(2,2'-Bipyridine)bis[2-pyridinyl-kN)phenyl-kC]iridium(III) hexafluorophosphate, 99%	55
77-0225	Bis(1,5-cyclooctadiene)iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, 98%	56
77-5074	[(R)-(+)-5,5'-Bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole][4-cyano-3-nitrobenzenecarboxylato][1,2,3- <i>n</i> -2-propenyl]iridium(III), min. 97%	56
77-5075	[(S)-(-)-5,5'-Bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole][4-cyano-3-nitrobenzenecarboxylato][1,2,3- <i>n</i> -2-propenyl]iridium(III), min. 97%	57
77-0425	(4,4'-Di- <i>t</i> -butyl-2,2'-bipyridine)bis[3,5-difluoro-2-[5-trifluoromethyl-2-pyridinyl-kN)phenyl-kC]iridium(III) hexafluorophosphate, 99%	65
77-0410	(4,4'-Di- <i>t</i> -butyl-2,2'-bipyridine)bis[2-(2-pyridinyl-kN)phenyl-kC]iridium(III) hexafluorophosphate, 99%	65
77-1060	Dichloro(pentamethylcyclopentadienyl)iridium(III) dimer, 98%	66
77-0468	Di- μ -chlorotetrakis[3,5-difluoro-2-[5-trifluoromethyl-2-pyridinyl-kN)phenyl-kC]diiridium(III), 99% ...	66
26-0923	Dichloro[1,2-bis(diphenylphosphino)ethane]iron(II), 98%	75
26-1410	(R)-(+)-4-Dimethylaminopyridinyl(pentaphenylcyclopentadienyl)iron, min. 98% (R)-C ₅ Ph ₅ -DMAP	76
26-3700	(R)-(+)-4-Pyrrolidinopyridinyl(pentamethylcyclopentadienyl) iron, min. 98% (R)-PPY*	79
26-3701	(S)-(-)-4-Pyrrolidinopyridinyl(pentamethylcyclopentadienyl)iron, min. 98% (S)-PPY*	79
96-3660	Solvias Josiphos Nickel Catalyst Kit	
57-0201	Di-[3-((S)-2,2'-dihydroxy-1,1'-binaphthylmethyl)]ether, lanthanum(III) salt, tetrahydrofuran adduct SCT-(S)-BINOL	80
57-1250	Tris[N,N,N,N-tetramethylguanidinium][tris(1S)-(1,1'-binaphalene)-2,2'-diolato]lanthanate La-HTMG-B	80
03-2010	Lithium tris(S)-(-)-1,1'-binaphthyl-2,2'-diolato]yttrate(III) tetrahydrofuran adduct, min. 97%	81
12-1200	Magnesium bis(trifluoromethylsulfonyl)imide, min. 97%	82
25-0300	(1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di- <i>t</i> -butylsalicylidene)]manganese(III) chloride, 98% (R,R)-Jacobsen Cat	83
25-0301	(1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di- <i>t</i> -butylsalicylidene)]manganese(III) chloride, 98% (S,S)-Jacobsen Cat	84
28-0010	Bis(1,5-cyclooctadiene)nickel (0), 98+%	91
28-1330	trans-Bis(dicyclohexylphenylphosphino)nickel(II) chloride, 99%	93
28-0080	1,3-Bis(diphenylphosphino)propane nickel(II) chloride, 99%	94
28-0150	Chlorobis(dicyclohexylphenylphosphino)(2-methylphenyl)nickel(II), 99%	97
28-1130	Nickel(II) acetylacetonate, anhydrous, min. 95%	100
28-1110	Nickel(II) acetylacetonate hydrate	100
07-1712	(8 α , 9S)-(+)-9-Amino-cinchonan-6'-ol, min. 90%	101
07-1717	(9R)-(+)-9-Amino-cinchonan-6'-ol, min. 90%	102
07-0484	1,3-Bis(2,6-di- <i>i</i> -propylphenyl)imidazolium bicarbonate, min. 97% IPrH.HCO ₃	103
07-0215	(2S)-(-)-2-[[[3,5-Bis(trifluoromethyl)phenyl]amino]thioxomethyl]amino]-N-(diphenylmethyl)-N,3,3-trimethylbutanamide, 95%	103
07-4033	1,3-Bis(2,4,6-trimethylphenyl)imidazolium bicarbonate, min. 97% IMesH.HCO ₃	104
07-0380	(11bR)-4,4-Dibutyl-2,6-bis(3,4,5-trifluorophenyl)-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]azepinium bromide	106
07-0381	(11bS)-4,4-Dibutyl-2,6-bis(3,4,5-trifluorophenyl)-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]azepinium bromide	107
07-0421	6,7-Dihydro-2-phenyl-5H-pyrrolo[2,1-c]-1,2,4-triazolium chloride, min. 98%	109

Carbon-carbon bond formation-General

07-0496	(2R,3S)-(-)-3,4-Dihydro-3-(i-propyl)-2-phenyl-2H-pyrimido[2,1-b]benzothiazole, min. 98% HyperBTM	109
07-0975	(5aS,6R,9S,9aR)-5a,6,7,8,9,9a-Hexahydro-6,11,11-trimethyl-2-(2,4,6-trimethylphenyl)-6,9-methano-4H-[1,2,4]triazolo[3,4-c][1,4]benzoxazinium tetrafluoroborate.....	111
46-0040	Allylchloro[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-ylidene]palladium(II), 98%	115
46-0100	Allylpalladium chloride dimer, min. 98%	116
46-0101	Allylpalladium chloride dimer, supported on poly(ethylene glycol)polystyrene graft copolymer beads [-~6% (C ₃ H ₅ PdCl) ₂].....	117
46-0228	trans-Bis(dicyclohexylamine)bis(acetato)palladium(II) DAPCy	119
46-0828	Bis[[4-(N,N-dimethylamino)phenyl]di-t-butylphosphino]palladium(0), min. 98% Pdamphos...	120
46-0230	N,N'-[Bis(2,6-dimethylphenyl)-1,3-dimethyl-1,3-propanediylidene](methyl) (triethylphosphine)palladium(II), min. 97%	120
46-0226	[1,3-Bis(2,6-di-i-propylphenyl)-4,5-dihydroimidazol-2-ylidene][2-[(dimethylamino-kN)methyl]phenyl-kC](pyridine)palladium(II) tetrafluoroborate, min. 97% PACC™	121
46-0205	[P,P'-1,3-Bis(di-i-propylphosphino)propane][P-1,3-bis(di-i-propylphosphino)propane] palladium(0), 98%.....	122
46-0252	Bis(tri-t-butylphosphine)palladium(0), 98%.....	123
46-0224	[1,3-Bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene][2-[(dimethylamino-kN)methyl]phenyl-kC](pyridine)palladium (II) tetrafluoroborate, min. 97% PACC™.....	124
46-0955	Chloro[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene][2'-amino-1,1'-biphenyl] palladium(II) dichloromethane adduct, min. 98% [Xantphos Palladacycle Gen. 2].....	134
46-0270	Chloro(di-2-norbornylphosphino)(2'-dimethylamino-1,1'-biphenyl-2-yl)palladium(II), min. 97%...	135
46-1050	Chloro[2-[1-(N-methoxy)iminoethyl]phenyl][1,3-bis(2,6-di-i-propylphenyl)imidazole-2-ylidene] palladium(II).....	136
46-1058	Chloro[2-[(1-(N-phenyl)iminoethyl)phenyl][1,3-bis(2,6-di-i-propylphenyl)imidazole-2-ylidene] palladium(II).....	137
46-0298	Chloro[(1,2,3-η)-1-phenyl-2-propen-1-yl]-[1,3-bis[2,6-bis(diphenylmethyl)-4-methylphenyl]-2H-imidazol-2-ylidene]palladium(II), min. 97%	137
46-0274	Chloro[(1,2,3-η)-3-phenyl-2-propenyl][1,3-bis(2,6-di-i-propylphenyl)-4,5-dihydroimidazol-2-ylidene]palladium(II), min. 97%	138
46-0028	Chloro(tri-t-butylphosphine)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98%	139
46-0257	Diacetato[1,3-bis(diphenylphosphino)propane]palladium(II), 99%	139
46-0455	Dichloro[1,1'-bis(dicyclohexylphosphino)ferrocene]palladium(II), dichloromethane adduct, 99%..	144
46-0188	Dichloro[(R)-(+)-2,2'-bis(di-2-furanylphosphino)-6,6'-dimethoxy-1,1'-biphenyl]palladium(II)....	145
46-0870	Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]palladium(II), min. 98%	145
46-0871	Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]palladium(II), min. 98%	146
46-0463	Dichloro[bis[2-(diphenylphosphino)phenyl]ether]palladium(II), 98%	147
46-0295	Di-μ-chlorobis[(1,2,3-η)-1-phenyl-2-propenyl]dipalladium(II), 98%.....	148
46-0860	Dichloro(di-μ-chloro)bis[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-ylidene]dipalladium(II), 97%	151
46-2158	Methanesulfonato(1,1'-bis(di-t-butylphosphino)ferrocene)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [DTBPF Palladacycle Gen. 3].....	153
46-2153	Methanesulfonato[2,2'-bis(diphenylphosphino)-1,1'-binaphthyl](2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [BINAP Palladacycle Gen. 3]	154
46-2128	Methanesulfonato[1,1'-bis(diphenylphosphino)ferrocene][(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [DPPF Palladacycle Gen. 3]	154
46-0935	Methanesulfonato[N-[2-(di-1-adamantylphosphino)phenyl]morpholine](2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [Mor-Dalpos Palladacycle Gen. 3].....	157
46-0940	Methanesulfonato[N-[2-(di-1-adamantylphosphino)phenyl]morpholine](2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [MorDalpos Palladacycle Gen. 4]	158
46-0357	Methanesulfonato(2-di-t-butylphosphino-1,1'-binaphthyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 95% [TrixiePhos Palladacycle Gen. 3].....	159

Carbon-carbon bond formation-General

46-2135	Methanesulfonato[2-(di- <i>t</i> -butylphosphino)-2'-(<i>N,N</i> -dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [t-BuDavePhos Palladacycle Gen. 3]	161
46-2163	Methanesulfonato[2-(di- <i>t</i> -butylphosphino-3,4,5,6-tetramethyl-2',4',6'-tri- <i>i</i> -propylbiphenyl)](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 95% [Me4 <i>t</i> -ButylXPhos Palladacycle Gen. 3]	163
46-0980	Methanesulfonato[2-(dicyclohexylphosphino-1,1'-biphenyl)](2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% CyJohnphos Palladacycle Gen. 4	164
46-0487	Methanesulfonato[2-(dicyclohexylphosphino-2',6'-bis(dimethylamino)-1,1'-biphenyl)](2'-amino-1,1'-biphenyl-2-yl)palladium(II), 98% [CPhos Palladacycle Gen. 3]	164
46-0957	Methanesulfonato[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene]](2'-amino-1,1'-biphenyl)palladium(II) dichloromethane adduct, min. 98% [Xantphos Palladacycle Gen. 3]	170
46-0388	Methanesulfonato[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene]](2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98% [Xantphos Palladacycle Gen. 4]	171
46-0392	Methanesulfonato[1,3,5,7-tetramethyl-8-phenyl-2,4,6-trioxo-8-phosphaadamantane](2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [MeCgPPh Palladacycle Gen. 3]	171
46-0387	Methanesulfonato(tri- <i>t</i> -butylphosphino)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), 98% [P(<i>t</i> -Bu) ₃ Palladacycle Gen. 3]	172
46-0385	Methanesulfonato(tri- <i>t</i> -butylphosphino)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98% [P(<i>t</i> -Bu) ₃ Palladacycle Gen. 4]	172
46-2185	Tris[tris[3,5-bis(trifluoromethyl)phenyl]phosphine]palladium(0), 99%	181
15-1457	(11bR)-(+)-4,4-Dibutyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% R-MARUOKA CAT P-NB	182
15-1458	(11bS)-(-)-4,4-Dibutyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% S-Maruko CAT P-NB	183
15-1464	(11bR)-(+)-4,4-Di- <i>t</i> -butyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% R-MARUOKA CAT P-TB	183
15-1465	(11bS)-(-)-4,4-Di- <i>t</i> -butyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% S-MARUOKA CAT P-TB	183
59-1000	Tris[N,N,N-tetramethylguanidinium][tris(1S)-(1,1'-binaphthalene)-2,2'-diolato]praseodymate Pr-HTMG-B	186
75-2365	Chlorotricarbonyl(4,4'-di- <i>t</i> -butyl-2,2'-bipyridine)rhenium(I), 99%	186
45-0016	Acetylacetonatobis(cyclooctene)rhodium(I), min. 97%	187
45-0010	Acetylacetonato(1,5-cyclooctadiene)rhodium(I), 98%	187
45-0109	Bis(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+%	188
45-0161	(+)-1,2-Bis((2S,5S)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (S,S)-Me-DUPHOS-Rh	193
45-0655	Bromotris(triphenylphosphine)rhodium(I), 99% (99.9%-Rh)	203
45-0380	Chloro(1,5-cyclooctadiene)rhodium(I) dimer, 98%	204
45-0650	Chlorotris(triphenylphosphine)rhodium(I), 99% WILKINSON'S CATALYST	206
45-0652	1,5-Cyclooctadiene(hydroquinone)rhodium(I) tetrafluoroborate	208
45-0195	Dichloro(pentamethylcyclopentadienyl)rhodium(III) dimer, 99%	210
45-0670	Polymer-bound chlorotris(triphenylphosphine)rhodium(I) on styrene-divinylbenzene copolymer (20% cross-linked)	212
45-1730	Rhodium(II) acetate dimer, 99%	213
45-1878	Rhodium(III) chloride, anhydrous	214
45-2071	Tetrakis[(S)-(+)-(1-adamantyl)-(N-phthalimido)acetato]dirhodium(II) Rh ₂ (S-PTAD) ₄	216
45-2070	Tetrakis[(R)-(-)-(1-adamantyl)-(N-phthalimido)acetato]dirhodium(II) Rh ₂ (R-PTAD) ₄	216
45-2081	Tetrakis[(S)-(+)-[(1S)-1-(4-bromophenyl)-2,2-diphenylcyclopropanecarboxylato]dirhodium(II) Rh ₂ (S-BTPCP) ₄	217
45-2080	Tetrakis[(R)-(-)-[(1R)-1-(4-bromophenyl)-2,2-diphenylcyclopropanecarboxylato]dirhodium(II) Rh ₂ (R-BTPCP) ₄	217
45-2105	Tetrakis[5- <i>t</i> -butyl-phthaloyl-N-(S)-tert-leucinato]dirhodium bis(ethyl acetate) adduct Rh ₂ (S-tertP TTL) ₄	217

Carbon-carbon bond formation-General

45-2100	Tetrakis[(R)-(+)-N-(p-dodecylphenylsulfonyl)prolinato]dirhodium(II) Rh ₂ (R-DOSP) ₄	219
45-2101	Tetrakis[(S)-(-)-N-(p-dodecylphenylsulfonyl)prolinato]dirhodium(II) Rh ₂ (S-DOSP) ₄	219
45-2160	Tris(acetonitrile)pentamethylcyclopentadienylrhodium(III) hexafluoroantimonate, min. 98%...	220
44-0055	[1,3-Bis(2,6-di-i-propylphenyl)-4,5-dihydroimidazol-2-ylidene]-[2-i-propoxy-5-(trifluoroacetamido)phenyl]methyleneruthenium(II) dichloride M71-S1Pr	225
44-0750	[1,3-Bis(2,6-di-i-propylphenyl)imidazolidin-2-ylidene][2-[[1-(methoxy(methyl)amino)-1-oxopropan-2-yl]oxy]benzylidene]ruthenium(II) dichloride GreenCat	225
44-0083	1,3-Bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene[2-(i-propoxy)-5-(N,N-dimethylaminosulfonyl)phenyl]methyleneruthenium(II) dichloride (resin supported) Zhan Catalyst II..	228
44-0082	1,3-Bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene[2-(i-propoxy)-5-(N,N-dimethylaminosulfonyl)phenyl]methyleneruthenium(II) dichloride Zhan Catalyst-1B, min 96%.....	229
44-0768	[1,3-Bis(2,4,6-trimethylphenyl)-4-[[4-ethyl-4-methylpiperazin-1-ium-1-yl)methyl]imidazolidin-2-ylidene]-(2-i-propoxybenzylidene)dichlororuthenium(II) chloride AquaMet	230
44-0758	[1,3-Bis(2,4,6-trimethylphenylimidazolidin-2-ylidene)]-(2-i-propoxy-5-nitrobenzylidene)ruthenium(II) dichloride nitro-Grela.....	232
44-0753	[1,3-Bis(2,4,6-trimethylphenylimidazolidin-2-ylidene)](tricyclohexylphosphine)-(2-oxobenzyli- den)ruthenium(II) chloride LatMet	233
44-0765	[1,3-Bis(2,4,6-trimethylphenyl)-4-[(trimethylammonio)methyl]imidazolidin-2-ylidene]-(2-i-propoxybenzylidene)dichlororuthenium(II) chloride StickyCat Cl	234
44-0090	Carbonylbis(trifluoroacetato)bis(triphenylphosphine)ruthenium(II) methanol adduct, min. 98%	234
44-0085	Carbonylchlorohydridotris(triphenylphosphine)ruthenium(II), 99%.....	236
44-0100	Carbonyl(dihydrido)tris(triphenylphosphine)ruthenium (II), 99%	237
44-0102	Chloro{(R)-(-)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene){(R)-dtbm-segphos@}]Cl	241
44-0103	Chloro{(S)-(+)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene){(S)-dtbm-segphos@}]Cl	242
44-0095	Chloro{(S)-(-)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene){(S)-H ₈ -binap}Cl].....	246
44-0113	Chloro(1,5-cyclooctadiene)(pentamethylcyclopentadienyl)ruthenium(II), 98%	250
44-0117	Chloro(pentamethylcyclopentadienyl)bis(triphenylphosphine)ruthenium(II), 99%.....	256
44-0645	Dichlorobis(μ-methanethioato)bis(pentamethylcyclopentadienyl)diruthenium(III), 99% (minimum 90% syn isomer)	277
44-0433	Dichloro(p-cymene)triphenylphosphineruthenium(II) dichloromethane adduct, min. 98%	278
44-0510	Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-binap)} ₂ (μ-Cl)] ₂	283
44-0511	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][{RuCl((S)-binap)} ₂ (μ-Cl)] ₂	285
44-0078	{[2-(i-Propoxy)-5-(N,N-dimethylaminosulfonyl)phenyl]methylene}(tricyclohexylphosphine)ruthenium(II) dichloride Zhan Catalyst -1C.....	289
44-1850	Ruthenium carbonyl, 99%	290
44-7777	Tricyclohexylphosphine[3-phenyl-1H-inden-1-ylidene][1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene]ruthenium(II) dichloride, min. 95%	294
44-7783	Tri(i-propoxy)phosphine(3-phenyl-1H-inden-1-ylidene)[1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene]ruthenium (II) dichloride, min. 95% cis-Caz-1.....	295
44-7870	Tris(acetonitrile)cyclopentadienylruthenium(II) hexafluorophosphate, min. 98%	295
44-7890	Tris(acetonitrile)pentamethylcyclopentadienylruthenium(II) trifluoromethanesulfonate, min. 98%..	297
62-3100	Samarium(II) iodide, 0.1M in THF	299
21-2000	Scandium(III) trifluoromethanesulfonate, min. 98% (Scandium triflate)	300
21-2004	Scandium(III) trifluoromethanesulfonate (Scandium triflate), Microencapsulated in a Styrene Polymer [~13% Sc(SO ₃ F) ₃].....	302
14-1815	(4S,5S)-2-Allyl-2-chloro-3,4-dimethyl-5-phenyl-1-oxa-3-aza-3-silacyclopentane, min. 98% (~2:1 mixture of diastereomers)	302

Carbon-carbon bond formation-General

16-2230	3,4,5-Trimethylthiazolium iodide, 99%.....	305
22-0180	Bis(cyclopentadienyl)dicarbonyl titanium(II), min. 98%	306
22-0761	(4R,5R)-(-)-2,2-Dimethyl- α,α,α' -tetra(1-naphthyl)-1,3-dioxolane-4,5-dimethanolatitanium(IV) dichloride acetonitrile adduct.....	307
22-0780	(4R,5R)-(-)-2,2-Dimethyl- α,α,α' -tetraphenyl-1,3-dioxolane-4,5-dimethanolato[1,2-bis(dimethoxy)ethane]titanium(IV) dichloride acetonitrile adduct.....	307
93-2216	Titanium(IV) i-propoxide, min. 98%	308
70-0130	Tris[N,N,N,N-tetramethylguanidinium][tris(1S)-(1,1'-binaphalene)-2,2'-diolato]ytterbate Yb-HTMG-B.....	311
39-5850	Tris[N,N,N,N-tetramethylguanidinium][tris(1S)-(1,1'-binaphalene)-2,2'-diolato]ytrate Y-HTMG-B.....	311
30-4050	Oxo[hexa(trifluoroacetato)]tetrazinc trifluoroacetic acid adduct ZnTAC ₂₄ TM	311
30-1350	Zinc bis(trifluoromethylsulfonyl)imide, min. 97%	312
30-4000	Zinc trifluoromethanesulfonate, min. 98% (Zinc triflate)	313
40-1040	Bis(cyclopentadienyl)zirconium chloride hydride (Schwartz's Reagent), 95%	314
93-4002	Bis(cyclopentadienyl)zirconium dichloride, 99% (Zirconocene dichloride).....	315
40-1054	Bis(pentamethylcyclopentadienyl)dimethylzirconium(IV), 99%	316
40-1056	(+)-Bis[1-((1R,2'R,5'R)-2'-i-propyl-5'-methylcyclohexyl)indenyl]zirconium(IV) dichloride	317
40-1142	rac-Dimethylsilylbis(1-indenyl)zirconium dichloride, min. 97%.....	317
40-1400	rac-Ethylenebis(4,5,6,7-tetrahydro-1-indenyl)zirconium dichloride	317

Carbon-carbon bond formation-Heck Reaction

27-0478	1,2-Bis(diphenylphosphino)ethanedichlorocobalt(II), min. 97%	15
29-4000	Bromo(1,10-phenanthroline)(triphenylphosphine)copper(I), min. 97%.....	23
29-6000	(1,10-Phenanthroline)bis (triphenylphosphine)copper(I) nitrate dichloromethane adduct, 98%	28
46-0220	1,3-Bis(2,6-di-i-propylphenyl)imidazol-2-ylidene(1,4-naphthoquinone)palladium(0) dimer, 96%	121
46-0265	1,3-Bis(2,4,6-trimethylphenyl)imidazol-2-ylidene(1,4-naphthoquinone)palladium(0) dimer, 96% ...	125
46-0270	Chloro(di-2-norbornylphosphino)(2'-dimethylamino-1,1'-biphenyl-2-yl)palladium(II), min., 97%.....	135
46-0290	trans-Di(μ -acetato)bis[o-(di-o-tolylphosphino)benzyl]dipalladium(II), 97+% [cataCXium® C]..	140
46-0530	trans-Dichlorobis(triphenylphosphine)palladium(II), 99% (99.9+% -Pd).....	150
46-1780	Palladium(II) acetate, min. 98% (99.9+% -Pd)	174
46-1781	Palladium(II) acetate, 99+% (99.95+% -Pd)	174
46-3015	Tris(dibenzylideneacetone)dipalladium(0)/tri-t-butylphosphonium tetrafluoroborate admixture (molar Pd/P = 1:1.2).....	181
46-3020	Tris(dibenzylideneacetone)dipalladium(0)/tri-t-butylphosphonium tetrafluoroborate admixture (molar Pd/P = 1:2).....	181
46-1660	Palladium on carbon - 1 wt % loading, activated synthetic carbon pellet.....	114
46-1610	Palladium on carbon - 1 wt % loading, activated synthetic carbon powder.....	114
46-1630	Palladium on carbon - 5 wt % loading, activated synthetic carbon powder.....	114
45-0670	Polymer-bound chlorotris(triphenylphosphine)rhodium(I) on styrene-divinylbenzene copolymer (20% cross-linked)	212
44-0092	Chloro((R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl)(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-xylnap)]Cl.....	248
44-0510	Dimethylammonium dichlorotri(μ -chloro)bis((R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl)diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-binap)} ₂ (μ -Cl) ₃].....	283

Carbon-heteroatom bond formation

24-0850	(1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]chromium(III) chloride...	13
24-0851	(1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]chromium(III) chloride ..	14
27-0525	(1R,2R)-(-)-1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)cobalt(II)	19
27-0526	(1S,2S)-(+)-1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)cobalt(II).....	20
27-0575	Dichlorobis(triphenylphosphine)cobalt(II), 98%	20
29-7050	μ -Benzenebis[N,N'-(1,3-dimethyl-1,3-propanediylidene)bis(2,6-dichlorobenzenamino)]dicopper(I), benzene adduct, min. 98%.....	22
29-4000	Bromo(1,10-phenanthroline)(triphenylphosphine)copper(I), min. 97%.....	23
29-0490	Copper(I) iodide/cesium carbonate admixture [5.50 wt% Cu]	25
29-5000	Copper(II) trifluoromethanesulfonate, 98% (Copper triflate).....	26
29-6000	(1,10-Phenanthroline)bis (triphenylphosphine)copper(I) nitrate dichloromethane adduct, 98%	28
29-6700	Tetrakis(acetonitrile)copper(I) hexafluorophosphate, 98+%	29
79-0200	1,3-Bis(2,6-di-isopropylphenyl)imidazol-2-ylidene-gold(I) chloride, 95%	32
79-0115	$[\mu$ -Bis(diphenylphosphino) methane]dichlorogold(I), 99%	33
79-0245	[1,3-Bis(2,6-di-i-propylphenyl)imidazol-2-ylidene][bis(trifluoromethanesulfonyl)imide]gold(I), min. 95%.....	33
79-0230	Bis(trifluoromethanesulfonyl)imide(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl) gold(I), 98%	36
79-1230	Chloro[1,3-bis[2,6-bis(1-methylethyl)phenyl]-1,3-dihydro-4,5-dimethyl-2H-imidazol-2-ylidene]gold(I), 98% IPrMeAuCl	37
79-0340	Chloro[2-(di-t-butylphosphino))-1,1'-biphenyl]gold(I), 99%.....	39
79-0225	Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)gold(I), 98%	41
79-0343	Chloro[2-(dicyclohexylphosphino)-2'-(N,N-dimethylamino))-1,1'-biphenyl]gold(I), 98%	42
79-0740	Chlorotri-t-butylphosphinegold(I), 99%	43
79-0352	2-(Di-t-butylphosphino))-1,1'-biphenyl(acetonitrile)gold(I) hexafluoroantimonate, 99%	44
79-0348	[2-(Dicyclohexylphosphino)-2'-(N,N-dimethylamino))-1,1'-biphenyl][bis(trifluoromethyl) sulfonylimido]gold(I), 98%	46
79-5000	Methyl(triphenylphosphine)gold(I), 99%	46
79-0355	Tri-t-butylphosphine[bis(trifluoromethyl)sulfonylimido]gold(I), 98%	47
79-3615	Triphenylphosphinegold(I) bis(trifluoromethanesulfonyl)imidate, min. 98%	48
77-0453	(2,2'-Bipyridine)bis[3,5-difluoro-2-[5-trifluoromethyl-2-pyridinyl-kN)phenyl-kC]iridium(III) hexafluorophosphate, 99%.....	53
77-0465	(2,2'-Bipyridine)bis[2-pyridinyl-kN)phenyl-kC]iridium(III) hexafluorophosphate, 99%.....	55
77-0440	Bis(pyridine)(1,5-cyclooctadiene)iridium(I) hexafluorophosphate, 99%	58
77-0258	Chloro(1,5-cyclooctadiene)(1,10-phenanthroline)iridium(I) THF adduct, min. 98%	58
77-0424	Chloro(pentamethylcyclopentadienyl){5-cyano-2-[1-[(4-methoxyphenyl)imino-kN]ethyl] phenyl-kC}iridium(III), 99% Iridicycle-CN.....	60
77-0418	Chloro(pentamethylcyclopentadienyl){5-methoxy-2-[1-[(4-methoxyphenyl)imino-kN]ethyl] phenyl-kC}iridium(III), 99% Iridicycle-MeO	60
77-0428	Chloro(pentamethylcyclopentadienyl){2-[1-[(4-methoxyphenyl)imino-kN]ethyl]naphthyl-kC} iridium(III), 99% Iridicycle-Naphth.....	61
77-0430	Chloro(pentamethylcyclopentadienyl){5-nitro-2-[1-[(4-methoxyphenyl)imino-kN]ethyl] phenyl-kC}iridium(III), 99% Iridicycle-NO2	62
77-0950	1,5-Cyclooctadiene(η 5-indenyl)iridium(I), 99%.....	64
77-0425	(4,4'-Di-t-butyl-2,2'-bipyridine)bis[3,5-difluoro-2-[5-trifluoromethyl-2-pyridinyl-kN)phenyl-kC] iridium(III) hexafluorophosphate, 99%.....	65
77-0410	(4,4'-Di-t-butyl-2,2'-bipyridine)bis[2-(2-pyridinyl-kN)phenyl-kC]iridium(III) hexafluorophosphate, 99%.....	65

Carbon-heteroatom bond formation

77-1060	Dichloro(pentamethylcyclopentadienyl)iridium(III) dimer, 98%.....	66
26-0061	(2R,2'R)-(-)-[N,N'-Bis(2-pyridylmethyl)-2,2'-bipyrolidinebis(acetonitrile)iron(II) hexafluoroantimonate Fe(R,R-PDP) White-Chen Catalyst.....	73
26-0060	(2S,2'S)-(-)-[N,N'-Bis(2-pyridylmethyl)-2,2'-bipyrolidinebis(acetonitrile)iron(II) hexafluoroantimonate Fe(S,S-PDP) White-Chen Catalyst.....	73
26-3700	(R)-(+)-4-Pyrrolidinopyridinyl(pentamethylcyclopentadienyl) iron, min. 98% (R)-PPY*.....	79
26-3701	(S)-(-)-4-Pyrrolidinopyridinyl(pentamethylcyclopentadienyl)iron, min. 98% (S)-PPY*.....	79
57-1250	Tris[N,N,N,N-tetramethylguanidinium][tris(1S)-(1,1'-binaphalene)-2,2'-diolato]lanthanate La-HTMG-B.....	80
12-1200	Magnesium bis(trifluoromethylsulfonyl)imide, min. 97%.....	82
28-0080	1,3-Bis(diphenylphosphino)propane nickel(II) chloride, 99%.....	94
28-0096	Bis(triphenylphosphino)(2-methylphenyl)chloronickel(II), 99%.....	96
28-0170	Chloro(4-cyanophenyl){(R)-1-[(S)-2-(diphenylphosphino)ferrocenyl]ethyl(di-t-butyl) phosphine} nickel(II).....	98
28-0518	Chloro(2-methylphenyl)[1,1'-bis(diphenylphosphino)ferrocene]nickel (II), 98%.....	98
28-1130	Nickel(II) acetylacetonate, anhydrous, min. 95%.....	100
28-1110	Nickel(II) acetylacetonate hydrate.....	100
07-1712	(8 α , 9S)-(+)-9-Amino-cinchonan-6'-ol, min. 90%.....	101
07-1717	(9R)-(+)-9-Amino-cinchonan-6'-ol, min. 90%.....	102
07-0484	1,3-Bis(2,6-di-i-propylphenyl)imidazolium bicarbonate, min. 97% IPrH.HCO ₃	103
07-4033	1,3-Bis(2,4,6-trimethylphenyl)imidazolium bicarbonate, min. 97% IMesH.HCO ₃	104
07-0299	1,3-Bis(2,4,6-trimethylphenyl)imidazolium chloride, min. 97%.....	105
07-0496	(2R,3S)-(-)-3,4-Dihydro-3-(i-propyl)-2-phenyl-2H-pyrimido[2,1-b]benzothiazole, min. 98% HyperBTM.....	109
46-0025	Acetato(2'-di-t-butylphosphino-1,1'-biphenyl-2-yl)palladium(II), min. 98%.....	114
46-0039	Allylchloro[1,3-bis(2,6-di-i-propylphenyl)-4,5-dihydroimidazol-2-ylidene]palladium(II), 97%....	115
46-0040	Allylchloro[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-ylidene]palladium(II), 98%.....	115
46-0045	Allylchloro[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]palladium(II), 98%.....	115
46-0241	Bis{[2-(Diadamantylphosphino)-3-methoxy-2',4',6'-tri-i-propyl-3'-(2,3,5,6-tetrafluoro-4-butylphenyl)-1,1'-biphenyl]palladium(0)}[1,5-cyclooctadiene, [AlPhos Palladium complex].....	118
46-0210	Bis(dibenzylideneacetone)palladium(0).....	118
46-0230	N,N'-[Bis(2,6-dimethylphenyl)-1,3-dimethyl-1,3-propanediylidene](methyl) (triethylphosphine)palladium(II), min. 97%.....	120
46-0226	[1,3-Bis(2,6-di-i-propylphenyl)-4,5-dihydroimidazol-2-ylidene][2-[(dimethylamino-kN)methyl]phenyl-kC](pyridine)palladium(II) tetrafluoroborate, min. 97% PACC™.....	121
46-0245	1,2-Bis(phenylsulfinyl)ethane palladium(II) acetate, min. 98% Christina White Catalyst.....	123
46-0252	Bis(tri-t-butylphosphine)palladium(0), 98%.....	123
46-0224	[1,3-Bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene][2-[(dimethylamino-kN)methyl]phenyl-kC](pyridine)palladium (II) tetrafluoroborate, min. 97% PACC™.....	124
46-0308	Bis(trimethylsilyl)methyl[(1,5-cyclooctadiene)palladium(II), 98%.....	125
46-0262	Bis(tri-o-tolylphosphine)palladium(0), min. 98%.....	126
46-0367	Chloro[[BrettPhos][2-(2-aminoethylphenyl)palladium(II)]]/[BrettPhos] admixture (molar PdP/P = 1:1).....	126
46-0440	Chloro(1-t-butylindenyl)[2-(dicyclohexylphosphino)-2',6'-di-i-propoxy-1,1'-biphenyl]palladium(II) ..	127
46-0364	Chloro[[t-BuXPhos][2-(2-aminoethylphenyl)palladium(II)]]/[t-BuXPhos] admixture (molar PdP/P = 1:1).....	128
46-0264	Chloro(2-di-t-butylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II), min. 98% [t-BuXPhos Palladacycle Gen. 1].....	128

Carbon-heteroatom bond formation

46-0283	Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II) min. 98% [SPhos Palladacycle Gen. 2]	129
46-0269	Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)[2-(2-aminoethylphenyl)] palladium(II) methyl-t-butylether adduct, min. 98% [SPhos Palladacycle Gen. 1].....	129
46-0292	Chloro(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 2]	130
46-0267	Chloro[2-(dicyclohexylphosphino)-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl][2-(2-aminoethyl)phenyl]palladium(II), min. 98% [BrettPhos Palladacycle Gen. 1].....	130
46-0232	Chloro[2-(dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [DavePhos Palladacycle Gen. 2].....	131
46-0286	Chloro(2-dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 2]	131
46-0266	Chloro(2-dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-biphenyl)[2-(2-aminoethylphenyl)] palladium(II), methyl-t-butylether adduct, min. 98% [RuPhos Palladacycle Gen. 1]	132
46-0281	Chloro(2-dicyclohexylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [XPhos Palladacycle Gen. 2]	132
46-0268	Chloro(2-dicyclohexylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II) methyl-t-butylether adduct, min. 98% [XPhos Palladacycle Gen. 1].....	133
46-0342	Chloro[4-(N,N-dimethylamino)phenyl]di-t-butylphosphino)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [Amphos Palladacycle Gen. 2].....	134
46-0955	Chloro[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene][2'-amino-1,1'-biphenyl] palladium(II) dichloromethane adduct, min. 98% [Xantphos Palladacycle Gen. 2].....	134
46-0270	Chloro(di-2-norbornylphosphino)(2'-dimethylamino-1,1'-biphenyl-2-yl)palladium(II), min. 97%	135
46-0272	Chloro(di-2-norbornylphosphino)(2-dimethylaminomethylferrocene-1-yl)palladium(II), min. 97%	135
46-0366	Chloro{[RuPhos][2-(2-aminoethylphenyl)]palladium(II)}/[RuPhos] admixture (molar Pd/P = 1:1) ..	138
46-0369	Chloro{[S-Phos][2-(2-aminoethylphenyl)]palladium(II)}/[S-Phos] admixture (molar Pd/P = 1:1)	139
46-0368	Chloro{[X-Phos][2-(2-aminoethylphenyl)]palladium(II)}/[X-Phos] admixture (molar Pd/P = 1:1)	139
46-0257	Diacetato[1,3-bis(diphenylphosphino)propane]palladium(II), 99%	139
46-0290	trans-Di(μ -acetato)bis[o-(di-o-tolylphosphino)benzyl]dipalladium(II), 97+% [cataCXium® C]..	140
46-0355	Di- μ -bromobis(tri-t-butylphosphino)dipalladium(I)	141
46-0450	Dichloro 1,1'-bis(diphenylphosphino)ferrocene palladium (II) dichloromethane, 99%.....	146
46-0460	Dichloro[1,1'-bis(di-i-propylphosphino)ferrocene]palladium(II), 99%	148
46-0295	Di- μ -chlorobis[(1,2,3- η)-1-phenyl-2-propenyl]dipalladium(II), 98%.....	148
46-2040	trans-Dichlorobis(tricyclohexylphosphine)palladium(II)/potassium phosphate admixture [CatKit single-use vials - 6.62 wt% Pd complex]	149
46-0530	trans-Dichlorobis(triphenylphosphine)palladium(II), 99% (99.9+% Pd).....	150
46-2038	trans-Dichlorobis(triphenylphosphine)palladium(II)/potassium phosphate admixture [CatKit single-use vials - 6.32 wt% Pd complex]	151
46-0860	Dichloro(di- μ -chloro)bis[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-ylidene]dipalladium(II), 97%	151
46-0310	Di- μ -iodobis(tri-t-butylphosphino)dipalladium(I), 98%	153
46-2158	Methanesulfonato(1,1'-bis(di-t-butylphosphino)ferrocene)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [DTBPF Palladacycle Gen. 3]	153
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44-0180	Diacetato((R)-(-)-5,5'-bis[di(3,5-di- <i>t</i> -butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole)ruthenium(II) Ru(OAc) ₂ [(R)-dtbm-segphos®].....	257

Carbon-heteroatom bond formation

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44-0176	Diacetato{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(S)-dm-segphos®]	261
44-0174	Diacetato{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(R)-dm-segphos®]	260
44-0215	Dichloro{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}[(2S)-(+)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) RuCl ₂ [(S)-dm-segphos®] [(S)-daipen]	273
44-0214	Dichloro{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}[(2R)-(-)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) RuCl ₂ [(R)-dm-segphos®] [(R)-daipen]	273
44-0229	Dichloro{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}[(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II) RuCl ₂ [(S)-dm-segphos®] [(S,S)-dpen]	274
44-0228	Dichloro{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole} [(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II) RuCl ₂ [(R)-dm-segphos®] [(R,R)-dpen]	273
44-0645	Dichlorobis(μ-methanethioato)bis(pentamethylcyclopentadienyl)diruthenium(III), 99% (minimum 90% syn isomer)	277
44-0172	Dichloro(2,6,10-dodecatriene-1,12-diyl)ruthenium(IV), 99%	278
44-0510	Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂]{[RuCl((R)-binap)] ₂ (μ-Cl) ₃ }	283
44-0511	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂]{[RuCl((S)-binap)] ₂ (μ-Cl) ₃ }	285
44-0780	1-Hydroxytetraphenylcyclopentadienyl(tetraphenyl-2,4-cyclopentadien-1-one)-μ-hydrotetracarbonyl diruthenium(II), 98% SHVO'S CATALYST	288
44-1850	Ruthenium carbonyl, 99%	290
44-7870	Tris(acetonitrile)cyclopentadienylruthenium(II) hexafluorophosphate, min. 98%	295
44-7880	Tris(acetonitrile)pentamethylcyclopentadienylruthenium(II) hexafluorophosphate, min. 98% ..	296
16-2230	3,4,5-Trimethylthiazolium iodide, 99%	305
22-0761	(4R,5R)-(-)-2,2-Dimethyl-α,α,α',α'-tetra(1-naphthyl)-1,3-dioxolane-4,5-dimethanolatotitanium(IV) dichloride acetonitrile adduct	307
22-0780	(4R,5R)-(-)-2,2-Dimethyl-α,α,α',α'-tetraphenyl-1,3-dioxolane-4,5-dimethanolato[1,2-bis(dimethoxy)ethane]titanium(IV) dichloride acetonitrile adduct	307
93-2216	Titanium(IV) i-propoxide, min. 98%	308
70-0130	Tris[N,N,N,N-tetramethylguanidinium][tris(1S)-(1,1'-binaphalene)-2,2'-diolato]ytterbate Yb-HTMG-B	311
39-5850	Tris[N,N,N,N-tetramethylguanidinium][tris(1S)-(1,1'-binaphalene)-2,2'-diolato]yttrate Y-HTMG-B	311
30-4050	Oxo[hexa(trifluoroacetato)]tetrazinc trifluoroacetic acid adduct ZnTAC ₂₄ TM	311
30-1350	Zinc bis(trifluoromethylsulfonyl)imide, min. 97%	312
40-1040	Bis(cyclopentadienyl)zirconium chloride hydride (Schwartz's Reagent), 95%	314

Cyclization

13-5801	(1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]aluminum(III) chloride, 98%	2
13-5800	(1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]aluminum(III) chloride, 98%	1
24-0850	(1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]chromium(III) chloride ..	13
24-0851	(1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]chromium(III) chloride ..	14
27-0400	Cobalt carbonyl (Dicobalt octacarbonyl) (Stabilized with 1-5% hexanes)	16
27-0550	Cyclopentadienylcobalt dicarbonyl, min. 95%	20
29-5000	Copper(II) trifluoromethanesulfonate, 98% (Copper triflate)	26

Cyclization

29-5001	Copper(II) trifluoromethanesulfonate, 99% (99.9%-Cu) (Copper triflate)	27
79-0200	1,3-Bis(2,6-di-isopropylphenyl)imidazol-2-ylidene-gold(I) chloride, 95%	32
79-0115	[μ -Bis(diphenylphosphino) methane]dichlorodigold(I), 99%	33
79-0300	1,3-Bis(2,6-di-i-propylphenyl)imidazol-2-ylidene(acetonitrile)gold(I) tetrafluoroborate, 95%	33
79-0340	Chloro[2-(di-t-butylphosphino))-1,1'-biphenyl]gold(I), 99%	39
79-0740	Chlorotri-t-butylphosphinegold(I), 99%	43
79-0352	2-(Di-t-butylphosphino))-1,1'-biphenyl(acetonitrile)gold(I) hexafluoroantimonate, 99%	44
79-3615	Triphenylphosphinegold(I) bis(trifluoromethanesulfonyl)imidate, min. 98%	48
79-3600	Tris[triphenylphosphinegold(I)]oxonium tetrafluoroborate, 98%	49
12-1200	Magnesium bis(trifluoromethylsulfonyl)imide, min. 97%	82
42-1213	2,6-Diisopropylphenylimidoneophylidene [(R)-(+)-BIPHEN]molybdenum(VI), min. 97% (R) SCHROCK-HOVEYDA CATALYST	88
42-1214	2,6-Diisopropylphenylimidoneophylidene[(S)-(-)-BIPHEN]molybdenum(VI), min. 97% (S) SCHROCK-HOVEYDA CATALYST	88
28-0010	Bis(1,5-cyclooctadiene)nickel (0), 98+%	91
07-0283	1-[3,5-Bis(trifluoromethyl)phenyl]-3-[(1R,2R)-(-)-2-(dimethylamino)cyclohexyl]thiourea (R,R-TUC)	103
07-0284	1-[3,5-Bis(trifluoromethyl)phenyl]-3-[(1S,2S)-(+)-2-(dimethylamino)cyclohexyl]thiourea (S,S-TUC)	104
07-0415	(5aR,10bS)-(+)-5a,10b-Dihydro-2-(pentafluorophenyl)-4H,6H-indeno[2,1-b][1,2,4] triazol[4,3-d][1,4]oxazinium tetrafluoroborate, min. 98%	107
07-0414	(5aS,10bR)-(-)-5a,10b-Dihydro-2-(pentafluorophenyl)-4H,6H-indeno[2,1-b][1,2,4] triazol[4,3-d][1,4]oxazinium tetrafluoroborate, min. 98%	108
07-0417	6,7-Dihydro-2-pentafluorophenyl-5H-pyrrolo[2,1-c]1,2,4-triazolium tetrafluoroborate, min. 98%	108
46-0245	1,2-Bis(phenylsulfanyl)ethane palladium(II) acetate, min. 98% Christina White Catalyst	123
46-0290	trans-Di(μ -acetato)bis[o-(di-o-tolylphosphino)benzyl]dipalladium(II), 97+% [cataCXium® C]	140
46-0370	Dichlorobis(acetonitrile)palladium(II), 99%	142
46-0400	Dichlorobis(benzonitrile)palladium(II), 99%	143
46-2150	Tetrakis(triphenylphosphine)palladium(0), 99% (99.9+% -Pd)	176
45-0109	Bis(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+%	188
45-0151	(+)-1,2-Bis((2S,5S)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (S,S)-Et-DUPHOS-Rh	191
45-0150	(-)-1,2-Bis((2R,5R)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (R,R)-Et-DUPHOS-Rh	188
45-0161	(+)-1,2-Bis((2S,5S)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (S,S)-Me-DUPHOS-Rh	193
45-0380	Chloro(1,5-cyclooctadiene)rhodium(I) dimer, 98%	204
45-1730	Rhodium(II) acetate dimer, 99%	213
45-2105	Tetrakis[5-t-butyl-phthaloyl-N-(S)-tert-leucinato]dirhodium bis(ethyl acetate) adduct Rh ₂ (S-tertPTTL) ₄	217
45-2111	(S)-(-)-2,2',6,6'-Tetramethoxy-4,4'-bis(diphenylphosphino)-3,3'-bipyridine(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97%	220
45-2110	(R)-(+)-2,2',6,6'-Tetramethoxy-4,4'-bis(diphenylphosphino)-3,3'-bipyridine(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97%	220
45-2160	Tris(acetonitrile)pentamethylcyclopentadienylrhodium(III) hexafluoroantimonate, min. 98%	220
44-0015	Acetonitrilebis[2-diphenylphosphino-6-t-butylpyridine]cyclopentadienylruthenium(II) hexafluorophosphate, min. 98%	221
44-0063	Bis(tricyclohexylphosphine)-3-phenyl-1H-inden-1-ylideneruthenium(II) dichloride	227

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44-0102	Chloro{(R)-(-)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-dtbm-segphos®)]Cl	241
44-0103	Chloro{(S)-(+)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((S)-dtbm-segphos®)]Cl	242
44-0113	Chloro(1,5-cyclooctadiene)(pentamethylcyclopentadienyl)ruthenium(II), 98%	250
44-0645	Dichlorobis(μ-methanethioato)bis(pentamethylcyclopentadienyl)diruthenium(III), 99% (minimum 90% syn isomer)	277
44-1850	Ruthenium carbonyl, 99%	290
44-7870	Tris(acetonitrile)cyclopentadienylruthenium(II) hexafluorophosphate, min. 98%	295
44-7880	Tris(acetonitrile)pentamethylcyclopentadienylruthenium(II) hexafluorophosphate, min. 98%..	296
44-7890	Tris(acetonitrile)pentamethylcyclopentadienylruthenium(II) trifluoromethanesulfonate, min. 98%..	297
22-0180	Bis(cyclopentadienyl)dicarbonyl titanium(II), min. 98%	306
22-0200	Bis(cyclopentadienyl)titanium dichloride, 99+% (Titanocene dichloride).....	306
93-2216	Titanium(IV) i-propoxide, min. 98%	308
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27-0526	(1S,2S)-(+)-1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)cobalt(II).....	20
29-5001	Copper(II) trifluoromethanesulfonate, 99% (99.9%-Cu) (Copper triflate)	27
45-0380	Chloro(1,5-cyclooctadiene)rhodium(I) dimer, 98%	204
44-0113	Chloro(1,5-cyclooctadiene)(pentamethylcyclopentadienyl)ruthenium(II), 98%	250
93-2216	Titanium(IV) i-propoxide, min. 98%	308

Decarbonylation

45-0380	Chloro(1,5-cyclooctadiene)rhodium(I) dimer, 98%	204
45-0650	Chlorotris(triphenylphosphine)rhodium(I), 99% WILKINSON'S CATALYST	206
45-0670	Polymer-bound chlorotris(triphenylphosphine)rhodium(I) on styrene-divinylbenzene copolymer (20% cross-linked)	212

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46-1781	Palladium(II) acetate, 99+% (99.95+%Pd).....	174
44-0102	Chloro{(R)-(-)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-dtbm-segphos®)]Cl	241
44-0103	Chloro{(S)-(+)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((S)-dtbm-segphos®)]Cl	242
44-1850	Ruthenium carbonyl, 99%	290

Dehydrogenation

44-0090	Carbonylbis(trifluoroacetato)bis(triphenylphosphine)ruthenium(II) methanol adduct, min. 98%	234
44-1035	Carbonylchlorohydrido[bis(2-di-t-butylphosphinoethyl)amine]ruthenium(II), min. 97%	234
44-1043	Carbonylchlorohydrido[bis(2-di-cyclohexylphosphinoethyl)amine]ruthenium(II), min. 97%	234
44-0071	Carbonylchlorohydrido[bis(2-(diphenylphosphinoethyl)amino]ruthenium(II), min.98% Ru-MACHO™	235
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Dehydrogenation

44-0100	Carbonyl(dihydrido)tris(triphenylphosphine)ruthenium (II), 99%	237
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25-0301	(1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]manganese(III) chloride, 98% (S,S)-Jacobsen Cat	84
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93-2216	Titanium(IV) i-propoxide, min. 98%	308
23-2202	Vanadium(IV) bis(acetylacetonato)oxide, 98% (Vanadyl acetylacetonate)	309

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05-1001	(S)-Tetrahydro-1-methyl-3,3-diphenyl-1H,3H-pyrrolo[1,2-c][1,3,2]oxazaborole, 0.9-1.1M in toluene [(S)-Methyloxazaborolidine] (S)-CBS Catalyst.....	12
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77-1115	3-Di-i-propylphosphino-2-(N,N-dimethylamino)-1H-indene(1,5-cyclooctadiene)iridium(I) hexafluorophosphate, min. 98%	67
45-0184	(2R,3R)-(-)-2,3-Bis(diphenylphosphino)bicyclo[2.2.1]hept-5-ene(1,5-cyclooctadiene) rhodium(I) tetrafluoroborate, min. 97% (R,R)-NORPHOS-Rh	197
45-0185	(2S,3S)-(+)-2,3-Bis(diphenylphosphino)bicyclo[2.2.1]hept-5-ene(1,5-cyclooctadiene) rhodium(I) tetrafluoroborate, min. 97% (S,S)-NORPHOS-Rh	198
45-0380	Chloro(1,5-cyclooctadiene)rhodium(I) dimer, 98%	204
45-0198	3-Di-i-propylphosphino-2-(N,N-dimethylamino)-1H-indene(1,5-cyclooctadiene)rhodium(I) hexafluorophosphate, min. 98%	211
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45-0201	(-)-1,2-Bis((2R,5R)-2,5-diphenylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (R,R)-Ph-BPE-Rh.....	199
45-0700	Dicarbonylacetylacetonato rhodium(I), 99%.....	209
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77-5010	((4S,5S)-(-)-O-[1-Benzyl-1-(5-methyl-2-phenyl-4,5-dihydrooxazol-4-yl)-2-phenylethyl]-dicyclohexylphosphinite)(1,5-COD)iridium(I) tetrakis(3,5-bis(trifluoromethyl)phenyl)borate, min. 97% (S,S)-[COD]Ir[cy ₂ PThrePHOX].....	50
77-5019	((4R,5R)-(+)-O-[1-Benzyl-1-(5-methyl-2-phenyl-4,5-dihydrooxazol-4-yl)-2-phenylethyl] (diphenylphosphinite)(1,5-COD)iridium(I) tetrakis(3,5-bis(trifluoromethyl)phenyl)borate, min. 97% (R,R)-[COD]Ir[Ph ₂ PThrePHOX].....	51
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77-4035	Chlorodihydrido{(R)-(+)-7-Bis(3,5-di-t-butylphenyl)phosphino-7'-[(3-methylpyridine-2-ylmethyl)amino]-2,2',3,3'-tetrahydro-1,1'-spirobiindane}iridium(III), >97% (>99% ee) Ir-(R)-DTB-SpiroPAP-3-Me.....	59
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77-0570	Chlorohydro[2-[[[R]-2-[[R]-2-(4-morpholinyl-kN4)ethyl]amino-kN]ethyl]thio-kS]methyl] phenyl-kC]iridium(III)	60
77-0550	Chlorohydro[2-[[[3-[3-(4-morpholinyl-kN4)propyl]amino-kN]propyl]thio-kS]methyl]phenyl-kC] iridium(III).....	60
77-5040	1,5-Cyclooctadiene{(4S)-(+)-2-[(5S)-6-(diphenylphosphino)spiro[4.4]nona-1.6-dien-1-yl]-4,5-dihydro-4-benzoxazole}iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, 97% (S,S)-(COD)Ir[Ph-SpinPHOX].....	63
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77-5046	1,5-Cyclooctadiene{(4S)-(+)-2-[(5S)-6-(diphenylphosphino)spiro[4.4]nona-1.6-dien-1-yl]-4,5-dihydro-4-phenyloxazole}iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, 97% (S,S)-(COD)Ir[Ph-SpinPHOX].....	63
77-5050	1,5-Cyclooctadiene{(4S)-(+)-2-[(5S)-6-(diphenylphosphino)spiro[4.4]nona-1.6-dien-1-yl]-4,5-dihydro-4-(i-propyl)oxazole}iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, 97% (S,S)-(COD)Ir[Pr-SpinPHOX].....	64
77-1060	Dichloro(pentamethylcyclopentadienyl)iridium(III) dimer, 98%.....	66
77-1830	(Dimethylphenylphosphine)(1,5-cyclooctadiene)[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]iridium(I) hexafluorophosphate, min. 98%.....	67
77-1115	3-Di-i-propylphosphino-2-(N,N-dimethylamino)-1H-indene(1,5-cyclooctadiene)iridium(I) hexafluorophosphate, min. 98%	67
77-2510	{(R)-(+)-7-[N-(1,3-Dithian-2-yl)methylamino]-7'-[bis(3,5-di-t-butylphenyl)phosphino]-2,2',3,3'-tetrahydro-1,1'-spirobiindane}chlorodihydroiridium(III), 97+% [Ir-(R)-DTB-SpiroSAP].....	68
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77-1810	Tribenzylphosphine(1,5-cyclooctadiene)[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene] iridium(I) hexafluorophosphate, min. 98%.....	69
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77-1825	Triphenylphosphine(1,5-cyclooctadiene)[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene] iridium(I) hexafluorophosphate, min. 98%.....	70
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25-0301	(1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]manganese(III) chloride, 98% (S,S)-Jacobsen Cat	84
46-1660	Palladium on carbon - 1 wt % loading, activated synthetic carbon pellet	114
46-1610	Palladium on carbon - 1 wt % loading, activated synthetic carbon powder	114
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45-0010	Acetylacetonato(1,5-cyclooctadiene)rhodium(I), 98%	187
45-0109	Bis(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+%	188
45-0149	(+)-1,2-Bis((2S,5S)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (S,S)-Et-DUPHOS-Rh	188
45-0148	(-)-1,2-Bis((2R,5R)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (R,R)-Et-DUPHOS-Rh	188
45-0151	(+)-1,2-Bis((2S,5S)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (S,S)-Et-DUPHOS-Rh	191
45-0150	(-)-1,2-Bis((2R,5R)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (R,R)-Et-DUPHOS-Rh	188
45-0155	(-)-1,1'-Bis((2S,4S)-2,4-diethylphosphotano)ferrocene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98%	192
45-0159	(+)-1,2-Bis((2S,5S)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (S,S)-Me-DUPHOS-Rh	193
45-0158	(-)-1,2-Bis((2R,5R)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (R,R)-Me-DUPHOS-Rh	192
45-0160	(-)-1,2-Bis((2R,5R)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (R,R)-Me-DUPHOS-Rh	193
45-0169	(-)-1,2-Bis((2S,5S)-2,5-dimethylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (S,S)-Me-BPE-Rh	194
45-0168	(+)-1,2-Bis((2R,5R)-2,5-dimethylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (R,R)-Me-BPE-Rh	193
45-0766	(-)-2,3-Bis[(2R,5R)-2,5-dimethylphospholanyl]-1-[3,5-bis(trifluoromethyl)phenyl]-1H-pyrrole-2,5-dione(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% [catASium® MNXylF(R)Rh]	194
45-0750	(-)-4,5-Bis[(2R,5R)-2,5-dimethylphospholanyl]((1,2-dimethyl-1,2-dihydropyridazine-3,6-dione)(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 95% [catASium® MNN(R)Rh] ..	195
45-0754	(-)-2,3-Bis[(2R,5R)-2,5-dimethylphospholanyl]maleic anhydride(1,5-cyclooctadiene)rhodium(I) hexafluoroantimonate, min. 97% [catASium® M(R)RhSbF ₆]	195
45-0758	(-)-2,3-Bis[(2R,5R)-2,5-dimethylphospholanyl]maleic anhydride(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, min. 97% [catASium® M(R)RhOTf]	196

45-0176	(-)-2,3-Bis[(2R,5R)-2,5-dimethylphospholanyl]-1-methyl-1H-pyrrole-2,5-dione(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% [catASium® MN(R)Rh]	196
45-0177	(+)-2,3-Bis[(2S,5S)-2,5-dimethylphospholanyl]-1-methyl-1H-pyrrole-2,5-dione(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% [catASium® MN(S)Rh].....	197
45-0184	(2R,3R)-(-)-2,3-Bis(diphenylphosphino)bicyclo[2.2.1]hept-5-ene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (R,R)-NORPHOS-Rh	197
45-0185	(2S,3S)-(+)-2,3-Bis(diphenylphosphino)bicyclo[2.2.1]hept-5-ene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (S,S)-NORPHOS-Rh	198
45-0218	(S)-(+)-4,12-Bis(diphenylphosphino)[2.2]paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97%	198
45-0217	(R)-(-)-4,12-Bis(diphenylphosphino)[2.2]paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97%	198
45-0202	(+)-1,2-Bis[(2S,5S)-2,5-di-phenylphospholano]ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (S,S)-Ph-BPE-Rh	199
45-0201	(-)-1,2-Bis[(2R,5R)-2,5-di-phenylphospholano]ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (R,R)-Ph-BPE-Rh.....	199
45-0205	1,1'-Bis(di-i-propylphosphino)ferrocene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98%	199
45-0211	(-)-1,2-Bis[(2S,5S)-2,5-di-i-propylphospholano]benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (S,S)-i-Pr-DUPHOS-Rh	200
45-0210	(+)-1,2-Bis[(2R,5R)-2,5-di-i-propylphospholano]benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (R,R)-i-Pr-DUPHOS-Rh	200
45-0214	(S)-(+)-4,12-Bis(di-3,5-xylylphosphino)[2.2]paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97%	201
45-0213	(R)-(-)-4,12-Bis(di-3,5-xylylphosphino)[2.2]paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97%	200
45-0256	(S)-4,12-Bis(4-methoxyphenyl)-[2.2]-paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97%	201
45-0255	(R)-4,12-Bis(4-methoxyphenyl)-[2.2]-paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97%	201
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45-2110	(R)-(+)-2,2',6,6'-Tetramethoxy-4,4'-bis(diphenylphosphino)-3,3'-bipyridine(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97%	220
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44-0255	Chloro{N-[(1R,2R)-2-[(S)-2-[[1,2,3,4,5,6- η]-4-methylphenyl]methoxy]ethyl]amino]-1,2-di- phenylethylmethanesulfonamidato}ruthenium(II) Ru-(R,R)-Ms-DENEB	255
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44-0181	Diacetato{(S)-(+)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3- benzodioxole}ruthenium(II) Ru(OAc) ₂ [(S)-dtbm-segphos®]	258
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44-0163	Diacetato{(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl}ruthenium(II) Ru(OAc) ₂ [(S)-tolbinap]	260
44-0162	Diacetato{(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl}ruthenium(II) Ru(OAc) ₂ [(R)-tolbinap]	260
44-0176	Diacetato{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(S)-dm-segphos®]	261
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44-0260	Dichlorobis[2-(di-t-butylphosphino)ethylamine]ruthenium(II), min. 97%	262
44-0263	Dichlorobis[2-(diphenylphosphino)ethylamine]ruthenium(II), min. 95% (mixture of isomers)...	263
44-0265	Dichlorobis[2-(di-i-propylphosphino)ethylamine]ruthenium(II), min. 97%	263
44-0211	Dichloro{(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl}[(2S)-(+)-1,1-bis(4-methoxyphenyl)- 3-methyl-1,2-butanediamine]ruthenium(II) dichloromethane adduct, min. 97%	265
44-0210	Dichloro{(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl}[(2R)-(-)-1,1-bis(4-methoxy- phenyl)-3-methyl-1,2-butanediamine]ruthenium(II) dichloromethane adduct, min. 97%	264
44-0925	Dichloro{(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl}[(S)-(-)-2-(α -t-butyl) methanamine]-1H-benzimidazole}ruthenium(II), min. 95%	265
44-0221	Dichloro{(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl}[(1S,2S)-(-)-1,2- diphenylethylenediamine]ruthenium(II), min. 90%	266
44-0220	Dichloro{(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl}[(1R,2R)-(+)-1,2-diphenyl- ethylenediamine]ruthenium(II), min. 90%	265
44-0223	Dichloro{(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl}[(1S,2S)-(-)-1,2- diphenylethylenediamine]ruthenium(II), min. 98%	267
44-0222	Dichloro{(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl}[(1R,2R)-(+)-1,2- diphenylethylenediamine]ruthenium(II), min. 98%	267

Hydrogenation

44-0910	Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(S)-(+)-2-(α -methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95%.....	267
44-0905	Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(α -methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95%.....	267
44-0920	Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(R)-(+)-2-(α -i-propyl) methanamine)-1H-benzimidazole]ruthenium(II), min. 95%.....	267
44-0915	Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(α -i-propyl) methanamine)-1H-benzimidazole]ruthenium(II), min. 95%.....	268
44-0249	Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]ruthenium(II), min. 95%.....	268
44-0248	Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]ruthenium(II), min. 95%.....	268
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44-0980	Dichloro[(4S,5S)-(+)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(S)-(-)-2-(t-butyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 97%.....	269
44-0960	Dichloro[(4R,5R)-(-)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(R)-(+)-2-(α -methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95%.....	269
44-0955	Dichloro[(4S,5S)-(+)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(S)-(-)-2-(α -methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 98%.....	270
44-0970	Dichloro[(4R,5R)-(-)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(R)-(+)-2-(i-propyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95%.....	270
44-0965	Dichloro[(4S,5S)-(+)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(S)-(-)-2-(i-propyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95%.....	270
44-2314	Dichloro[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl](2-aminomethylpyridine) ruthenium(II) RuCl ₂ (AMPY)((R)-Tol-Binap).....	271
44-2315	Dichloro[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl](2-aminomethylpyridine) ruthenium(II) RuCl ₂ (AMPY)((S)-Tol-Binap).....	271
44-0950	Dichloro[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(α -t-butyl) methanamine)-1H-benzimidazole]ruthenium(II), min. 97%.....	271
44-0935	Dichloro[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(R)-(+)-2-(α -methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95%.....	271
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44-0215	Dichloro[(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole][(2S)-(+)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) RuCl ₂ [(S)-dm-segphos@] [(S)-daipen].....	273
44-0214	Dichloro[(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole][(2R)-(-)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) RuCl ₂ [(R)-dm-segphos@] [(R)-daipen].....	273
44-0229	Dichloro[(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole][(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II) RuCl ₂ [(S)-dm-segphos@] [(S,S)-dpen].....	274
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44-0226	Dichloro[(R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl][(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II) RuCl ₂ [(R)-xylbinap] [(R,R)-dpen].....	275
44-0381	Dichloro[(S)-(+)-4,12-bis(di(3,5-xylyl)phosphino)-[2,2]-paracyclophane][(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II), min. 95%.....	276
44-0380	Dichloro[(R)-(-)-4,12-bis(di(3,5-xylyl)phosphino)-[2,2]-paracyclophane][(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II), min. 95%.....	276

44-0580	Dichloro[N1,N1-dimethyl-N2-[2-(phenylthio-κS)ethyl]-1,2-ethanediamine-κN1,κN2] (tricyclohexylphosphine)ruthenium(II).....	278
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44-0442	(+)-Dichloro[(4R)-4-(i-propyl)-2-[(R)-2-(diphenylphosphino)ferrocenyl]oxazoline](triphenylphosphine)ruthenium(II).....	279
44-0443	(-)-Dichloro[(4S)-4-(i-propyl)-2-[(S)-2-(diphenylphosphino)ferrocenyl]oxazoline](triphenylphosphine)ruthenium(II).....	279
44-0575	Dichloro[rel-[N2(S)]-N1,N1-dimethyl-N2-[2-[(R)-phenylthio-κS]ethyl]-1,2-ethanediamine-κN-1,κN2](triphenylphosphine)ruthenium(II), compd. with dichloromethane.....	279
44-0560	Dichloro[rel-[N(S)]-N-[2-[(R)-methylthio-κS]ethyl]-4-morpholineethanamine-κNN4,κN4] (triphenylphosphine)ruthenium(II).....	279
44-0555	Dichloro[rel-[N(R)]-N-[2-[(R)-(phenylmethyl)thio-κS]ethyl]-4-morpholineethanamine-κN-N4,κN4](triphenylphosphine)ruthenium(II), compd. with dichloromethane.....	279
44-0550	Dichloro[rel-[N(S)]-N-[2-[(R)-phenylthio-κS]ethyl]-4-morpholineethanamine-κNN4,κN4] (triphenylphosphine)ruthenium(II).....	279
44-0570	Dichloro[rel-[N(S)]-N-[2-[(R)-phenylthio-κS]ethyl]-[1-pyrrolidineethanamine-κNN1,κN1] (triphenylphosphine)ruthenium(II).....	279
44-0386	Dichloro[(S)-(-)-2,2',6,6'-tetramethoxy-4,4'-bis(diphenylphosphino)-3,3'-bipyridine] [(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II), min. 95%.....	280
44-0385	Dichloro[(R)-(+)-2,2',6,6'-tetramethoxy-4,4'-bis(diphenylphosphino)-3,3'-bipyridine] [(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II), min. 95%.....	280
44-0390	Dichloro[(R)-(+)-2,2',6,6'-tetramethoxy-4,4'-bis(di(3,5-xylyl)phosphino)-3,3'-bipyridine] [(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II), min. 95%.....	280
44-0391	Dichloro[(S)-(-)-2,2',6,6'-tetramethoxy-4,4'-bis(di(3,5-xylyl)phosphino)-3,3'-bipyridine] [(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II), min. 95%.....	280
44-0520	Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-5,5'-bis(di(3,5-xylyl)phosphino)-4,4'-bi-1,3-benzodioxole]diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-dm-segphos®)} ₂ (μ-Cl) ₂].....	281
44-0521	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-5,5'-bis(di(3,5-xylyl)phosphino)-4,4'-bi-1,3-benzodioxole]diruthenate(II) [NH ₂ Me ₂][{RuCl((S)-dm-segphos®)} ₂ (μ-Cl) ₂].....	282
44-0514	Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-2,2'-bis(di(3,5-xylyl)phosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-xylbinap)} ₂ (μ-Cl) ₂].....	282
44-0515	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-2,2'-bis(di(3,5-xylyl)phosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][{RuCl((S)-xylbinap)} ₂ (μ-Cl) ₂].....	282
44-0518	Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole]diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-segphos®)} ₂ (μ-Cl) ₂].....	282
44-0519	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole]diruthenate(II) [NH ₂ Me ₂][{RuCl((S)-segphos®)} ₂ (μ-Cl) ₂].....	283
44-0510	Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-binap)} ₂ (μ-Cl) ₂].....	283
44-0511	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][{RuCl((S)-binap)} ₂ (μ-Cl) ₂].....	285
44-0516	Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-H ₈ -binap)} ₂ (μ-Cl) ₂].....	286
44-0517	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][{RuCl((S)-H ₈ -binap)} ₂ (μ-Cl) ₂].....	286
44-0512	Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-tolbinap)} ₂ (μ-Cl) ₂].....	286
44-0513	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][{RuCl((S)-tolbinap)} ₂ (μ-Cl) ₂].....	286
44-0186	N-[(1S,2S)-1,2-Diphenyl-2-(2-(4-methylbenzyloxy)ethylamino)-ethyl]-4-methylbenzene sulfonamide(chloro)ruthenium(II) (S,S)-Ts-DENE TM	287
44-0780	1-Hydroxytetraphenylcyclopentadienyl(tetraphenyl-2,4-cyclopentadien-1-one)-μ-hydroxytetraacetyl-diruthenium(II), 98% SHVO'S CATALYST.....	288
44-0111	{N-[3-(n6-phenyl)propyl]}-[(1R-2R)-1,2-diphenyl-1,4-methylbenzenesulfonylamidato(κN')-ethyl-2-amino-(κN)]ruthenium(II) (R,R)-Teth-TsDpen RuCl WILLIS CATALYST.....	289
44-0110	{N-[3-(n6-phenyl)propyl]}-[(1S-2S)-1,2-diphenyl-1,4-methylbenzenesulfonylamidato(κN')-ethyl-2-amino-(κN)]ruthenium(II) (S,S)-Teth-TsDpen RuCl WILLIS CATALYST.....	289

Hydrolysis

06-3110	Alcalase® 2.4 L FG	2
06-3112	Alcalase® 2.5 L	2
06-3115	Esperase® 8.0 L	9
06-3105	Lipozyme® CALB L	9
06-3140	Lipozyme® TL 100 L	9
06-3155	Lipozyme® TL IM	9
06-3160	Neutrase® 0.8 L	9
06-3100	NovoCor® AD L	9
06-3123	Novozym® 435	10
06-3120	Novozym® 40086	10
06-3135	Novozym® 51032	10
06-3118	Palatase® 20000 L	10
06-3125	Resinase® HT	10
06-3137	Savinase® 12 T	11
06-3150	Savinase® 16 L	11
79-5000	Methyl(triphenylphosphine)gold(I), 99%	46
96-0224	Novozymes Endoprotease Screening Kit (contains 6 endoprotease enzymes)	
78-0725	Hydrido(dimethylphosphinous acid-kP)[hydrogen bis(dimethylphosphinito-kP)]platinum(II) Ghaffar-Parkins catalyst	185
44-0015	Acetonitrilebis[2-diphenylphosphino-6-t-butylpyridine]cyclopentadienylruthenium(II) hexafluorophosphate, min. 98%	221

Hydrosilylation

27-1050	Chlorotris(triphenylphosphine)cobalt(I), min. 98%	15
77-1115	3-Di-i-propylphosphino-2-(N,N-dimethylamino)-1H-indene(1,5-cyclooctadiene)iridium(I) hexafluorophosphate, min. 98%	67
28-1095	Chloro(cyclopentadienyl){1,3-bis[2-(diphenylmethyl)-4,6-dimethylphenyl]1H-imidazolium} nickel(II)	98
46-0100	Allylpalladium chloride dimer, min. 98%	116
45-0198	3-Di-i-propylphosphino-2-(N,N-dimethylamino)-1H-indene(1,5-cyclooctadiene)rhodium(I) hexafluorophosphate, min. 98%	211
45-0197	3-Di-i-propylphosphoranylidene-2-(N,N-dimethylamino)-1H-indene(1,5-cyclooctadiene) rhodium(I), min. 95%	211
45-1878	Rhodium(III) chloride, anhydrous	214
44-0442	(+)-Dichloro[(4R)-4-(i-propyl)-2-((R)-2-(diphenylphosphino)ferrocenyl)oxazoline](triphenylphosphine)ruthenium(II)	279
44-0443	(-)-Dichloro[(4S)-4-(i-propyl)-2-((S)-2-(diphenylphosphino)ferrocenyl)oxazoline](triphenylphosphine)ruthenium(II)	279
44-7880	Tris(acetonitrile)pentamethylcyclopentadienylruthenium(II) hexafluorophosphate, min. 98%	296
22-0200	Bis(cyclopentadienyl)titanium dichloride, 99+% (Titanocene dichloride)	306

Isomerization

79-0125	Bis{1,3-bis[2,6-bis(1-methylethyl)phenyl]-1,3-dihydro-2H-imidazol-2-ylidene}-μ-hydroxydigold(I) tetrafluoroborate, 99%	32
46-0252	Bis(tri-t-butylphosphine)palladium(0), 98%	123
44-0015	Acetonitrilebis[2-diphenylphosphino-6-t-butylpyridine]cyclopentadienylruthenium(II) hexafluorophosphate, min. 98%	221
44-0460	Dihydrotetrais(triphenylphosphine)ruthenium(II), 95%	281

Kinetic Resolution

24-0850	(1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]chromium(III) chloride	13
24-0851	(1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]chromium(III) chloride	14
27-0495	Cyclic-Oligo Bis[(1R,2R)-(+)-1,2-cyclohexanediamino-N,N'-bis(3,3'-di-t-butylsalicylidene) cobalt(III)triflate]-5,5'-bis(2-carboxyethyl)ether	18
27-0496	Cyclic-Oligo Bis[(1S,2S)-(-)-1,2-cyclohexanediamino-N,N'-bis(3,3'-di-t-butylsalicylidene) cobalt(III)triflate]-5,5'-bis(2-carboxyethyl)ether	18
27-0525	(1R,2R)-(-)-1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)cobalt(II)	19
27-0526	(1S,2S)-(+)-1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)cobalt(II)	20
25-0300	(1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]manganese(III) chloride, 98% (R,R)-Jacobsen Cat	83
25-0301	(1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]manganese(III) chloride, 98% (S,S)-Jacobsen Cat	84
42-1213	2,6-Diisopropylphenylimidoneophylidene [(R)-(+)-BIPHEN]molybdenum(VI), min. 97% (R) SCHROCK-HOVEYDA CATALYST	88
42-1214	2,6-Diisopropylphenylimidoneophylidene[(S)-(-)-BIPHEN]molybdenum(VI), min. 97% (S) SCHROCK-HOVEYDA CATALYST	88
46-0860	Dichloro(di-μ-chloro)bis[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-ylidene]dipalladium(II), 97%	151
44-0092	Chloro((R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl)(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-xylinap)]Cl	248
44-0123	Chlorodicarbonyl[(1-(i-propylamino)-2,3,4,5-tetraphenylcyclopentadienyl]ruthenium(II), min. 95%	252
44-0213	Dichloro((S)-(-)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl)((2S)-(+)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine)ruthenium(II) RuCl ₂ [(S)-xylinap][(S)-daipen]	275
44-0212	Dichloro((R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl)((2R)-(-)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine)ruthenium(II) RuCl ₂ [(R)-xylinap][(R)-daipen]	274
44-0442	(+)-Dichloro[(4R)-4-(i-propyl)-2-((R)-2-(diphenylphosphino)ferrocenyl)oxazoline](triphenylphosphine)ruthenium(II)	279
44-0443	(-)-Dichloro[(4S)-4-(i-propyl)-2-((S)-2-(diphenylphosphino)ferrocenyl)oxazoline](triphenylphosphine)ruthenium(II)	279
44-0510	Dimethylammonium dichlorotri(μ-chloro)bis((R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl)diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-binap)} ₂ (μ-Cl)] ₃	283
44-0511	Dimethylammonium dichlorotri(μ-chloro)bis((S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl)diruthenate(II) [NH ₂ Me ₂][{RuCl((S)-binap)} ₂ (μ-Cl)] ₃	285
44-0780	1-Hydroxytetraphenylcyclopentadienyl(tetraphenyl-2,4-cyclopentadien-1-one)-μ-hydroxotetracarbonyl diruthenium(II), 98% SHVO'S CATALYST	288

Metathesis

42-1213	2,6-Diisopropylphenylimidoneophylidene [(R)-(+)-BIPHEN]molybdenum(VI), min. 97% (R) SCHROCK-HOVEYDA CATALYST	88
42-1214	2,6-Diisopropylphenylimidoneophylidene[(S)-(-)-BIPHEN]molybdenum(VI), min. 97% (S) SCHROCK-HOVEYDA CATALYST	88
42-1200	2,6-Diisopropylphenylimidoneophylidene molybdenum(VI) bis(t-butoxide)	88
42-1205	2,6-Diisopropylphenylimidoneophylidene molybdenum(VI) bis(hexafluoro-t-butoxide) SCHROCK'S CATALYST	90
42-1210	2,6-Diisopropylphenylimidoneophylidene molybdenum(VI) bis(trifluoromethanesulfonate) dimethoxyethane adduct	91
42-1212	2,6-Diisopropylphenylimidoneophylidene[racemic-BIPHEN]molybdenum(VI), min. 97% rac-SCHROCK-HOVEYDA CATALYST	91
07-0299	1,3-Bis(2,4,6-trimethylphenyl)imidazolium chloride, min. 97%	105
44-0759	(1,3-Bis(2,6-diisopropylphenyl)-4-((4-ethyl-4-methylpiperzain-1-ium-1-yl)methyl)imidazolidin-2-ylidene)(2-isopropoxybenzylidene)ruthenium(II) chloride dihydrate FixCat	224
44-0055	[1,3-Bis(2,6-di-i-propylphenyl)-4,5-dihydroimidazol-2-ylidene]-[2-i-propoxy-5-(trifluoroacetamido)phenyl]methyleneruthenium(II) dichloride M71-S1Pr	225
44-0750	[1,3-Bis(2,6-di-i-propylphenyl)imidazolidin-2-ylidene][2-[[1-(methoxy(methyl)amino)-1-oxopropan-2-yl]oxy]benzylidene]ruthenium(II) dichloride GreenCat	225

44-0748	[1,3-Bis(2,6-di-i-propylphenyl)imidazolidin-2-ylidene][(2-((1-methoxy(methyl)amino)-1-oxopropan-2-yl)oxy)benzylidenediiodoruthenium(II) GreenCat-I2.....	226
44-0770	1,3-Bis(2,6-di-i-propylphenyl)imidazolidin-2-ylidene)(2-i-propoxy-5-nitrobenzylidene) ruthenium(II) dichloride Nitro-Grela SiPr	226
44-0782	[1,3-Bis(2,6-di-i-propylphenyl)imidazolidin-2-ylidene)(2-i-propoxy-5-nitrobenzylidene) ruthenium(II) diiodide nitro-Grela I2 SiPr.....	226
44-0793	[1,3-Bis(2,6-di-i-propylphenyl)imidazolidin-2-ylidene)(tricyclohexylphosphine)-(2-oxo-5-nitrobenzylidene)ruthenium(II) chloride LatMet SiPr	227
44-0073	Bis(tricyclohexylphosphine)[(phenylthio)methylene]ruthenium(II) dichloride, min. 97%.....	227
44-0063	Bis(tricyclohexylphosphine)-3-phenyl-1H-inden-1-ylideneruthenium(II) dichloride.....	227
44-0755	1,3-Bis(2,4,6-trimethylphenyl)-4-[(trimethylammonio)methyl]imidazolidin-2-ylidene)-(2-i-propoxybenzylidene)dichlororuthenium(II) hexafluorophosphate StickyCat PF6	228
44-0795	1,3-Bis(2,4,6-trimethylphenyl)-4-[(trimethylammonio)methyl]imidazolidin-2-ylidene)-(2-i-propoxy-5-nitrobenzylidene)dichlororuthenium(II) chloride Nitro-StickyCat Cl.....	228
44-0083	1,3-Bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene[2-(i-propoxy)-5-(N,N-dimethylaminosulfonyl)phenyl]methylenerruthenium(II) dichloride (resin supported) Zhan Catalyst II..	228
44-0082	1,3-Bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene[2-(i-propoxy)-5-(N,N-dimethylaminosulfonyl)phenyl]methylenerruthenium(II) dichloride, Zhan Catalyst-1B, min 96%.....	229
44-0768	[1,3-Bis(2,4,6-trimethylphenyl)-4-[(4-ethyl-4-methylpiperazin-1-ium-1-yl)methyl]imidazolidin-2-ylidene)-(2-i-propoxybenzylidene)dichlororuthenium(II) chloride AquaMet	230
44-0047	[1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]-[2-[[[(4-methylphenyl)imino]methyl]-4-nitrophenyl]-3-phenyl-1H-inden-1-ylidene]ruthenium(II) chloride.....	230
44-0049	[1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]-[2-[[[(2-methylphenyl)imino] methyl]phenyl]-3-phenyl-1H-inden-1-ylidene]ruthenium(II) chloride.....	231
44-0026	1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene)(3-phenyl-1H-inden-1-ylidene) (4,5-dichloro-1,3-diethyl-1,3-dihydro-2H-imidazol-2-ylidene)ruthenium(II) chloride	231
44-0767	[1,3-Bis(2,4,6-trimethylphenyl)imidazolidin-2-ylidene)-(2-i-propoxy-5-nitrobenzylidene) ruthenium(II) diiodide nitro-Grela I2.....	232
44-0758	[1,3-Bis(2,4,6-trimethylphenyl)imidazolidin-2-ylidene)]-(2-i-propoxy-5-nitrobenzylidene) ruthenium(II) dichloride nitro-Grela	232
44-0753	[1,3-Bis(2,4,6-trimethylphenyl)imidazolidin-2-ylidene)](tricyclohexylphosphine)-(2-oxobenzylidene)ruthenium(II) chloride LatMet	233
44-0787	[1,3-Bis(2,4,6-trimethylphenyl)imidazolidin-2-ylidene)(tricyclohexylphosphine)-(2-oxo-5-nitrobenzylidene)ruthenium(II) chloride Nitro-LatMet	233
44-0765	[1,3-Bis(2,4,6-trimethylphenyl)-4-[(trimethylammonio)methyl]imidazolidin-2-ylidene)-(2-i-propoxybenzylidene)dichlororuthenium(II) chloride StickyCat Cl	234
44-0113	Chloro(1,5-cyclooctadiene)(pentamethylcyclopentadienyl)ruthenium(II), 98%	250
44-0797	Dichloro(1,3-Bis(2,6-di-i-propylphenyl)-4-((4-ethyl-4-methylpiperazin-1-ium-1-yl)methyl)imidazolidin-2-ylidene)(2-isopropoxybenzylidene)ruthenium(II) hexafluorophosphate FixCat PF6	270
44-0760	Dichloro(1,3-bis(2,4,6-trimethylphenyl)imidazolidin-2-ylidene)[2-[(ethoxy-2-oxoethylidene)amino]benzylidene]ruthenium(II) HeatMet	277
44-0430	Dichloro(p-cymene)tricyclohexylphosphineruthenium(II), min. 97%.....	277
44-0792	Dichloro(1,3-di-i-propylimidazolidin-2-ylidene)[2-[(ethoxy-2-oxoethylidene)amino]benzylidene] ruthenium(II) HeatMet SiPr	278
44-0740	(1,3-Di-o-tolylimidazolidin-2-ylidene)(2-i-propoxy-5-nitrobenzylidene)dichlororuthenium(II) Nitro-Grela SI-o-Tolyl	287
44-7778	3-Phenyl-1H-inden-1-ylidene[bis(i-butylphoban)]ruthenium(II) dichloride	289
44-0078	{[2-(i-Propoxy)-5-(N,N-dimethylaminosulfonyl)phenyl]methylene}(tricyclohexylphosphine) ruthenium(II) dichloride Zhan Catalyst -1C.....	289
44-7785	Tricyclohexylphosphine[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene][2-thienylmethylene]ruthenium(II) dichloride, min. 95% [catMETium® RF 2].....	291
44-7780	Tricyclohexylphosphine[1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene] [(phenylthio)methylene]ruthenium(II) dichloride	292
44-7775	Tricyclohexylphosphine[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene][3-phenyl-1H-inden-1-ylidene]ruthenium(II) dichloride, min. 95% [catMETium® RF 1].....	292

Metathesis

44-7795	Tricyclohexylphosphine[2,4-dihydro-2,4,5-triphenyl-3H-1,2,4-triazol-3-ylidene][2-thienylmethylene]ruthenium(II) dichloride, min. 95% [catMETium® RF 4]	293
44-7790	Tricyclohexylphosphine[4,5-dimethyl-1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene][2-thienylmethylene]ruthenium(II) dichloride, min. 95% [catMETium® RF 3]	293
44-0763	Tricyclohexylphosphine(2- <i>i</i> -propoxy-5-nitrobenzylidene)dichlororuthenium(II) Nitro-Grela 1 gen...	294
44-7783	Tri(<i>i</i> -propoxy)phosphine(3-phenyl-1H-inden-1-ylidene)[1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene]ruthenium (II) dichloride, min. 95% cis-Caz-1	295
74-1800	Tris(<i>t</i> -butoxy)(2,2-dimethylpropylidene)tungsten(VI), 98% Schrock Alkyne Metathesis Catalyst	309

Oxidation

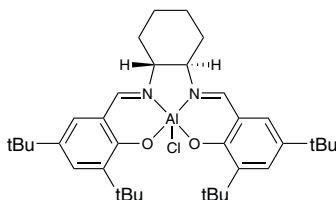
29-5001	Copper(II) trifluoromethanesulfonate, 99% (99.9%-Cu) (Copper triflate)	27
79-3600	Tris(triphenylphosphinegold(I))oxonium tetrafluoroborate, 98%	49
77-1060	Dichloro(pentamethylcyclopentadienyl)iridium(III) dimer, 98%	66
26-0061	(2R,2'R)-(-)-[N,N'-Bis(2-pyridylmethyl)-2,2'-bipyrrolidinebis(acetonitrile)]iron(II) hexafluoroantimonate Fe(R,R-PDP) White-Chen Catalyst	73
26-0060	(2S,2'S)-(-)-[N,N'-Bis(2-pyridylmethyl)-2,2'-bipyrrolidinebis(acetonitrile)]iron(II) hexafluoroantimonate Fe(S,S-PDP) White-Chen Catalyst	73
76-2956	Osmium(VIII) oxide, Microencapsulated in a Styrene Polymer (~10%OsO ₄)	112
46-0970	Acetato(2,9-dimethyl-1,10-phenanthroline)palladium(II) dimer bis(trifluoromethanesulfonate), 99% ..	114
46-0039	Allylchloro[1,3-bis(2,6-di- <i>i</i> -propylphenyl)-4,5-dihydroimidazol-2-ylidene]palladium(II), 97%	115
46-0040	Allylchloro[1,3-bis(2,6-di- <i>i</i> -propylphenyl)imidazol-2-ylidene]palladium(II), 98%	115
46-0045	Allylchloro[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]palladium(II), 98%	115
46-0245	1,2-Bis(phenylsulfanyl)ethane palladium(II) acetate, min. 98% Christina White Catalyst	123
46-1850	Palladium(II) chloride (99.9%-Pd)	175
75-2375	Methyltrioxorhenium(VII), 98%	186
44-0071	Carbonylchlorohydrido[bis(2-(diphenylphosphinoethyl)amino)ruthenium(II), min.98% Ru-MACHO™	235
44-0100	Carbonyl(dihydrido)tris(triphenylphosphine)ruthenium (II), 99%	237
44-0138	Chloro(1-phenylindenyl)bis(triphenylphosphine)ruthenium(II), min. 98%	256
44-0780	1-Hydroxytetraphenylcyclopentadienyl(tetraphenyl-2,4-cyclopentadien-1-one)- μ -hydrotetracarbonyldiruthenium(II), 98% SHVO'S CATALYST	288

Ring Opening

29-5001	Copper(II) trifluoromethanesulfonate, 99% (99.9%-Cu) (Copper triflate)	27
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ALUMINUM (Compounds)

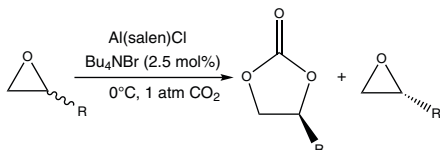
13-5800 (1*R*,2*R*)-(-)-[1,2-Cyclohexane-diamino-*N,N'*-bis(3,5-di-*t*-butyl-salicylidene)]aluminum(III) chloride, **98%** (250611-13-3)
[C₃₆H₅₂N₂O₂AlCl]; FW: 607.26; yellow powdr.; m.p. 250-255°



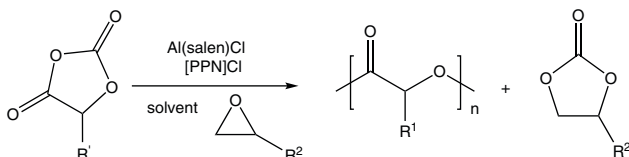
1g
5g

Technical Notes:

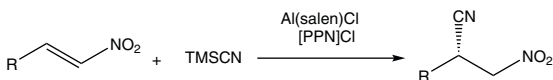
1. Aluminum salen complexes as catalysts for the kinetic resolution of terminal epoxides via carbon dioxide coupling.
2. Efficient synthesis of bio-renewable polyesters and cyclic carbonates through tandem catalysis.
3. Catalyst used for the asymmetric hydrocyanation of nitroolefins.
4. Catalyst used in the reaction of epoxides with heterocumulenes.



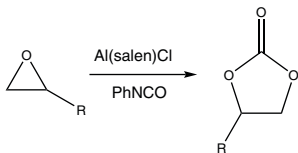
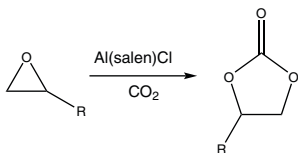
Tech. Note (1)
Ref. (1)



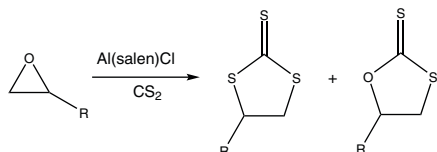
Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



References:

1. *ACS Catalysis*, **2015**, 5, 3398
2. *Chem. Commun.*, **2015**, 51, 8504
3. *ChemCatChem*, **2014**, 6, 2656
4. *Chem-Eur J.*, **2014**, 20, 8182

ALUMINUM (Compounds)

13-5801	(1 <i>S</i> ,2 <i>S</i>)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di- <i>t</i> -butylsalicylidene)]aluminum(III) chloride, 98% (307926-51-8) [C ₃₆ H ₅₂ N ₂ O ₂]AlCl ₃ ; FW: 607.26; yellow powdr.; m.p. >350°	1g 5g
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Technical Note:

- See 13-5800 (page 1)

BIOCATALYSTS (Compounds)

06-3110	Alcalase® 2.4 L FG (9014-01-1) brown liq.; d. 1.17 <i>(store cold)</i>	10g 50g 250g
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NEW

Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 2.4 AU-A/g. Serine endoprotease that hydrolyzes internal peptide bonds. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes

06-3112	Alcalase® 2.5 L (9014-01-1) amber liq. (semitransparent); d. 1.08 <i>(store cold)</i>	10g 50g 250g
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NEW

Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 2.5 AU-A/g. Serine endoprotease that hydrolyzes internal peptide bonds. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes

07-3155	CalB immo 1090™ - Immobilized enzyme white to slightly yellow spherical beads, dry <i>(store cold)</i>	10g 50g 250g
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NEW

Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 1 year; Particle Size: 300-710 micron; CalB immo 1090 is an adsorbed preparation and is suitable for applications in solvent-free systems like oils, as well as organic solvents and it can be used for (regio- and stereoselective) esterifications and transesterifications. CalB Immo 1090 has many advantages including high activity and the possibility to use in oils, organic solvent and bi-phasic systems. Sold in collaboration with Purolite for research purposes only.

07-3152	CalB immo 5587™ - Immobilized enzyme white to slightly yellow spherical beads, dry <i>(store cold)</i>	10g 50g 250g
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NEW

Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 1 year; Particle Size: 300-710 micron; CalB immo 5587 is an adsorbed preparation and is particularly suitable for applications where cost is an essential parameter, like biodiesel or industrial oil manufacture. CalB Immo 5587 has many advantages including cost-effectiveness in processes like biodiesel manufacture. It is also a highly robust carrier, particularly suitable for column configurations. Sold in collaboration with Purolite for research purposes only.

07-3159	CalB immo 5872™ - Immobilized enzyme white to slightly yellow spherical beads, dry <i>(store cold)</i>	10g 50g 250g
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NEW

Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 1 year; Particle Size: 300-1500 micron; CalB immo 5872 is an adsorbed preparation and is suitable for applications in solvent-free systems like oils, as well as organic solvents and it can be used for (regio- and stereoselective) esterifications and transesterifications. CalB Immo 5872 has many advantages including cost-effectiveness and the possibility to use in oils, organic solvent and bi-phasic systems. Sold in collaboration with Purolite for research purposes only.

BIOCATALYSTS (Compounds)

07-3142	CalB immo 8285™ - Immobilized enzyme white to slightly yellow spherical beads, dry <i>(store cold)</i> Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 1 year; Particle Size: 100-710 micron; CalB immo 8285 is covalently immobilized and is suitable for applications in water, organic solvents as well as solvent-free systems and can be used for (regio- and stereoselective) hydrolysis, esterifications and transesterifications. The lipase is immobilized by covalent immobilization onto Purolites highly hydrophobic carrier PuroLite ECR8285 (an epoxy/butyl methacrylate co-polymer). Sold in collaboration with PuroLite for research purposes only.	10g 50g 250g
NEW		
07-3148	CalB immo 8806™ - Immobilized enzyme white to slightly yellow spherical beads, dry <i>(store cold)</i> Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 1 year; Particle Size: 300-710 micron; CalB immo 8806 is an adsorbed preparation and is suitable for applications in solvent-free systems like oils, as well as organic solvents and it can be used for (regio- and stereoselective) esterifications and transesterifications. CalB Immo 8806 has many advantages including high activity and the possibility to use in oils, organic solvent and bi-phasic systems. Sold in collaboration with PuroLite for research purposes only.	10g 50g 250g
NEW		
96-4050	CalB immo KIT™ - Immobilized enzyme See page 319	
07-3130	CalB immo Plus™ - Immobilized enzyme white to off white spherical beads, dry <i>(store cold)</i> Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 1 year; Particle Size: 300-710 micron; CalB immo Plus is suitable for applications in organic solvents as well as solvent-free systems and can be used for (regio- and stereoselective) esterifications and transesterifications. CalB Immo Plus has many advantages including high activity and high mechanical stability. Sold in collaboration with PuroLite for research purposes only.	10g 50g 250g
NEW		
07-3133	CalB immo Plus Food Grade™ - Immobilized enzyme white to slightly yellow spherical beads, dry <i>(store cold)</i> Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 1 year; Particle Size: 300-710 micron; CalBimmo Plus Food Grade is supplied in food-grade quality and conforms to the General Specifications and Considerations for Enzyme Preparations Used in Food Processing of the Joint FAO/WHO Expert Committee on Food Additives (JECFA). CalB immo Plus is suitable for applications in organic solvents as well as a solvent-free systems and can be used for (regio- and stereoselective) esterifications and transesterifications. CalB Immo Plus has many advantages including high activity and high mechanical stability. Sold in collaboration with PuroLite for research purposes only.	10g 50g 250g
NEW		
06-0925	Enzyme carrier Lifetech™ ECR1030M White to off white spherical beads (wet); SA: 80 - 120 m ² /g <i>(store cold)</i> Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-710 micron; Pore Diameter: 220-340; Lifetech ECR1030M is a copolymer of divinylbenzene (DVB) and methacrylate with no functional groups. It is used for enzyme immobilization by adsorption (hydrophobic interaction) and it is particularly suitable for lipase immobilization such as CALB. Lifetech ECR1030M main features are high mechanical stability compared to other existing resins, low surface area that grants high enzyme activity at low protein loading. Sold in collaboration with PuroLite for research purposes only.	50g 5x50g
NEW		

BIOCATALYSTS (Compounds)

07-2215 NEW	<p>Enzyme carrier Lifetech™ ECR1504 White to off white spherical beads (wet) (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-1200 micron; Lifetech ECR1504 is a copolymer of divinylbenzene (DVB) and styrene functionalised with tertiary amines. It is used for enzyme immobilization by ionic interaction of the ionizable surface aminoacids (Lys, Arg, His, Asp, Glu) with the tertiary amines on the polymer. It is particularly suitable for immobilization of enzymes with iP in the range 3 - 5 like many glycosidases. Lifetech ECR1504 main features are possibility to regenerate the resin, pH adjustment before immobilization and large particle size for column applications. Sold in collaboration with Purolite for research purposes only.</p>	50g 5x50g
07-2220 NEW	<p>Enzyme carrier Lifetech™ ECR1508 White to off white spherical beads (wet) (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-1200 micron; Lifetech ECR1508 is copolymer of divinylbenzene (DVB) and styrene functionalised with tertiary amines. It is used for enzyme immobilization by ionic interaction of the ionizable surface aminoacids (Lys, Arg, His, Asp, Glu) with the tertiary amines on the polymer. It is particularly suitable for immobilization of enzymes with iP in the range 3 - 5 like many glycosidases. Lifetech ECR1508 main features are possibility to regenerate the resin, pH adjustment before immobilization and large particle size for column applications. Sold in collaboration with Purolite for research purposes only.</p>	50g 5x50g
07-2224 NEW	<p>Enzyme carrier Lifetech™ ECR1604 White to off white spherical beads (wet) (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-1200 micron; Lifetech ECR1604 is a copolymer of divinylbenzene (DVB) and styrene functionalised with quaternary amines. It is used for enzyme immobilization by ionic interaction of the ionizable surface aminoacids (Lys, Arg, His, Asp, Glu) with the tertiary amines on the polymer. It is particularly suitable for immobilization of enzymes with iP in the range 3 - 5 like many glycosidases. Lifetech ECR1604 main features are possibility to regenerate the resin, pH adjustment before immobilization and large particle size for column applications. Sold in collaboration with Purolite for research purposes only.</p>	50g 5x50g
07-2230 NEW	<p>Enzyme carrier Lifetech™ ECR1640 White to off white spherical beads (wet) (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-1200 micron; Lifetech ECR1640 is a copolymer of divinylbenzene (DVB) and styrene functionalized with quaternary amines. It is used for enzyme immobilization by ionic interaction of the ionizable surface aminoacids (Lys, Arg, His, Asp, Glu) with the tertiary amines on the polymer. It is particularly suitable for immobilization of enzymes with iP in the range 3 - 5 like many glycosidases. Lifetech ECR1640 main features are possibility to regenerate the resin, pH adjustment before immobilization and large particle size for column applications. Sold in collaboration with Purolite for research purposes only.</p>	50g 5x50g
06-0928 NEW	<p>Enzyme carrier Lifetech™ ECR1061M White to off white spherical beads (wet); SA: 400 - 510 m²/g (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-710 micron; Pore Diameter: 600-750 Å; Lifetech ECR1061M is a copolymer of divinylbenzene (DVB) with methacrylate with no functional groups. It is used for enzyme immobilization by adsorption (hydrophobic interaction) and it is particularly suitable for lipase immobilization as CALB. Lifetech ECR1061M main features are higher porosity compared to Lifetech ECR1030M to allow better diffusion for bulky substrates or better application in viscous systems. Sold in collaboration with Purolite for research purposes only.</p>	50g 5x50g

BIOCATALYSTS (Compounds)

06-0905	Enzyme carrier Lifetech™ ECR1090F	50g
NEW	White to off white spherical beads (wet); SA: 750 - 850 m ² /g (store cold) Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 150-300 micron; Pore Diameter: 900-1100 Å; Lifetech ECR1090F is a copolymer of divinylbenzene (DVB) and styrene with high porosity and no functional groups. It is used for enzyme immobilization by adsorption (hydrophobic interaction) and it is particularly suitable for lipase immobilization. Lifetech ECR1090F main features are high porosity, high mechanical stability and high surface area. Sold in collaboration with Puro-lite for research purposes only.	5x50g
06-0913	Enzyme carrier Lifetech™ ECR1090M	50g
NEW	White to off white spherical beads (wet); SA: 750 - 850 m ² /g (store cold) Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-710 micron; Pore Diameter: 900-1100 Å; Lifetech ECR1090M is a copolymer of divinylbenzene (DVB) and styrene with high porosity and no functional groups. It is used for enzyme immobilization by adsorption (hydrophobic interaction) and it is particularly suitable for lipase immobilization. Lifetech ECR1090M main features are high porosity, high mechanical stability and high surface area. Sold in collaboration with Puro-lite for research purposes only.	5x50g
06-0922	Enzyme carrier Lifetech™ ECR1091M	50g
NEW	White to off white spherical beads (wet); SA: > 450 m ² /g (store cold) Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-710 micron; Pore Diameter: 950-1200; Lifetech ECR1091M is a copolymer of divinylbenzene (DVB) and styrene with very high porosity and no functional groups. It is used for enzyme immobilization by adsorption (hydrophobic interaction) and it is particularly suitable for lipase immobilization. Lifetech ECR1091M main features are high porosity, high mechanical stability and high surface area. Sold in collaboration with Puro-lite for research purposes only.	5x50g
06-0810	Enzyme carrier Lifetech™ ECR8204F	50g
NEW	White to off white spherical beads (wet) (store cold) Note: Store in dry conditions (2-8°C). Do not freeze. Shelf life: 6 months; Particle Size: 150-300 micron; Pore Diameter: 300-600 Å; Lifetech ECR8204F is a methacrylate polymer functionalised with epoxy groups, used for covalent enzyme immobilization. Epoxides form very stable covalent linkages with different protein surface groups as ε-NH ₂ in Lys or nucleophiles (amino, thiol, phenolic). Immobilization is performed under very mild experimental conditions of pH and temperature, at high ionic buffer strength. Lifetech ECR8204F main features are the low porosity, the hydrophilicity, high mechanical strength and it is optimal for use in batch reactors. Sold in collaboration with Puro-lite for research purposes only.	5x50g
06-0813	Enzyme carrier Lifetech™ ECR8204M	50g
NEW	White to off white spherical beads (wet) (store cold) Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 6 months; Particle size: 300-710 micron; Pore Diameter: 300-600 Å; Lifetech ECR8204M is a methacrylate polymer functionalized with epoxy groups, used for covalent enzyme immobilization. Epoxides form very stable covalent linkages with different protein surface groups as ε-NH ₂ in Lys or nucleophiles (amino, thiol, phenolic). Immobilization is performed under very mild experimental conditions of pH and temperature, at high ionic buffer strength. Lifetech ECR8204M main features are the low porosity, the hydrophilicity, high mechanical strength and it is optimal for use in batch reactors and columns.	5x50g

BIOCATALYSTS (Compounds)

06-0817 NEW	<p>Enzyme carrier Lifetech™ ECR8209F white to off white spherical beads (wet) (store cold) Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 6 months; Particle Size: 150-300 micron; Pore Diameter: 300-600 Å; Lifetech ECR8209F is a methacrylate polymer functionalized with epoxy groups, used for covalent enzyme immobilization. Epoxy groups form very stable covalent linkages with different protein surface groups as ε-NH₂ in Lys or nucleophiles (amino, thiol, phenolic). Immobilization is performed under very mild experimental conditions of pH and temperature, at high ionic buffer strength. Lifetech ECR8209F main features are the high porosity, the hydrophilicity and it is optimal for use in batch reactors.</p>	50g 5x50g
07-1512 NEW	<p>Enzyme carrier Lifetech™ ECR8309F white to off white spherical beads (wet); SA: 70 min. m²/g (store cold) Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 150-300 micron; Pore Diameter: 600-1200 Å; Lifetech ECR8309F is a methacrylate polymer functionalized with amino groups on a short spacer (C2). It is used for covalent enzyme immobilization by pre-activation of the resin with glutaraldehyde and to subsequently form very stable covalent linkages with different protein groups (amino, thiol, phenolic) under very mild experimental conditions of pH and temperature, at low ionic buffer strength. It can also be used for enzyme immobilization by ionic interaction of the ionizable surface aminoacids (Lys, Arg, His, Asp, Glu) with the charged amines on the polymer. Lifetech ECR8309F main features are the medium porosity, the hydrophilicity and its optimal use in batch reactors. Sold in collaboration with Puro-lite for research purposes only.</p>	50g 5x50g
07-1515 NEW	<p>Enzyme carrier Lifetech™ ECR8309M White to off white spherical beads (wet); SA: 70 min. m²/g (store cold) Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-710 micron; Pore Diameter: 600-1200 Å; Lifetech ECR8309M is a methacrylate polymer functionalized with amino groups on a short spacer (C2). It is used for covalent enzyme immobilization by pre-activation of the resin with glutaraldehyde and to subsequently form very stable covalent linkages with different protein groups (amino, thiol, phenolic) under very mild experimental conditions of pH and temperature, at low ionic buffer strength. It can also be used for enzyme immobilization by ionic interaction of the ionizable surface aminoacids (Lys, Arg, His, Asp, Glu) with the charged amines on the polymer. Lifetech ECR8309M main features are the medium porosity, the hydrophilicity and its optimal use in batch reactors and columns. Sold in collaboration with Puro-lite for research purposes only.</p>	50g 5x50g
07-1518 NEW	<p>Enzyme carrier Lifetech™ ECR8315F white to off white spherical beads (wet); SA: 60 min. m²/g (store cold) Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 150-300 micron; Pore Diameter: 1200-1800 Å; Lifetech ECR8315F is a methacrylate polymer functionalized with amino groups on a short spacer (C2). It is used for covalent enzyme immobilization by pre-activation of the resin with glutaraldehyde and to subsequently form very stable covalent linkages with different protein groups (amino, thiol, phenolic) under very mild experimental conditions of pH and temperature, at low ionic buffer strength. Lifetech ECR8315F main features are the high porosity, the hydrophilicity and its optimal use in batch reactors. Sold in collaboration with Puro-lite for research purposes only.</p>	50g 250g
07-1520 NEW	<p>Enzyme carrier Lifetech™ ECR8315M white to off white spherical beads (wet); SA: 60 min. m²/g (store cold) Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-710 micron; Pore Diameter: 1200-1800 Å; Lifetech ECR8315M is a methacrylate polymer functionalized with amino groups on a short spacer (C2). It is used for covalent enzyme immobilization by pre-activation of the resin with glutaraldehyde and to subsequently form very stable covalent linkages with different protein groups (amino, thiol, phenolic) under very mild experimental conditions of pH and temperature, at low ionic buffer strength. It can also be used for enzyme immobilization by ionic interaction of the ionizable surface aminoacids (Lys, Arg, His, Asp, Glu) with the charged amines on the polymer. Lifetech ECR8315M main features are the medium porosity, the hydrophilicity and its optimal use in batch reactors and columns. Sold in collaboration with Puro-lite for research purposes only.</p>	50g 250g

BIOCATALYSTS (Compounds)

07-1523 NEW	<p>Enzyme carrier Lifetech™ ECR8409F white to off white spherical beads (wet); SA: 70 min. m²/g (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 150-300 micron; Pore Diameter: 600-1200 Å; Lifetech ECR8409F is a methacrylate polymer functionalized with amino groups on a long spacer (C6). It is used for covalent enzyme immobilization by pre-activation of the resin with glutaraldehyde and to subsequently form very stable covalent linkages with different protein groups (amino, thiol, phenolic) under very mild experimental conditions of pH and temperature, at low ionic buffer strength. It can also be used for enzyme immobilization by ionic interaction of the ionizable surface aminoacids (Lys, Arg, His, Asp, Glu) with the charged amines on the polymer. Lifetech ECR8409F main features are the medium porosity, the hydrophilicity and its optimal use in batch reactors. Sold in collaboration with Puro-lite for research purposes only.</p>	50g 250g
07-1525 NEW	<p>Enzyme carrier Lifetech™ ECR8409M white to off white spherical beads (wet); SA: 70 min. m²/g (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-710 micron; Pore Diameter: 600-1200 Å; Lifetech ECR8409M is a methacrylate polymer functionalized with amino groups on a long spacer (C6). It is used for covalent enzyme immobilization by pre-activation of the resin with glutaraldehyde and to subsequently form very stable covalent linkages with different protein groups (amino, thiol, phenolic) under very mild experimental conditions of pH and temperature, at low ionic buffer strength. It can also be used for enzyme immobilization by ionic interaction of the ionizable surface aminoacids (Lys, Arg, His, Asp, Glu) with the charged amines on the polymer. Lifetech ECR8409M main features are the medium porosity, the hydrophilicity and its optimal use in batch reactors and columns. Sold in collaboration with Puro-lite for research purposes only.</p>	50g 250g
07-1528 NEW	<p>Enzyme carrier Lifetech™ ECR8415F white to off white spherical beads (wet); SA: 60 min. m²/g (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 150-300 micron; Pore Diameter: 1200-1800 Å; Lifetech ECR8415F is a methacrylate polymer functionalized with amino groups on a long spacer (C6). It is used for covalent enzyme immobilization by pre-activation of the resin with glutaraldehyde and to subsequently form very stable covalent linkages with different protein groups (amino, thiol, phenolic) under very mild experimental conditions of pH and temperature, at low ionic buffer strength. It can also be used for enzyme immobilization by ionic interaction of the ionizable surface aminoacids (Lys, Arg, His, Asp, Glu) with the charged amines on the polymer. Lifetech ECR8415F main features are the high porosity, the hydrophilicity and its optimal use in batch reactors. Sold in collaboration with Puro-lite for research purposes only.</p>	50g 250g
07-1530 NEW	<p>Enzyme carrier Lifetech™ ECR8415M White to off white spherical beads (wet); SA: 60 min. m²/g (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-710 micron; Pore Diameter: 1200-1800 Å; Lifetech ECR8415M is a methacrylate polymer functionalized with amino groups on a long spacer (C6). It is used for covalent enzyme immobilization by pre-activation of the resin with glutaraldehyde and to subsequently form very stable covalent linkages with different protein groups (amino, thiol, phenolic) under very mild experimental conditions of pH and temperature, at low ionic buffer strength. It can also be used for enzyme immobilization by ionic interaction of the ionizable surface aminoacids (Lys, Arg, His, Asp, Glu) with the charged amines on the polymer. Lifetech ECR8415M main features are the high porosity, the hydrophilicity and its optimal use in batch reactors. Sold in collaboration with Puro-lite for research purposes only.</p>	50g 5x50g
07-1532 NEW	<p>Enzyme carrier Lifetech™ ECR8806F White to off white spherical beads (wet); SA: 70 min. m²/g (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 150-300 micron; Pore Diameter: 350-600 Å; Lifetech ECR8806F is a methacrylic polymer functionalized with octadecyl groups. It is used for enzyme immobilization by adsorption (hydrophobic interaction) and it is particularly suitable for lipase and transaminases immobilization. Lifetech ECR8806F main features are very enzyme activity achieved upon immobilization compared to other existing resins. Sold in collaboration with Puro-lite for research purposes only.</p>	50g 5x50g

BIOCATALYSTS (Compounds)

07-1535 NEW	Enzyme carrier Lifetech™ ECR8806M White to off white spherical beads (wet); SA: 70 min. m ² /g <i>(store cold)</i> Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-710 micron; Pore Diameter: 350-600 Å; Lifetech ECR8806M is a methacrylic polymer functionalized with octadecyl groups. It is used for enzyme immobilization by adsorption (hydrophobic interaction) and it is particularly suitable for lipase and transaminases immobilization. Lifetech ECR8806M main features are very high enzyme activity achieved upon immobilization compared to other existing resins. Optimal for column packed reactors. Sold in collaboration with Purolite for research purposes only.	50g 5x50g
06-0820 NEW	Enzyme carrier Lifetech™ ECR8209M white to off white spherical beads (wet); SA: 70 min. m ² /g <i>(store cold)</i> Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 6 months; Particle Size: 300-710 micron; Pore Diameter: 600-1200 Å; Lifetech ECR8209M is a methacrylate polymer functionalized with epoxy groups, used for covalent enzyme immobilization. Epoxy groups form very stable covalent linkages with different protein surface groups as ε-NH ₂ in Lys or nucleophiles (amino, thiol, phenolic). Immobilization is performed under very mild experimental conditions of pH and temperature, at high ionic buffer strength. Lifetech ECR8209M main features are the high porosity, the hydrophilicity and it is optimal use in batch reactors and columns.	50g 5x50g
06-0823 NEW	Enzyme carrier Lifetech™ ECR8215F white to off white spherical beads (wet); SA: 60 min. m ² /g <i>(store cold)</i> Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 6 months; Particle Size: 150-300 micron; Pore Diameter: 1200-1800 Å; Lifetech ECR8215F is a methacrylate polymer functionalized with epoxy groups, used for covalent enzyme immobilization. Epoxy groups form very stable covalent linkages with different protein surface groups as ε-NH ₂ in Lys or nucleophiles (amino, thiol, phenolic). Immobilization is performed under very mild experimental conditions of pH and temperature, at high ionic buffer strength. Lifetech ECR8215F main features are the very high porosity, the hydrophilicity and it is optimal for use in batch reactors.	50g 5x50g
06-0826 NEW	Enzyme carrier Lifetech™ ECR8215M white to off white spherical beads (wet); SA: 60 min. m ² /g <i>(store cold)</i> Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 6 months; Particle Size: 300-710 micron; Pore Diameter: 1200-1800 Å; Lifetech ECR8215M is a methacrylate polymer functionalized with epoxy groups, used for covalent enzyme immobilization. Epoxy groups form very stable covalent linkages with different protein surface groups as ε-NH ₂ in Lys or nucleophiles (amino, thiol, phenolic). Immobilization is performed under very mild experimental conditions of pH and temperature, at high ionic buffer strength. Lifetech ECR8215M main features are the very high porosity, the hydrophilicity and its optimal use in batch reactors and columns.	50g 5x50g
06-0828 NEW	Enzyme carrier Lifetech™ ECR8285 white to off white spherical beads (wet); SA: 100-200 m ² /g <i>(store cold)</i> Note: Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 6 months; Particle Size: 250-1000 micron; Pore Diameter: 400-600 Å; Lifetech ECR8285 is a methacrylate polymer functionalized with both butyl and epoxy groups. This combination creates a good balance of hydrophobicity that makes the polymer optimal for immobilization of hydrophobic enzymes like lipases and transaminases. Epoxides form very stable covalent linkages with different protein groups (amino, thiol, phenolic) under very mild experimental conditions of pH and temperature. Lifetech ECR8285 main features are the process advantages deriving from hydrophobic property combined with epoxy groups allowing the use in bi-phasic systems. Sold in collaboration with Purolite for research purposes only.	50g 5x50g
96-0255	Enzyme carrier Lifetech™ ECRKIT1 See page 357	

BIOCATALYSTS (Compounds)

06-3115	Esperase® 8.0 L (9014-01-1) amber liq. (semitransparent); d. 1.07 NEW (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 8KNPU-E/g. Serine endoprotease that hydrolyzes internal peptide bonds. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes	10g 50g 250g
96-4065	Lipase immo Kit - Immobilized enzymes See page 319	
06-3105	Lipozyme® CALB L (9001-62-1) yellow to light-brown liq.; d. 1.2 NEW (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 5000 LU/g. Lipase that hydrolyzes ester bonds in glycerides. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes	10g 50g 250g
06-3140	Lipozyme® TL 100 L (9001-62-1) yellow liq.; d. 1.05 NEW (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 100 KLU/g. Lipase that hydrolyzes ester bonds in glycerides. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes	10g 50g 250g
06-3155	Lipozyme® TL IM (9001-62-1) off-white immobilized granulate; d. 0.4 NEW (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 250 IUN/g. Lipase that hydrolyzes ester bonds in glycerides. It is a 1,3 specific lipase which is immobilized on a non-compressible silica gel carrier into an immobilized granulate. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes	10g 50g 250g
06-3160	Neutrase® 0.8 L (9080-56-2) brown liq.; d. 1.26 NEW (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 0.8 AU/g. Kinetic resolution of amino esters is a neutral, zinc metallo endoprotease, that randomly hydrolyzes internal peptide bonds and also facilitates enzymatic synthesis of oligopeptides by the reverse proteolysis reaction with zinc metal as co-catalyst. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes	10g 50g 250g
06-3100	NovoCor® AD L (9001-62-1) brown liq.; d. 1.17 NEW (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 6000 LU/g. Lipase that hydrolyzes ester bonds in glycerides. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes	10g 50g 250g

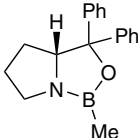
BIOCATALYSTS (Compounds)

06-3123 NEW	<p>Novozym® 435 (9001-62-1) off-white immobilized granulate; d. 0.4 (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 10000 PLU/g. Lipase that hydrolyzes ester bonds in glycerides. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes</p>	5g 25g
06-3120 NEW	<p>Novozym® 40086 (9001-62-1) brown immobilized granulate; d. 0.33 (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 275 IUN/g. Lipase that hydrolyzes ester bonds in glycerides. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes</p>	5g 25g
06-3135 NEW	<p>Novozym® 51032 (9001-62-1) yellow to light-brown liq.; d. 1.04 (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 15 KLU/g. Lipase that hydrolyzes ester bonds in glycerides. Product may be hazy and contain slight precipitate. This does not affect enzyme activity or performance. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes</p>	10g 50g 250g
96-0224	<p>Novozymes Endoprotease Screening Kit (contains 6 endoprotease enzymes) See page 320</p>	
96-0220	<p>Novozymes Lipase Screening Kit (contains 9 lipase enzymes) See page 320</p>	
06-3118 NEW	<p>Palatase® 20000 L (9001-62-1) brown liq.; d. 1.19 (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 20000 LU-MM/g. Lipase that hydrolyzes ester bonds in glycerides. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes</p>	5g 25g 100g
06-3125 NEW	<p>Resinase® HT (9001-62-1) yellow liq.; d. 1.05 (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 50 KLU/g. Lipase that hydrolyzes ester bonds in glycerides. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes</p>	10g 50g 250g

BIOCATALYSTS (Compounds)

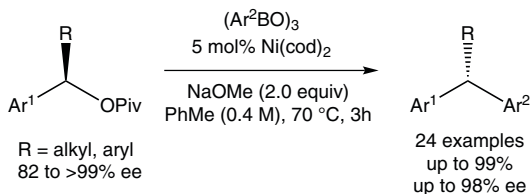
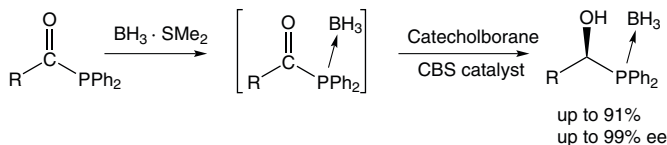
06-3137 NEW	Savinase® 12 T (9014-01-1) off-white granulate; d. 1.3 (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 12 KNPU-S/g. Serine endoprotease that hydrolyzes internal peptide bonds. The granulate contains enzyme concentrate, inorganic salt, binder and coating materials. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes	10g 50g 250g
06-3150 NEW	Savinase® 16 L (9014-01-1) amber liq. (semitransparent); d. 1.16 (store cold) Note: Store at 0-10°C. DO NOT FREEZE. Declared activity 16 KNPU-S/g. A serine endoprotease that hydrolyzes internal peptide bonds. Color can vary from batch to batch. Color intensity is not an indication of enzyme activity. Packaging must be kept intact, dry and away from sunlight. Please follow the recommendations and use the product before the best before date to avoid the need for a higher dosage. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes	10g 50g 250g

BORON (Compounds)

05-1000 HAZ	(R)-Tetrahydro-1-methyl-3,3-diphenyl-1H,3H-pyrrolo[1,2-c][1,3,2]oxazaborole, 0.9-1.1M in toluene [(R)-Methyloxazaborolidine] (R)-CBS Catalyst (112022-83-0) C ₁₈ H ₂₀ BNO; FW: 277.17; liq.; f.p. 40°F (toluene); d. 0.925 moisture sensitive	 10ml 50ml
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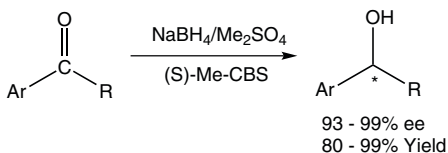
Technical Notes:

1. Convenient catalyst for the enantioselective borane reduction of ketones at ambient temperatures.
2. Asymmetric synthesis of α -chiral hydroxyalkylphosphines via a catalytic, enantioselective reduction of acylphosphines.
3. Nickel-catalyzed cross-couplings of benzylic pivalates with arylboroxines: Stereospecific formation of diarylalkanes and triarylmethanes.
4. Enantioselective reduction of prochiral ketones with NaBH₄/Me₂SO₄/(S)-Me-CBS.



BORON (Compounds)

05-1000 (continued) (R)-Tetrahydro-1-methyl-3,3-diphenyl-1H,3H-pyrrolo[1,2-c][1,3,2]oxazaborole, 0.9-1.1M in toluene [(R)-Methyloxazaborolidine] (R)-CBS Catalyst (112022-83-0)



Tech. Note (4)
Ref. (3)

References:

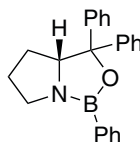
1. *Org. Lett.*, **2014**, *16*, 5830
2. *J. Am. Chem. Soc.*, **2013**, *135*, 3307
3. *Synthetic Commun.*, **2014**, *44*, 1515

05-1001 HAZ (S)-Tetrahydro-1-methyl-3,3-diphenyl-1H,3H-pyrrolo[1,2-c][1,3,2]oxazaborole, 0.9-1.1M in toluene [(S)-Methyloxazaborolidine] (S)-CBS Catalyst (112022-81-8) 10ml
50ml
C₁₈H₂₀BNO; FW: 277.17; liq.; f.p. 40°F (toluene); d. 0.925
moisture sensitive

Technical Note:

1. See 05-1000 (page 11)

05-1002 (R)-Tetrahydro-1,3,3-triphenyl-1H,3H-pyrrolo[1,2-c][1,3,2]oxazaborole, 99% (R)-Phenyl oxazaborolidine (145238-45-5) 5g
C₂₃H₂₂BNO; FW: 339.24; white to off-white powder.
moisture sensitive
Note: **Limited quantity available**.

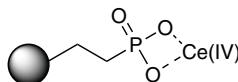


Technical Note:

1. See 05-1001 (page 12)

CERIUM (Compounds)

58-5100 Cerium(IV) ethyl/butyl phosphonate Silica (PhosphonicS POCe) 5g
25g
yellow solid; SA: >350 m²/g
Note: Sold in collaboration with PhosphonicS Ltd. for research purposes only. PhosphonicS Metal Oxidation Catalyst Kit component.



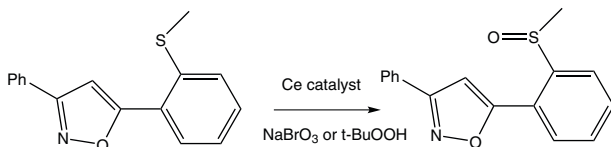
Particle size range: 70-200 microns

Average pore size: 60Å

Effective loadings: 0.3 to 0.5 mmol/g

Technical Note:

1. Catalyst used for the oxidation of a range of sulfides to sulfoxides.



References:

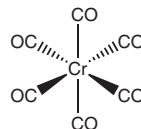
1. *Tetrahedron Lett.*, **2005**, *46*, 4365

96-6770 PhosphonicS Metal Oxidation Catalyst Kit
See page 346

CHROMIUM (Compounds)

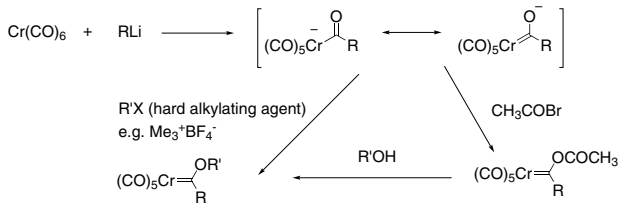
24-0183 **Chromium carbonyl, 98+% (13007-92-6)** 5g
 Cr(CO)₆; FW: 220.06; white to off-white solid 25g
NEW 100g
 HAZ

24-0180 **Chromium carbonyl, sublimed, 99% (13007-92-6)** 5g
 Cr(CO)₆; FW: 220.06; white xtl.; m.p. 154-155°; d. 1.77 25g
 HAZ 100g
 500g

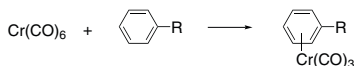


Technical Notes:

1. Reagent for the preparation of Fischer carbenes.
2. Reagent for the preparation of arenechromium complexes.



Tech. Note (1)

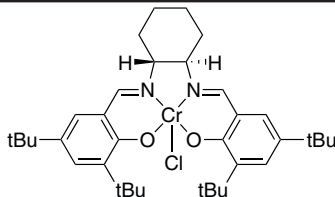


Tech. Note (2)

References:

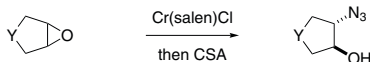
1. *Comprehensive Organic Synthesis*, **1991**, Vol. 5, Chapter, 9.2, 1065
2. *Comprehensive Organic Synthesis*, **1991**, Vol. 4, Chapter, 2.4, 517
3. *Comprehensive Organometallic Chemistry*, **1982**, Vol. 3, Chapter, 26.2, 953
4. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol. 4, 2633

24-0850 **(1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)] chromium(III) chloride (164931-83-3)** 1g
 [C₃₆H₅₂N₂O₂]₂CrCl; FW: 632.28; brown powdr.; 5g
 m.p. >350°

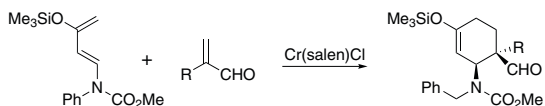


Technical Notes:

1. Catalyst for the asymmetric ring-opening of meso-epoxides and for the kinetic resolution of terminal epoxides.
2. Precatalyst for asymmetric Diels-Alder and hetero Diels-Alder reactions.
3. Catalyst for copolymerization of CO₂ and epoxides.
4. Catalyst for enantioselective alkylation of tributyltin enolates.
5. Enantioselective addition of Me₂Zn to aldehydes.
6. Enantioselective intramolecular addition of tertiary enamides to ketones.
7. Asymmetric iodocyclization.
8. Catalytic intermolecular linear allylic C-H amination.
9. Cocatalyst for enantioselective ring opening of epoxides with fluoride.



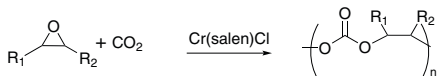
Tech. Note (1)
 Ref. (1)



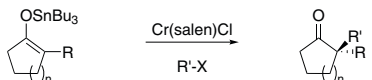
Tech. Note (2)
 Ref. (2)

CHROMIUM (Compounds)

24-0850 (1*R*,2*R*)-(-)-[1,2-Cyclohexanediamino-*N,N'*-bis(3,5-di-*t*-butylsalicylidene)]chromium(III) chloride (164931-83-3)



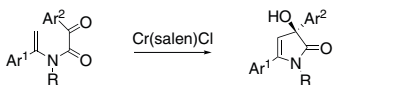
Tech. Note (3)
Ref. (4)



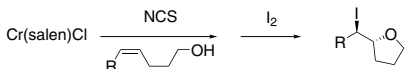
Tech. Note (4)
Ref. (5)



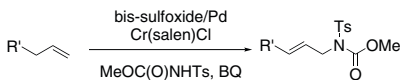
Tech. Note (5)
Ref. (6)



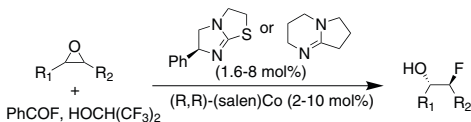
Tech. Note (6)
Ref. (7)



Tech. Note (7)
Ref. (8)



Tech. Note (8)
Ref. (9)



Tech. Note (9)
Ref. (10)

References:

1. *Acc. Chem. Res.*, **2000**, 33, 421, review
2. *J. Am. Chem. Soc.*, **2000**, 122, 7843
3. *J. Org. Chem.*, **1998**, 63, 403
4. *Acc. Chem. Res.*, **2004**, 37, 836
5. (a) *J. Am. Chem. Soc.*, **2005**, 127, 62, b, *Angew. Chem, Int, Ed*, 2007, 46, 3701
6. *J. Am. Chem. Soc.*, **2006**, 128, 4940
7. *J. Am. Chem.*, **2009**, 131, 10390
8. *Chem. Eur. J.*, **2008**, 14, 1023
9. *J. Am. Chem.*, **2008**, 130, 3316
10. *J. Am. Chem.*, **2010**, 132, 3268

24-0851 (1*S*,2*S*)-(+)-[1,2-Cyclohexanediamino-*N,N'*-bis(3,5-di-*t*-butylsalicylidene)]chromium(III) chloride (219143-92-7)

1g
5g

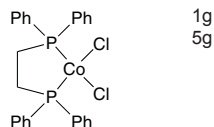
$[\text{C}_{36}\text{H}_{52}\text{N}_2\text{O}_2]\text{CrCl}$; FW: 632.28; brown powdr.; m.p. >350°

Technical Note:

1. See 24-0850 (page 13)

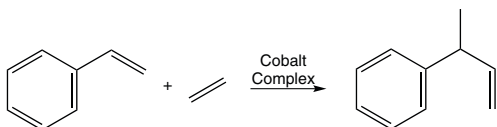
COBALT (Compounds)

27-0478 1,2-Bis(diphenylphosphino)ethanedichlorocobalt(II), min. 97% (18498-01-6)
 $\text{CoCl}_2(\text{C}_{26}\text{H}_{24}\text{P}_2)$; FW: 528.26; green powdr.
moisture sensitive

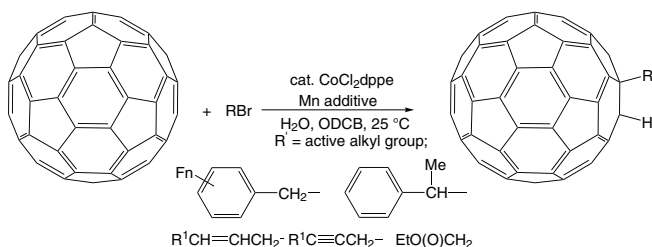


Technical Notes:

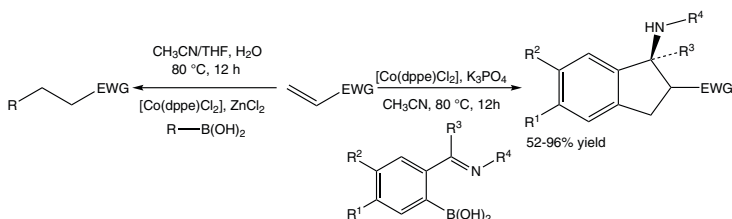
1. Catalyst used for the hydrovinylation of styrene.
2. Cobalt-catalyzed hydroalkylation of [60] fullerene with active alkyl bromides.
3. Cobalt-catalyzed 1,4-addition of organoboronic acids to activated alkenes.



Tech. Note (1)
 Ref. (1)



Tech. Note (2)
 Ref. (2)



Tech. Note (3)
 Ref. (3)

References:

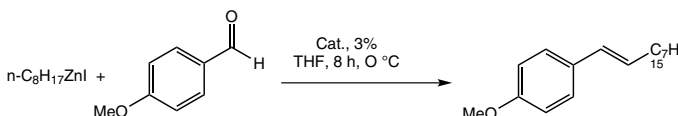
1. *J. Am. Chem. Soc.*, **2006**, *128*, 7414
2. *J. Am. Chem. Soc.*, **2011**, *133*, 12842
3. *Chem. Eur. J.*, **2012**, *18*, 14918

27-1050 Chlorotris(triphenylphosphine)cobalt(I), min. 98% (26305-75-9)
 $\text{CoCl}(\text{P}(\text{C}_6\text{H}_5)_3)_3$; FW: 881.24; brown powdr.
air sensitive, (store cold)

1g
 5g

Technical Notes:

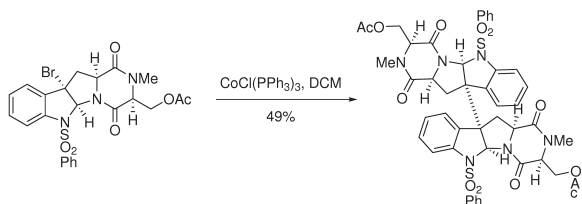
1. Cobalt(I)-catalyzed, stereoselective olefination of alkylzinc reagents with aryl aldehydes.
2. Reagent for the reductive radical dimerization of 3-haloindoline derivatives.
3. Cobalt-catalyzed, asymmetric addition of silylacetylene to 1,1-disubstituted allenes.



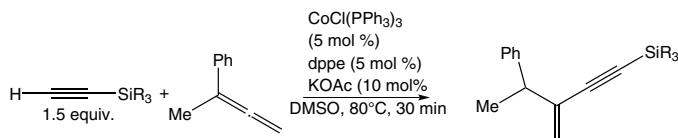
Tech. Note (1)
 Ref. (1)

COBALT (Compounds)

27-1050 Chlorotrīs(triphenylphosphine)cobalt(I), min. 98% (26305-75-9)
(continued)



Tech. Note (2)
Ref. (2)

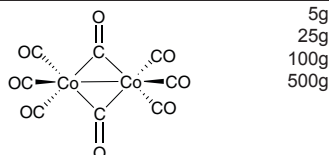


Tech. Note (3)
Ref. (3)

References:

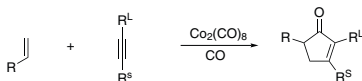
1. *Synthesis*, **2003**, 1506
2. *J. Am. Chem. Soc.*, **2010**, 132, 14376
3. *J. Org. Chem.*, **2013**, 78, 8986

27-0400 Cobalt carbonyl (Dicobalt octacarbonyl)
HAZ
(Stabilized with 1-5% hexanes) (10210-68-1)
Co₂(CO)₈; FW: 341.95; dark orange xtl.; m.p. 51-52°
dec.; f.p. -9°F (hexane); d. 1.73
air sensitive, (store cold)

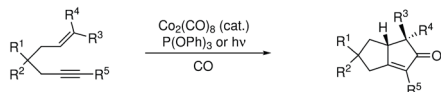


Technical Notes:

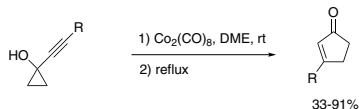
1. Reagent for the Pauson-Khand conversion of an olefin, an alkyne and carbon monoxide into a cyclopentenone.
2. Precatalyst in combination with triphenylphosphite for the catalytic Pauson-Khand reaction.
3. Catalyzes the rearrangement of 1-alkynylcyclopropanols to cyclopentenones.
4. Catalyzes the conversion of aziridines to β-lactams
5. Catalyzes the conversion of diallylanilines and aryliminies to quinolines.
6. Reagent for the selective cleavage of benzyl ethers.
7. Domino Nicholas and Pauson-Khand process induced by nitroarene reduction.



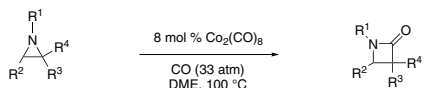
Tech. Note (1)
Ref. (1)



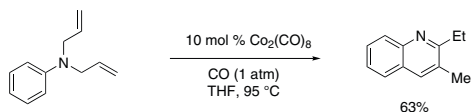
Tech. Note (2)
Ref. (2,3,4)



Tech. Note (3)
Ref. (5,6)



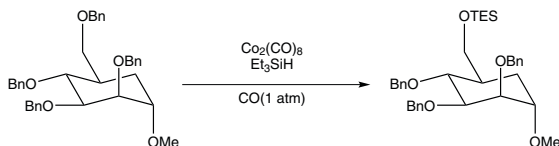
Tech. Note (4)
Ref. (7)



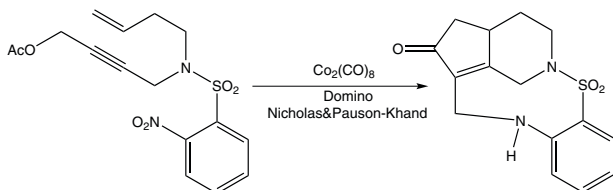
Tech. Note (5)
Ref. (8)

COBALT (Compounds)

27-0400 Cobalt carbonyl (Dicobalt octacarbonyl) (Stabilized with 1-5% hexanes) (10210-68-1)
(continued)



Tech. Note (6)
Ref. (9)



Tech. Note (7)
Ref. (10)

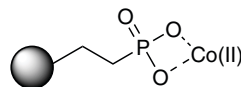
References:

1. *Comprehensive Organic Synthesis*, **1991**, Vol. 5, Ch. 9.1, 1037.
Encyclopedia of Reagents for Organic Synthesis, **1995**, Vol. 6, 3785.
2. *J. Am. Chem. Soc.*, **1994**, *116*, 3159
3. *J. Am. Chem. Soc.*, **1996**, *118*, 2285
4. *Tetrahedron Lett.*, **1998**, *39*, 7637
5. *Tetrahedron: Asymmetry*, **2000**, *11*, 797
6. *J. Am. Chem. Soc.*, **1998**, *120*, 3903
7. *J. Am. Chem. Soc.*, **1996**, *118*, 111
8. *J. Org. Chem.*, **2003**, *68*, 3563
9. *Org. Lett.*, **2010**, *12*, 536
10. *Tetrahedron Lett.*, **2015**, *56*, 4674

27-0900 Cobalt(II) ethyl/butyl phosphonate Silica (PhosphonicS POCo)

blue solid; SA: >350 m²/g

Note: Sold in collaboration with PhosphonicS Ltd. for research purposes only. PhosphonicS Metal Oxidation Catalyst Kit component.



5g
25g

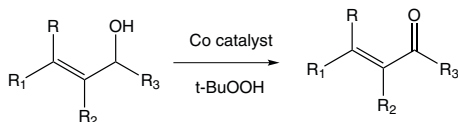
Particle size range: 70-200 microns

Average pore size: 60Å

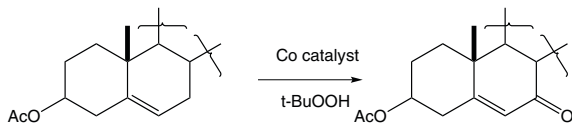
Effective loadings: 0.3 to 0.5 mmol/g

Technical Note:

1. Catalyst used for oxidation of a wide variety allylic alcohols and alkene substrates, including complex steroids.



Tech. Note (1)
Ref. (1)



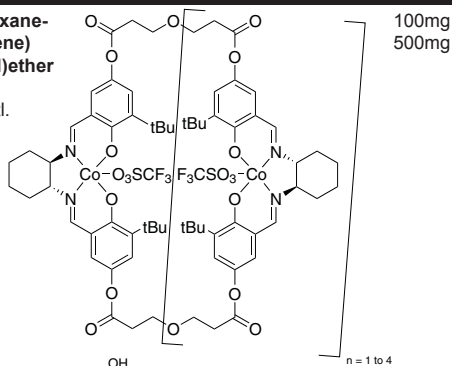
Tech. Note (1)
Ref. (2)

References:

1. *Tetrahedron Lett.*, **2004**, *45*, 4465
2. *Tetrahedron Lett.*, **2003**, *44*, 4283

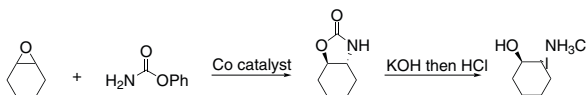
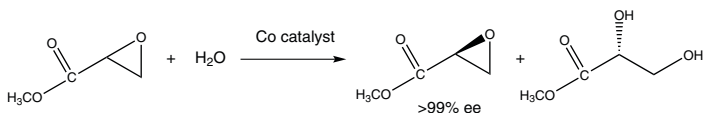
COBALT (Compounds)

27-0495 Cyclic-Oligo Bis[(1R,2R)-(+)-1,2-cyclohexane-diamino-N,N'-bis(3,3'-di-t-butylsalicylidene)cobalt(III)triflate]-5,5'-bis(2-carboxyethyl)ether (647036-07-5)
 $C_{70}H_{84}Co_2F_6N_4O_{20}S_2$; FW: 1597.42; black xtl.



Technical Notes:

- Oligomeric catalyst used for the hydrolytic kinetic resolution of terminal epoxides under solvent-free conditions.
- Oligomeric catalyst used for the synthesis of highly enantioenriched trans-1,2-amino alcohols.



References:

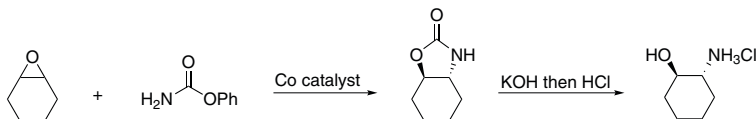
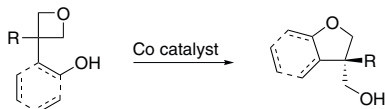
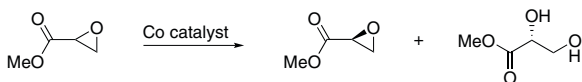
- Tetrahedron: Asymmetry*, **2003**, *14*, 3633.
- Org. Lett.*, **2013**, *15*, 2895.
- Tetrahedron* **2014**, *70*, 4165.

27-0496 Cyclic-Oligo Bis[(1S,2S)-(-)-1,2-cyclohexanediamino-N,N'-bis(3,3'-di-t-butylsalicylidene)cobalt(III)triflate]-5,5'-bis(2-carboxyethyl) ether (1252661-94-1)
 $C_{70}H_{84}Co_2F_6N_4O_{20}S_2$; FW: 1597.42; black xtl.

100mg
500mg

Technical Notes:

- Oligomeric catalyst used for the hydrolytic kinetic resolution of terminal epoxides under solvent-free conditions.
- Catalyst used for the synthesis of enantioenriched tetrahydrofurans via the intramolecular openings of oxetanes.
- Catalyst for the enantioselective addition of phenyl carbamate to meso-epoxides for the synthesis of trans-1,2-amino alcohols.

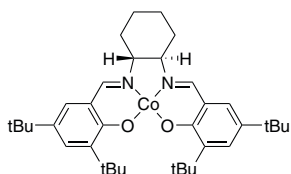


References:

- Tetrahedron: Asymmetry*, **2003**, *14*, 3633.
- J. Am. Chem. Soc.* **2009**, *131*, 2786.
- Org. Lett.*, **2013**, *15*, 2895.

COBALT (Compounds)

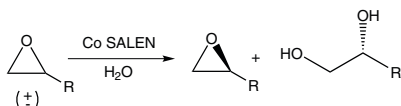
27-0525 (1R,2R)-(-)-1,2-Cyclohexanediamino-N,N'-bis(3,5-di-*t*-butylsalicylidene)cobalt(II)
(176763-62-5)
C₃₆H₅₂CoN₂O₂; FW: 603.76; red-brown powder;
m.p. 406-412°



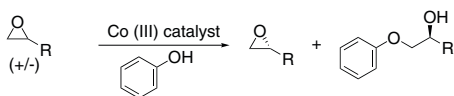
1g
5g
25g

Technical Notes:

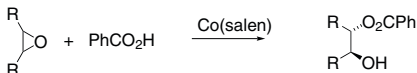
1. Catalyst used in the kinetic resolution of racemic, terminal epoxides yielding a chiral diol and the unreacted enantiomer of the epoxide.
2. Precursor to a Co(III) catalyst for the kinetic resolution of terminal epoxides with alcohols.
3. Desymmetrization of meso-epoxides with carboxylic acids and fluoride.
4. Catalyst for asymmetric cyclopropanation of styrene.
5. Catalyst for copolymerization of CO₂ and epoxides.
6. Enantioselective intramolecular openings of oxetanes.



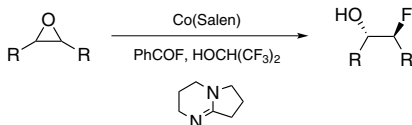
Tech. Note (1)
Ref. (1)



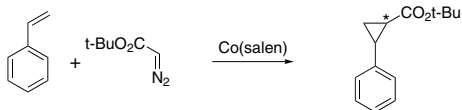
Tech. Note (2)
Ref. (2)



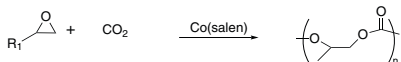
Tech. Note (3)
Ref. (3)



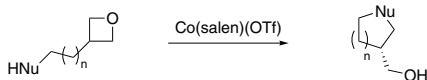
Tech. Note (3)
Ref. (4)



Tech. Note (4)
Ref. (5)



Tech. Note (5)
Ref. (6)



Tech. Note (6)
Ref. (7)

References:


1. *J. Am. Chem. Soc.*, **2002**, *124*, 1307
2. *J. Am. Chem. Soc.*, **1999**, *121*, 6086
3. *Tetrahedron Lett.*, **1997**, *38*, 773
4. *J. Am. Chem. Soc.*, **2010**, *132*, 3268
5. *Adv. Synth. Catal.*, **2001**, *343*, 79
6. *J. Am. Chem. Soc.*, **2005**, *127*, 10869
7. *J. Am. Chem. Soc.*, **2009**, *131*, 2786

COBALT (Compounds)

27-0526	(1S,2S)-(+)-1,2-Cyclohexanediamino-N,N'-bis(3,5-di-<i>t</i>-butylsalicylidene)cobalt(II) (188264-84-8)	1g
	C ₃₆ H ₅₂ CoN ₂ O ₂ ; FW: 603.76; red-brown powdr.; m.p. 409-412°	5g
		25g

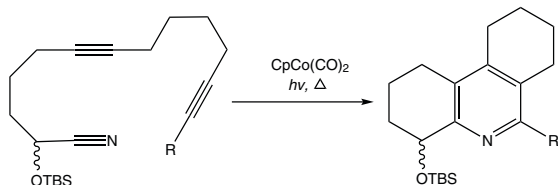
Technical Note:

1. See 27-0525 (page 19)

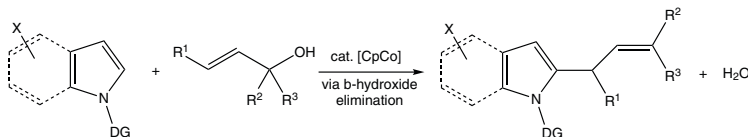
27-0550	Cyclopentadienylcobalt dicarbonyl, min. 95% (12078-25-0)		2g
amp	C ₅ H ₅ Co(CO) ₂ ; FW: 180.05; dark red liq.; b.p. 37-38.5°/2 mm;		10g
HAZ	f.p. 80°F; d. 1.35		
	<i>air sensitive, (store cold)</i>		

Technical Notes:

1. Volatile cobalt complex used for the deposition of cobalt and cobalt oxide films.
2. Intramolecular cobalt-catalyzed [2+2+2] cycloaddition of O-protected diyne-cycanohydriens.
3. Catalyst used for the dehydrative direct CH allylation with allylic alcohols.



Tech. Note (2)
Ref. (4)



Tech. Note (3)
Ref. (5)

99-62% yield, TON: up to 92
high C2- and g-selectivity

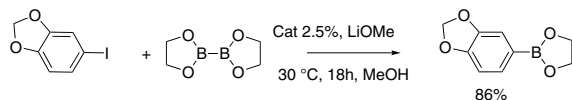
References:

1. *Thin Solid Films*, **2014**, 567, 8.
2. *J. Vac. Sci. Technol. A: Vacuum, Surfaces, and Films*, **2013**, 31, 01A145/1.
3. *J. Electrochem. Soc.*, **2009**, 156, D169.
4. *SynLett.*, **2010**, 7, 1051.
5. *Angew. Chem. Int. Ed.*, **2015**, 54, 9944.

27-0554	Dichloro[1,1'-bis(diphenylphosphino)ferrocene]cobalt(II), 99% (67292-36-8)	1g
	[(C ₅ H ₄ P(C ₆ H ₅) ₂) ₂ Fe]CoCl ₂ ; FW: 684.22; green microxtls.	5g

Technical Note:

1. Catalyst for preparation of boronic acids from diboron derivatives.



Tech. Note (1)
Ref. (1)

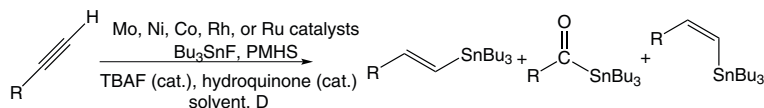
References:

1. WO2001029051 A1.

27-0575	Dichlorobis(triphenylphosphine)cobalt(II), 98% (14126-40-0)	1g
NEW	CoCl ₂ [P(C ₆ H ₅) ₃] ₂ ; FW: 654.41; blue powdr.	5g
	<i>air sensitive</i>	25g

Technical Notes:

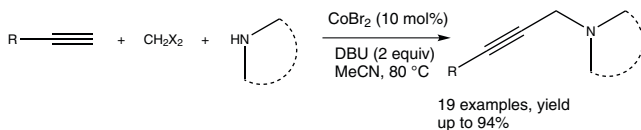
1. Catalyst used for hydrostannations.
2. Catalyst used for alkyne-dihalomethaneamine couplings. – an efficient route for propargylamines.
3. Cobalt-catalyzed transformation of alkynyl C-H bond: aldehyde-alkyne-amine coupling.



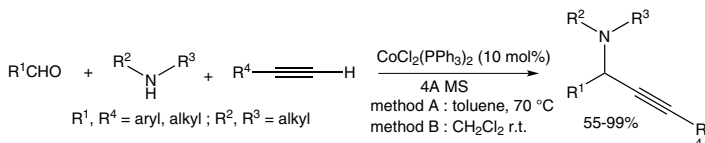
Tech. Note (1)
Ref. (1)

COBALT (Compounds)

27-0575 Dichlorobis(triphenylphosphine)cobalt(II), 98% (14126-40-0)
(continued)



Tech. Note (2)
Ref. (2)



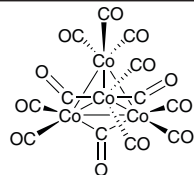
Tech. Note (3)
Ref. (3)

References:

1. *Tetrahedron*, **2013**, 69, 4000
2. *Tetrahedron Lett.*, **2012**, 53, 6199
3. *SynLett.*, **2010**, 3, 475

96-6770 PhosphonicS Metal Oxidation Catalyst Kit
See page 346

27-1950 Tetracobalt dodecacarbonyl, min. 98% (17786-31-1)
HAZ
Co₄(CO)₁₂; FW: 571.85; black xtl.; m.p. 60° dec.; d. 2.09
air sensitive, (store cold)



1g
5g
25g

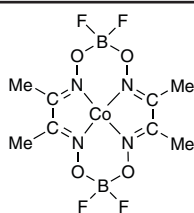
Technical Note:

1. Catalyst precursor in the inter- and intramolecular Pauson-Khand reaction.

References:

1. *Synthesis*, **1998**, 142

27-1965 N,N',N'',N'''-(Tetrafluorodiborato) bis[μ-(2,3-butanedione)dioximato]cobalt(II), min. 98% (26220-72-4)
C₈H₁₂B₂CoF₄N₄O₄; FW: 384.75; brown solid
Note: Limited quantities available.



100mg
500mg

Technical Note:

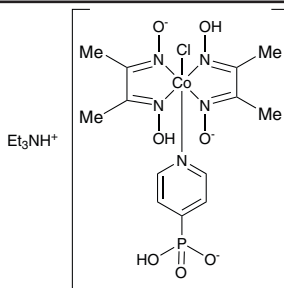
1. Effective catalyst for high conversion, chain transfer polymerization of methyl methacrylate.

References:

1. *Macromolecular Engineering*, **2011**, 5(9-10), 404.
2. *Polymer Chemistry*, **2011**, 2, 815.
3. *J. Applied Polymer Science*, **2004**, 91, 1375.

27-3015 Triethylammonium {chlorobis(dimethylglyoximate)(4-hydrogenphosphonate)pyridinyl} cobaltate(III) (1280199-86-1)
C₁₉H₃₅ClCoN₆O₆P; FW: 584.88;
light-brown solid

NEW



5mg
25mg

Technical Notes:

1. Synthetic cobaloxime catalyst for reduction of aqueous protons to hydrogen in the presence of atmospheric oxygen.
2. Catalyst containing phosphonate anchor groups for immobilization on metal oxide semiconductor surfaces, enabling light-driven hydrogen evolution.

References:

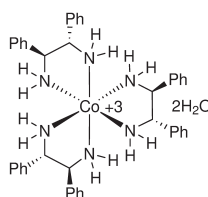
1. *Angew. Chem. Int. Ed.*, **2012**, 51, 9381
2. *Angew. Chem. Int. Ed.*, **2012**, 51, 12749
3. *Chem. Commun.*, **2011**, 47, 1695
4. *Chem. Sci.*, **2015**, 6, 2727

COBALT (Compounds)

27-4010

NEW

lambda-Tris[(1*S*,2*S*)-1,2-diphenyl-1,2-ethanediamine]cobalt(III) chloride tetrakis[3,5-bis(trifluoromethyl)phenyl]borate dihydrate
SKJ-1 (1542135-29-4)
C₇₄H₆₀BCl₂CoF₂₄N₆; FW: 1629.92(1665.92);
orange pwr.
Note: U.S. Patent 14/417655

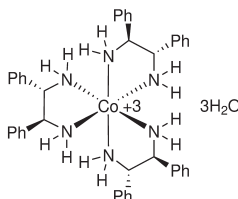


50mg
250mg

27-4011

NEW

delta-Tris[(1*S*,2*S*)-1,2-diphenyl-1,2-ethanediamine]cobalt(III) chloride tetrakis(2,3,4,5,6-pentafluorophenyl)borate trihydrate SKJ-3 (1867120-15-7)
C₆₆H₄₈BCl₂CoF₂₀N₆; FW: 1445.74 (1501.80);
orange solid
Note: U.S. Patent 14/417655

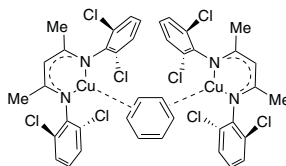


50mg
250mg

COPPER (Compounds)

29-7050

μ-Benzenebis[N,N'-(1,3-dimethyl-1,3-propanediylidene)bis(2,6-dichlorobenzamino-*tao*)] dicopper(I), benzene adduct, min. 98% (1119821-62-3)
C₃₄H₂₆Cl₈Cu₂N₄ · 0.8C₆H₆; FW: 963.80;
pale yellow solid
air sensitive, moisture sensitive, (store cold)
Note: Sold under license from Georgetown University for noncommercial research use only.
Patent pending.



250mg
1g

Technical Note:

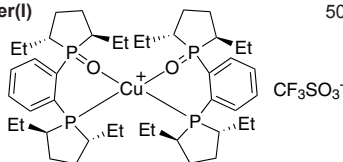
1. High yield C-H amination of unactivated C-H bonds with 1-adamantylazide.

References:

1. *Angew. Chem. Int. Ed.*, **2008**, 47, 9961
2. *Inorg. Chem.*, **2004**, 43, 6357

29-3007

Bis[[1-(2*R*,5*R*)-2,5-diethylphospholanyl]-[2-(2*R*,5*R*)-2,5-diethylphospholanyl-1-oxide]benzene]copper(I) trifluoromethanesulfonate, min. 97%
C₄₅H₇₂CuF₃O₅P₄S; FW: 969.55;
white to beige solid
air sensitive
Note: Sold under license from Kanata for research purposes only.



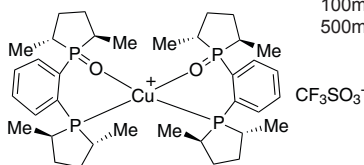
100mg
500mg

29-3008

Bis[[1-(2*S*,5*S*)-2,5-diethylphospholanyl]-[2-(2*S*,5*S*)-2,5-diethylphospholanyl-1-oxide]benzene]copper(I) trifluoromethanesulfonate, min. 97%
C₄₅H₇₂CuF₃O₅P₄S; FW: 969.55; white to beige solid
air sensitive
Note: Sold under license from Kanata for research purposes only.

29-3002

Bis[[1-(2*R*,5*R*)-2,5-dimethylphospholanyl]-[2-(2*R*,5*R*)-2,5-dimethylphospholanyl-1-oxide]benzene]copper(I) trifluoromethanesulfonate, min. 97% (874013-62-4)
C₃₇H₅₆CuF₃O₅P₄S; FW: 857.34; white to beige solid
air sensitive
Note: Sold under license from Kanata for research purposes only.

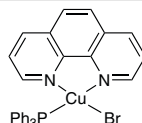


100mg
500mg

COPPER (Compounds)

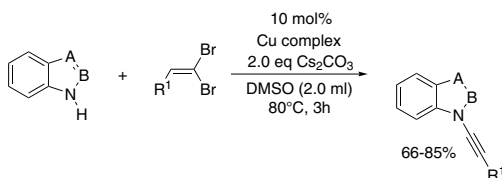
29-3003 **Bis[[(1-(2*S*,5*S*)-2,5-dimethylphospholanyl]-[2-(2*S*,5*S*)-2,5-dimethylphospholanyl-1-oxide]benzene)copper(I) trifluoromethanesulfonate, min. 97%** 100mg
500mg
C₃₇H₅₆CuF₃O₅P₄S; FW: 857.34; white to beige solid
air sensitive
Note: Sold under license from Kanata for research purposes only.

29-4000 **Bromo(1,10-phenanthroline)(triphenylphosphine)copper(I), min. 97% (25753-84-8)** 1g
5g
CuBr(C₁₂H₈N₂)P(C₆H₅)₃; FW: 585.94; yellow powdr.

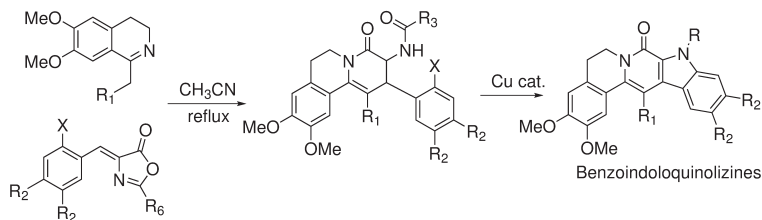


Technical Notes:

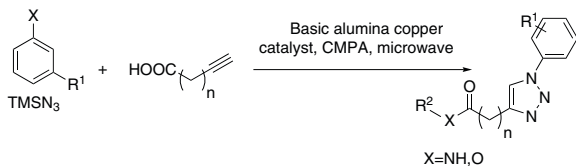
1. Copper-catalyzed coupling of imidazoles and pyrazoles with 1,1-dibromo-1-alkenes: a distinct approach for direct N-alkynylation of heteroarenes.
2. Synthesis of benzoindoloquinolizines via a Cu(I)-mediated C-N bond formation.
3. Efficient synthesis of 1,4-disubstituted triazolyl N-carboxamides via a simple and convenient MCR using basic alumina as a solid support.
4. Cu(I) complexes with diethoxyphosphoryl-1,10-phenanthrolines in catalysis of C-C and C-heteroatom bond formation.



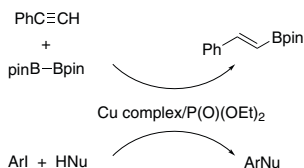
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)

HNu = PhC≡C-H, HNPh₂, HP(O)(O-n-Bu)₂, NCCH₂P(O)(OEt)₂

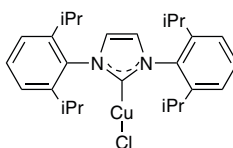
References:

1. *Tetrahedron Lett.*, **2011**, 52, 6497.
2. *Tetrahedron*, **2012**, 68, 2864
3. *Tetrahedron Lett.*, **2013**, 54, 5642.
4. *Inorg. Chim. Acta.*, **2015**, 431, 297.

COPPER (Compounds)

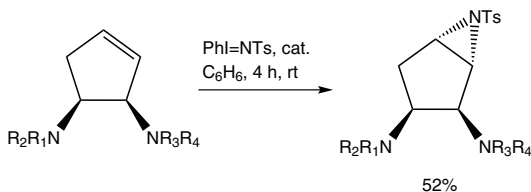
29-4050 Chloro[1,3-bis(2,6-di-*i*-propylphenyl)imidazol-2-ylidene]copper(I), 98% (578743-87-0)
 $C_{27}H_{36}ClCuN_2$; FW: 487.59; white powder.
air sensitive

500mg
2g

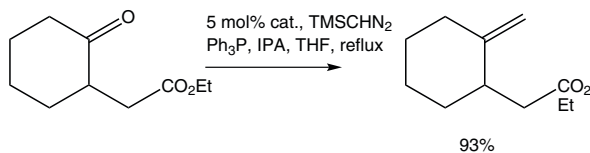


Technical Notes:

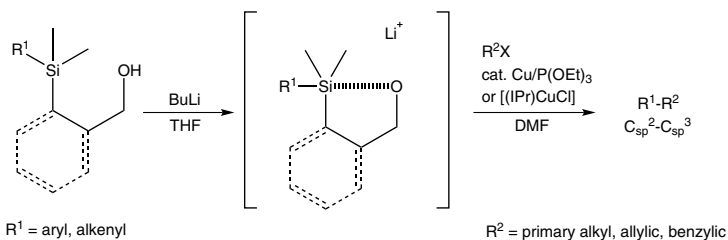
1. Catalyst for the aziridination of olefins.
2. Mild catalyst, superior to CuCl, in the methylenetriphenylphosphorane methylenation of aldehydes and ketones.
3. Copper(I) catalyzed alkylation of aryl and alkenylsilanes.
4. Copper-catalyzed formal methylative and hydrogenative carboxylation of alkynes with carbon dioxide.
5. Regioselective copper-catalyzed carboxylation of allylboronates with carbon dioxide.
6. Carboxylation of organoboronic esters with potassium methyl carbonate under copper catalysis.
7. Catalytic anti-Markovnikov hydrobromination of alkynes.
8. Copper-catalyzed borylative cross-coupling of allenes and imines.



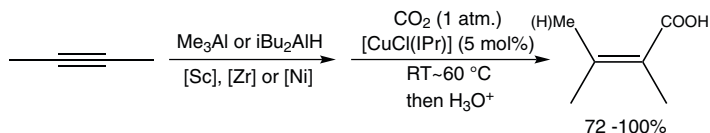
Tech. Note (1)
Ref. (1)



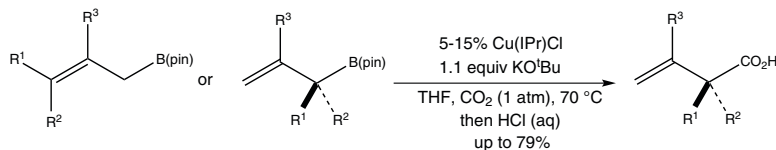
Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)

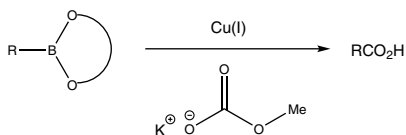


Tech. Note (5)
Ref. (5)

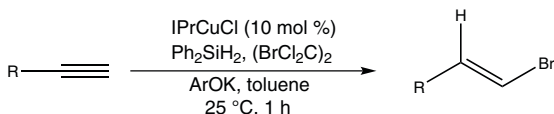
COPPER (Compounds)

29-4050
(continued)

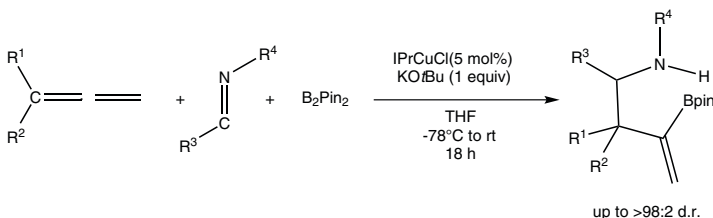
Chloro[1,3-bis(2,6-di-*i*-propylphenyl)imidazol-2-ylidene]copper(I), 98% (578743-87-0)



Tech. Note (6)
Ref. (6)



Tech. Note (7)
Ref. (7)



Tech. Note (8)
Ref. (8)

References:

1. *J. Am. Chem. Soc.*, **2006**, 128, 6054
2. *J. Org. Chem.*, **2007**, 72, 144
3. *Angew. Chem. Int. Ed.*, **2013**, 52, 12719
4. *Chem-Eur. J.*, **2013**, 11439
5. *Org. Lett.*, **2013**, 15, 4034
6. *Synthesis*, **2014**, 1881
7. *J. Am. Chem. Soc.*, **2014**, 136, 8799
8. *Angew. Chem. Int. Ed.*, **2016**, 55, 823

29-0225

Copper(I) bromide, dimethyl sulfide complex, 99% (54678-23-8)

5g

BrC₂CuH₆S; FW: 205.59; off-white to light-green powdr.

25g

NEW

moisture sensitive

29-0490

Copper(I) iodide/cesium carbonate admixture [5.50 wt% CuI]

5g

(7681-65-4)

25g

CuI/Cs₂CO₃; off-white powdr.

Weight-percent of components:

5.50 wt% copper(I) iodide

94.50 wt% cesium carbonate

Technical Note:

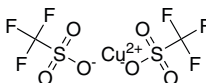
1. Copper catalyst/base admixture useful for screening reactions involving the N-arylation of nitrogen-containing heterocycles.

References:

1. *J. Org. Chem.*, **2007**, 72, 8535

COPPER (Compounds)

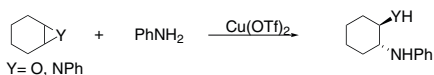
29-5000 **Copper(II) trifluoromethanesulfonate, 98%**
 HAZ **(Copper triflate) (34946-82-2)**
 Cu(CF₃SO₃)₂; FW: 361.68;
 light green solid
hygroscopic



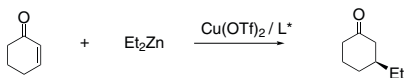
5g
 25g
 100g

Technical Notes:

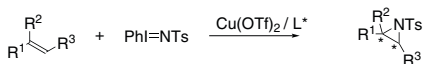
1. Ring-Opening of epoxides and aziridines.
2. Asymmetric conjugate addition of organozinc reagents to α,β -unsaturated ketones.
3. Electrophilic addition of olefins.
4. Asymmetric aziridination of olefins.
5. Asymmetric cycloadditions and aldol condensations.
6. Asymmetric Kharasch oxidation.
7. Asymmetric Michael addition of enamides.
8. Asymmetric O-H or O-R insertion reactions.
9. Enantioselective intramolecular aminooxygenation of alkenes.
10. Enantioselective addition of dialkylzinc reagents to N-acylpyridinium salts.
11. Pd-catalyzed C-H functionalizations of oximes with arylboronic acids.
12. Used as a Lewis acid in the Nazarov cyclization.
13. Catalyst in the diacetoxylation olefins.
14. Catalyst in the meta-selective direct arylation of α -aryl carbonyl compounds.
15. Catalyst in the three-component coupling of amines, aldehydes, and alkynes.



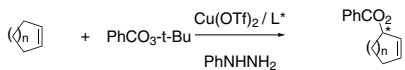
Tech. Note (1)
 Ref. (1,2)



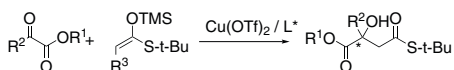
Tech. Note (2)
 Ref. (4)



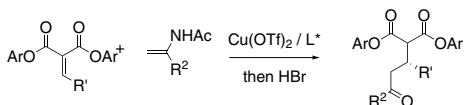
Tech. Note (4)
 Ref. (6)



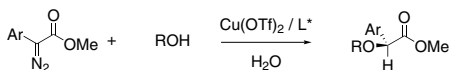
Tech. Note (6)
 Ref. (9,10)



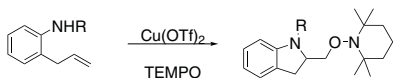
Tech. Note (5)
 Ref. (7)



Tech. Note (7)
 Ref. (11)



Tech. Note (8)
 Ref. (12)

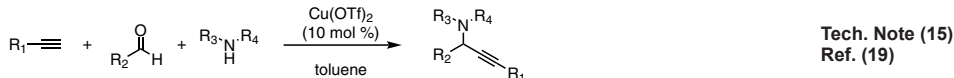


Tech. Note (9)
 Ref. (13)

COPPER (Compounds)

29-5000 Copper(II) trifluoromethanesulfonate, 98% (Copper triflate) (34946-82-2)

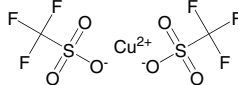
(continued)



References:

1. *J. Org. Chem.*, **1999**, 64, 287
2. *J. Org. Chem.*, **1999**, 64, 2537
3. *J. Org. Chem.*, **1998**, 63, 4568
4. (a) *Eur. J. Org. Chem.*, **2002**, 3221, b, *J. Am. Chem. Soc.*, 2006, 128, 8416
5. *Heterocycles*, **1997**, 45, 847
6. *J. Am. Chem. Soc.*, **1993**, 115, 5328
7. *Acc. Chem. Res.*, **2000**, 33, 325
8. *J. Am. Chem. Soc.*, **2001**, 123, 3830
9. *Angew. Chem. Int. Ed.*, **2001**, 40, 3567
10. *Tetrahedron*, **2002**, 58, 845
11. *Angew. Chem. Int. Ed.*, **2007**, 46, 7803
12. *J. Am. Chem. Soc.*, **2006**, 128, 4594
13. *J. Am. Chem. Soc.*, **2008**, 130, 17638
14. *Angew. Chem. Int. Ed.*, **2009**, 48, 9339
15. *Org. Lett.*, **2010**, 12, 184
16. *J. Am. Chem. Soc.*, **2008**, 130, 1003
17. *Org. Lett.*, **2010**, 12, 1412
18. *Angew. Chem. Int. Ed.*, **2011**, 50, 463
19. *Org. Lett.*, **2012**, 14, 964

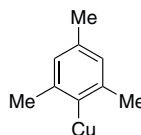
29-5001 Copper(II) trifluoromethanesulfonate, 99% (99.9%-Cu) (Copper triflate) (34946-82-2)
NEW Cu(CF₃SO₃)₂; FW: 361.68; light green solid
 HAZ *air sensitive*



5g
25g
100g

COPPER (Compounds)

29-5550 Mesitylcopper(I), min. 95% (75732-01-3)
 $C_9H_{11}Cu$; FW: 182.73; yellow to orange pwdr.
air sensitive, light sensitive, moisture sensitive, (store cold)

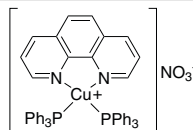


1g
5g

Technical Note:

- Starting material for a variety of copper(I) complexes.

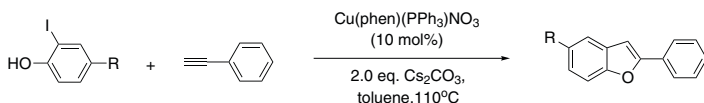
29-6000 (1,10-Phenanthroline)bis (triphenylphosphine)copper(I) nitrate dichloromethane adduct, 98% (33989-10-5)
 HAZ
 $[Cu(C_{12}H_8N_2)[P(C_6H_5)_3]_2]^+ NO_3^- \cdot 1/2 CH_2Cl_2$;
 FW: 830.33 (872.80); yellow pwdr.



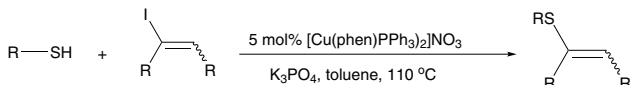
5g
25g

Technical Notes:

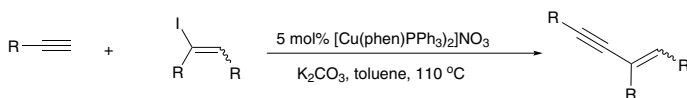
- High yield synthesis of 2-arylbenzo[b]furans via the copper (I) catalyzed coupling of o-iodophenols and aryl acetylenes.
- High yield synthesis of vinyl sulfides.
- Efficient synthesis of 1,3-enynes.
- Effective synthesis of 2-substituted indoles.
- Synthesis of 1,4-disubstituted 5-iodotriazoles.
- Selective cyclization strategy to 2-substitued benzofurans and indoles.
- Copper-catalyzed cascade reaction to 2-indolyl-C-glycosides.



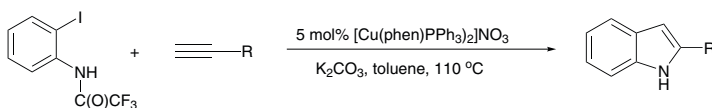
Tech. Note (1)
Ref. (1)



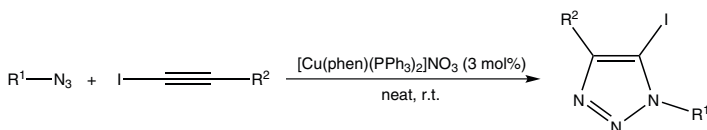
Tech. Note (2)
Ref. (2)



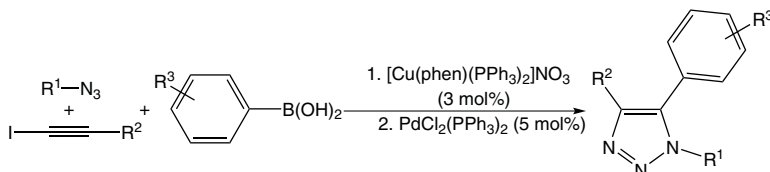
Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



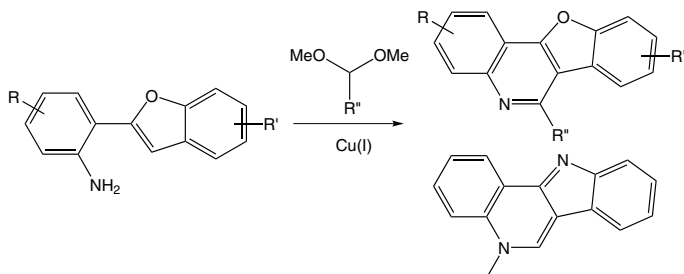
Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (5)

COPPER (Compounds)

29-6000 (1,10-Phenanthroline)bis (triphenylphosphine)copper(I) nitrate dichloromethane adduct, (continued) **98%** (33989-10-5)



Tech. Note (7)
Ref. (6)

References:

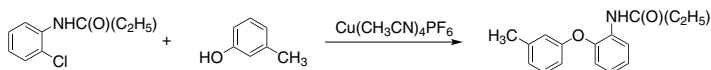
1. *Org. Lett.*, **2002**, 4, 4727.
2. *Org. Lett.*, **2004**, 6, 5005.
3. *Org. Lett.*, **2004**, 6, 1441.
4. *Org. Lett.*, **2003**, 5, 3843.
5. *Tetrahedron. Lett.*, **2014**, 55, 7026.
6. *Eur. J. Org. Chem.*, **2014**, 2014, 7193.

29-6700 Tetrakis(acetonitrile)copper(I) hexafluorophosphate, **98+%**
(64443-05-6)
(CH₃CN)₄CuPF₆; FW: 372.72; white to light blue solid
air sensitive, moisture sensitive

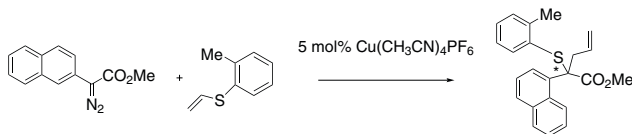
5g
25g

Technical Notes:

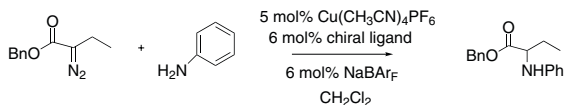
1. Useful catalyst for the Ullmann synthesis.
2. Catalytic asymmetric [2,3]-Sigmatropic rearrangement of sulfur ylides.
3. Precatalyst for enantioselective N-H insertion reactions with diazoesters and anilines.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



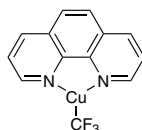
Tech. Note (3)
Ref. (3)

References:

1. *J. Org. Chem.*, **1999**, 64, 2986.
2. *J. Org. Chem.*, **2002**, 67, 5621.
3. *J. Am. Chem. Soc.*, **2012**, 134, 436.

COPPER (Compounds)

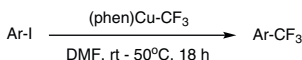
29-6720 Trifluoromethyl(1,10-phenanthroline) copper(I), 95%
Trifluoromethylator® (1300746-79-5)
 (C₁₂H₈N₂)CuCF₃; FW: 312.76; brown solid
air sensitive, moisture sensitive, (store cold)
 Note: Sold under license from CATYLIX.



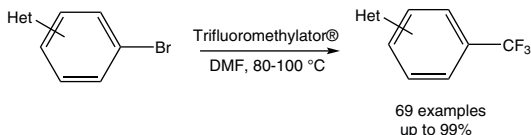
250mg
 1g
 5g
 25g

Technical Notes:

1. Reagent used for the perfluoromethylation of arenes and aryl bromides and iodides.
2. Catalyst used in the copper-mediated perfluoroalkylation of heteroaryl bromides.



Tech. Note (1)
 Ref. (1,2)



Tech. Note (2)
 Ref. (3)

References:

1. *Angew. Chem. Int. Ed.*, **2011**, 50, 3793.
2. *Angew. Chem. Int. Ed.*, **2012**, 51, 536.
3. *Org. Lett.*, **2014**, 16, 1744.

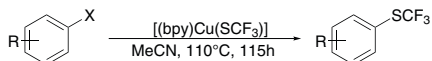
29-5515 Trifluoromethylthiolato(2,2-bipyridine)copper(I), 97%
 (1413732-47-4)
 C₁₁H₈CuF₃N₂S; FW: 320.80; red xtl.
air sensitive, moisture sensitive



250mg
 1g

Technical Notes:

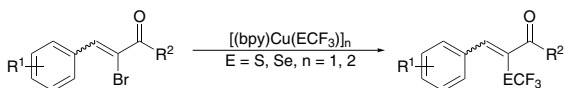
1. Catalyst for nucleophilic trifluoromethylthiolation of aryl halides.
2. Catalyst for synthesis of α -trifluoromethylthio- and seleno- α,β -unsaturated carbonyl compounds.
3. Catalyst for trifluoromethylthiolation of vinyl bromides.
4. Catalyst for trifluoromethylthiolation of bromopyridines.



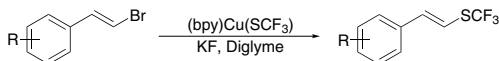
X = Br, I

R = H, Me, Ph, Cl, CO₂Me, CN, NO₂, OMe

Tech. Note (1)
 Ref. (1,2)

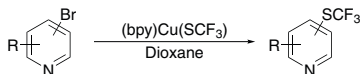


Tech. Note (2)
 Ref. (3)



R = OMe, NMe, NO₂, CF₃, F, Cl, *et al.*

Tech. Note (3)
 Ref. (4)



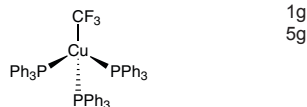
Tech. Note (4)
 Ref. (4)

References:

1. *Angew. Chem. Int. Ed.* **2013**, 52, 1548.
2. *Tetrahedron*, **2013**, 69, 6046.
3. *Tetrahedron*, **2014**, 70, 672.
4. *J. Org. Chem.* **2015**, 80, 2912.
5. *Adv. Synth. Catal.* **2016**, 358, 386.

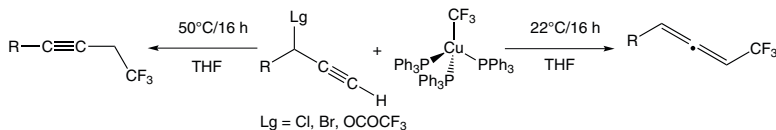
COPPER (Compounds)

29-2955 Tris(triphenylphosphine)(trifluoromethyl)copper(I), 99%
(325810-07-9)
 $C_{25}H_{45}CuF_3P_3$; FW: 919.41; white xtl.
air sensitive

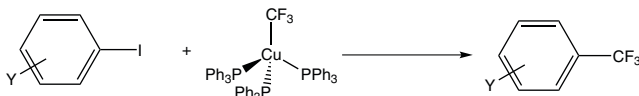


Technical Notes:

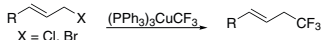
1. Reagent used in the copper-mediated trifluoromethylation of propargylic halides and trifluoroacetates.
2. Reagent used in a high-yielding simple preparation of trifluoromethylaromatics from iodides.
3. Reagent used in the copper-mediated trifluoromethylation of allylic halides and trifluoroacetates.



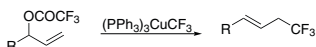
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (3)
Ref. (3)

References:

1. *Org. Lett.*, **2012**, *14*, 3966.
2. *Angew. Chem. Int. Ed.*, **2011**, *50*, 7655.
3. *J. Org. Chem.*, **2013**, *78*, 7330.

GOLD (Elemental Forms)

79-0921 Gold nanoparticles, 1% on carbon black (surfactant and reactant-free) 5g

NEW

(7440-57-5)
Au; FW: 196.70; black solid
(store cold)

25g

Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.

79-0916 Gold nanoparticles, 1% on Titania (anatase) (surfactant and reactant-free) 5g

NEW

(7440-57-5)
Au; FW: 196.70; dark purple pwd.
(store cold)

25g

Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.

79-0905 Gold nanoparticles, 1% on Titania (anatase/rutile) (surfactant and reactant-free) 5g

NEW

(7440-57-5)
Au; FW: 196.70; purple solid
(store cold)

25g

Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.

79-0926 Gold nanoparticles, 5% on carbon black (surfactant and reactant-free) 5g

NEW

(7440-57-5)
Au; FW: 196.70; black solid
(store cold)

25g

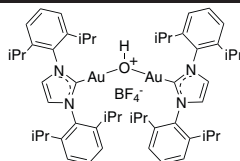
Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.

GOLD (Elemental Forms)

79-0935	Gold nanoparticles, 10% on Titania (anatase) (surfactant and reactant-free) (7440-57-5) Au; FW: 196.70; purple solid (store cold) Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.	1g 5g
NEW		
79-0930	Gold nanoparticles, 10% on Titania (rutile) (surfactant and reactant-free) (7440-57-5) Au; FW: 196.70; dark purple solid (store cold) Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.	1g 5g
NEW		

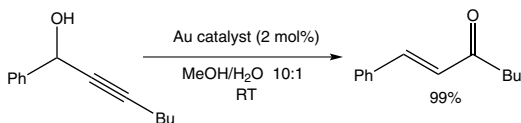
GOLD (Compounds)

79-0125	Bis{1,3-bis[2,6-bis(1-methylethyl)phenyl]-1,3-dihydro-2H-imidazol-2-ylidene}-μ-hydroxydigold(I) tetrafluoroborate, 99% (1262545-44-7) $C_{54}H_{73}Au_2BF_4N_4O$; FW: 1274.92; white solid	100mg 500mg
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Technical Note:

- Catalyst used in a Meyer-Schuster rearrangement reaction.

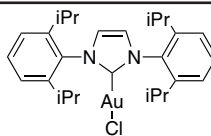


Tech. Note (1)
Ref. (1)

References:

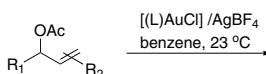
- Organometallics*, **2010**, *29*, 3665

79-0200	1,3-Bis(2,6-di-isopropylphenyl)imidazol-2-ylidene-gold(I) chloride, 95% (852445-83-1) $C_{27}H_{36}AuClN_2$; FW: 621.01; white powdr. (store cold)	250mg 1g
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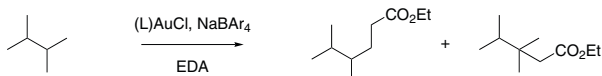


Technical Notes:

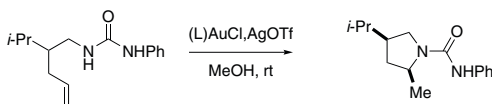
- Catalyst used for rearrangement of allylic acetates.
- Catalyst used for alkane carbon-hydrogen bond functionalization.
- Catalyst used for room temperature hydroamination of N-alkenyl ureas.
- Catalyst used for hydration of alkynes.



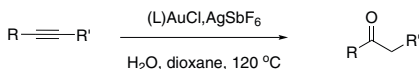
Tech. Note (1)
Ref. (1,2)



Tech. Note (2)
Ref. (3)



Tech. Note (3)
Ref. (4)



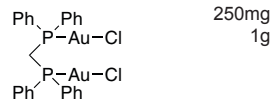
Tech. Note (4)
Ref. (5)

References:

- Org. Lett.*, **2007**, *9*, 2653
- Org. Lett.*, **2008**, *10*, 1037
- Organometallics*, **2006**, *25*, 2237
- Org. Lett.*, **2006**, *8*, 5303
- J. Am. Chem. Soc.*, **2009**, *131*, 448

GOLD (Compounds)

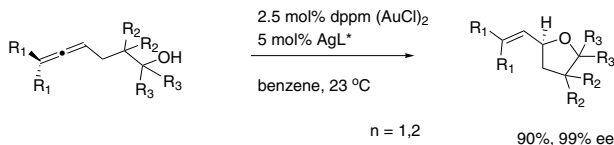
79-0115 [μ -Bis(diphenylphosphino) methane]dichlorodigold(I), 99%
(37095-27-5)
 $C_{25}H_{22}Au_2Cl_2P_2$; FW: 849.23; white powder.



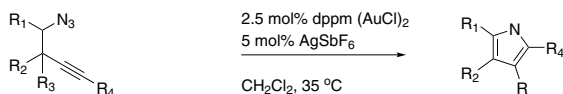
250mg
1g

Technical Notes:

1. Catalyst used with chiral counter-ion for asymmetric hydroalkoxylation.
2. Catalyst used for intramolecular acetylene Schmidt reaction.



Tech. Note (1)
Ref. (1)

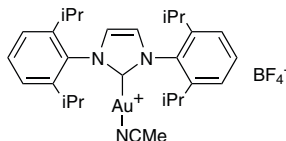


Tech. Note (2)
Ref. (2)

References:

1. *Science*, **2007**, 317, 496
2. *J. Am. Chem. Soc.*, **2005**, 127, 11260

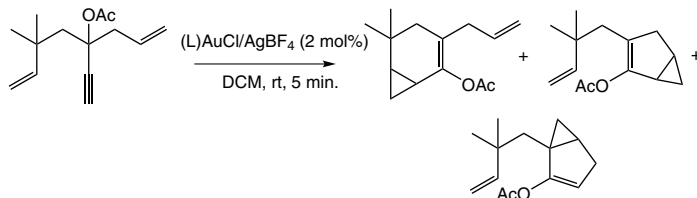
79-0300 1,3-Bis(2,6-di-*i*-propylphenyl)imidazol-2-ylidene(acetonitrile)gold(I) tetrafluoroborate, 95% (896733-61-2)
 $C_{29}H_{29}AuBF_4N_3$; FW: 713.41; white solid
air sensitive
Note: US Patent 7,767,841



100mg
500mg

Technical Note:

1. Gold(I) catalyst for the cycloisomerization of 1,5-enynes bearing a propargylic acetate.

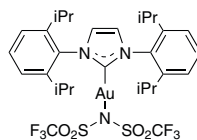


Tech. Note (1)
Ref. (1)

References:

1. *Chem. Commun.*, **2006**, 2048
2. *US Patent 7,767,841*

79-0245 [1,3-Bis(2,6-di-*i*-propylphenyl)imidazol-2-ylidene][bis(trifluoromethanesulfonyl)imide]gold(I), min. 95% (951776-24-2)
 $C_{29}H_{36}AuF_6N_3O_4S_2$; FW: 865.7;
white to pale yellow solid
air sensitive



100mg
500mg

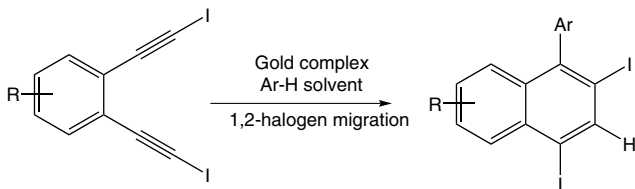
Technical Notes:

1. Gold catalyst used for the hydroarylation cyclization of 1,2-bis(2-iodoethynyl)benzenes.
2. Gold catalyst used for the carbocyclization of phenols with a terminal alkyne.
3. Intermolecular C-H activation through the gold(I)-catalyzed reaction of iodoalkynes.
4. Reaction of ynamide with benzyl azides.

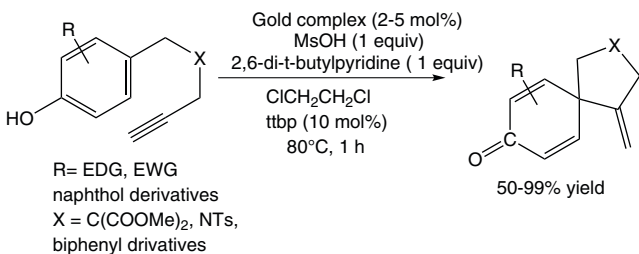
GOLD (Compounds)

79-0245
(continued)

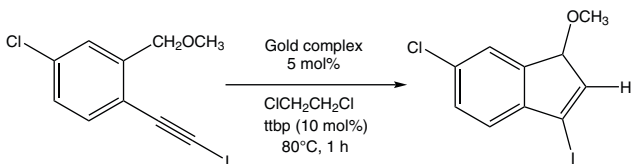
[1,3-Bis(2,6-di-*i*-propylphenyl)imidazol-2-ylidene][bis(trifluoromethanesulfonyl)imide]
gold(I), min. 95% (951776-24-2)



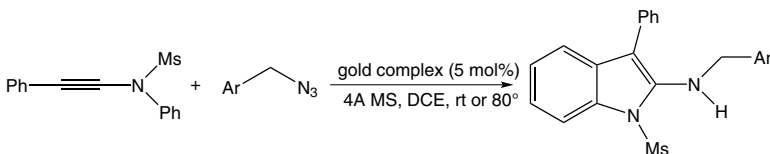
Tech. Note (1)
Ref. (1)



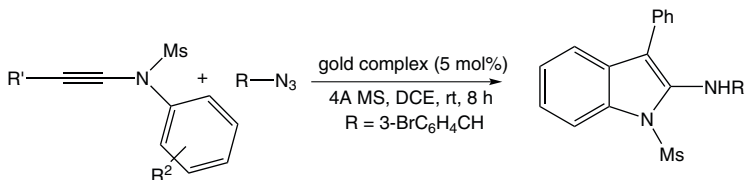
Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



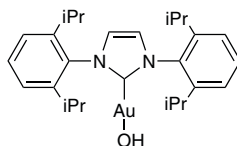
Tech. Note (4)
Ref. (4)

References:

1. *Adv. Synth. Catal.*, **2015**, 357, 500.
2. *Adv. Synth. Catal.*, **2014**, 356, 2417.
3. *Angew. Chem. Int. Ed.*, **2015**, 54, 3052.
4. *J. Am. Chem. Soc.*, **2015**, 137, 9567.

GOLD (Compounds)

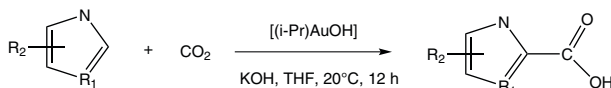
79-0205 1,3-Bis(2,6-di-*i*-propylphenyl)imidazol-2-ylidene-gold(I) hydroxide, min. 97% (1240328-73-7)
 $C_{27}H_{37}AuN_2O$; FW: 602.56; white microxtl.



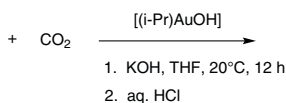
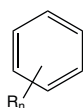
100mg
500mg

Technical Notes:

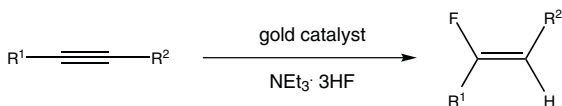
1. Catalyst used for the carboxylation of C-H bonds.
2. Catalyst used for the hydrofluorination of alkynes.
3. Gold-catalyzed synthesis of sulfinate derivatives.
4. Effective catalyst for the carboxylation/cyclization of propargylamines with carbon dioxide.
5. Catalyst used for the polymerization of racemic β -butyrolactones.
6. Catalyst used for the intermolecular mono and dihydroamination of activated alkenes.



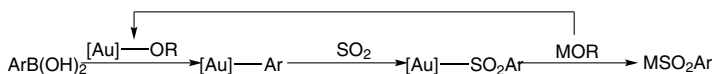
$R_1 = O, S$



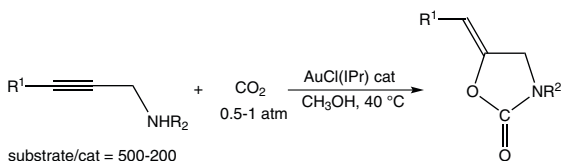
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



substrate/cat = 500-200

16-91% yield

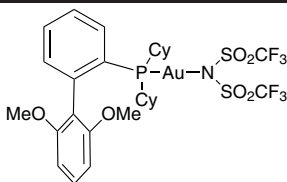
Tech. Note (4)
Ref. (4)

References:

1. *J. Am. Chem. Soc.*, **2010**, 132, 8858
2. *ChemCatChem.*, **2015**, 7, 240
3. *Angew. Chem. Int. Ed.*, **2014**, 53, 4404
4. *Organometallics*, **2013**, 32, 5285
5. *Organometallics*, **2011**, 30, 2650
6. *Eur. J. Org. Chem.*, **2012**, 2012, 6218

GOLD (Compounds)

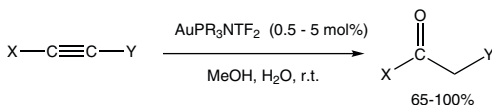
79-0230 Bis(trifluoromethanesulfonyl)imide(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)gold(I), 98% (1121960-90-4)
 $C_{28}H_{35}AuF_6NO_8PS_2$; FW: 887.64; white to off-white solid



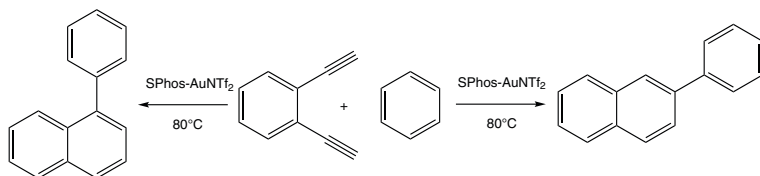
100mg
500mg

Technical Notes:

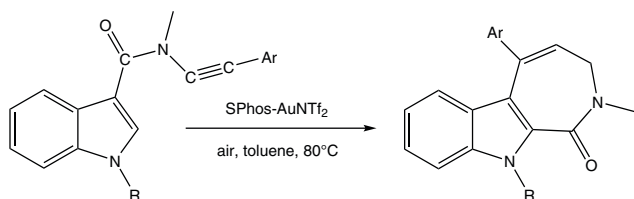
1. Catalyst used in the selective hydration of substituted alkynes at room temperatures.
2. Catalyst used in the hydroarylation/aromatization of arene-diyne.
3. Highly-efficient and regio-selective catalyst for the selective carbonyl migration in alkynyl-substituted indole-3-carboxamides.
4. Intermolecular gold(I) catalyzed alkyne carboalkoxylation reactions for the multicomponent assembly of β -alkoxy ketones.
5. Gold(I)-catalyzed hydration of alkynylphosphonates: Efficient access to β -ketophosphonates.
6. Gold-catalyzed intramolecular hydroamination reaction.



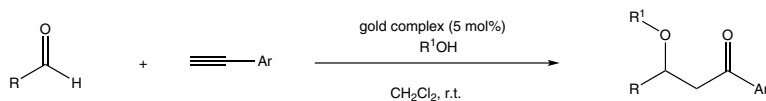
Tech. Note (1)
Ref. (1)



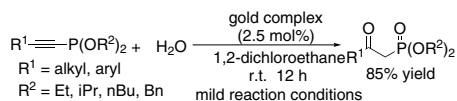
Tech. Note (2)
Ref. (2)



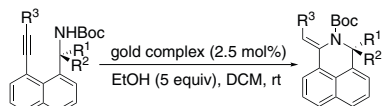
Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)



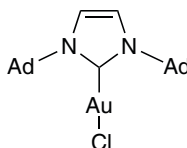
Tech. Note (6)
Ref. (6)

References:

1. *J. Org. Chem.*, **2009**, *74*, 2067
2. *Organometallics*, **2012**, *31*, 644
3. *Adv. Synth. Catal.*, **2012**, *354*, 1273
4. *Adv. Synth. Catal.*, **2012**, *354*, 3451.
5. *Eur. J. Org. Chem.*, **2014**, *2014*, 2668.
6. *Org. Lett.*, **2016**, *18*, 4722.

GOLD (Compounds)

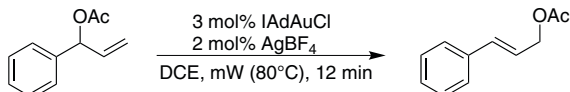
79-1225 **NEW** Chloro[1,3-bis(adamantyl)2H-imidazol-2-ylidene]gold(I), 98% (852445-88-6)
 $C_{23}H_{32}AuClN_2$; FW: 568.93; white to light-gray powdr.
air sensitive



100mg
500mg

Technical Note:

- Catalyst for the rearrangement of allylic acetates

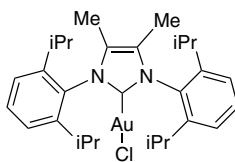


Tech. Note (1)
Ref. (1)

References:

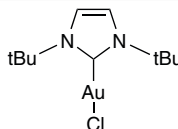
- Org. Lett.*, **2007**, *9*, 2653

79-1230 **NEW** Chloro{1,3-bis[2,6-bis(1-methylethyl)phenyl]-1,3-dihydro-4,5-dimethyl-2H-imidazol-2-ylidene}gold(I), 98% IPrMeAuCl (1192141-66-4)
 $C_{29}H_{40}AuClN_2$; FW: 649.0; white powdr.
air sensitive



100mg
500mg

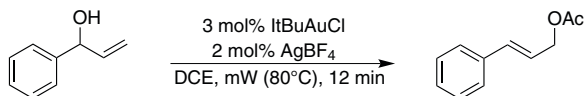
79-1215 **NEW** Chloro[1,3-bis(t-butyl)-2H-imidazol-2-ylidene]gold(I), 98% (839722-07-5)
 $C_{11}H_{20}AuClN_2$; FW: 412.71; white powdr.
air sensitive



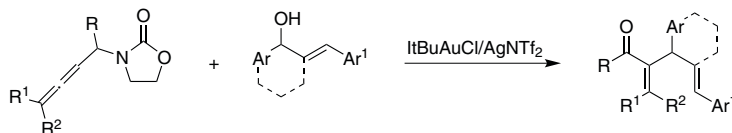
100mg
500mg

Technical Notes:

- Catalyst for the rearrangement of allylic acetates
- Catalyst for the α -allylation of enals and enones with alcohols



Tech. Note (1)
Ref. (1)

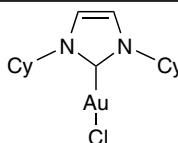


Tech. Note (2)
Ref. (2)

References:

- Org. Lett.*, **2007**, *9*, 2653
- Angew. Chem. Int. Ed.*, **2015**, *54*, 14885

79-1220 **NEW** Chloro[1,3-bis(cyclohexyl)2H-imidazol-2-ylidene]gold(I), 98% (852445-87-5)
 $C_{15}H_{24}AuClN_2$; FW: 464.78; white to light-gray powdr.
air sensitive



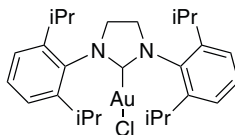
100mg
500mg

GOLD (Compounds)

79-1210

NEW

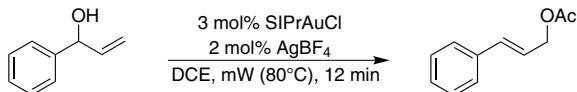
**Chloro{1,3-bis[2,6-di-*i*-propylphenyl]-4,5-dihydroimidazol-2-ylidene}gold(I), 98%
SiPrAuCl (852445-84-2)
C₂₇H₃₈AuClN₂; FW: 623.02; white powd.
*air sensitive***



100mg
500mg

Technical Note:

- Catalyst for the rearrangement of allylic acetates



**Tech. Note (1)
Ref. (1)**

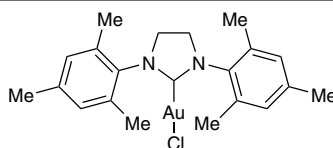
References:

- Org. Lett.*, **2007**, 9, 2653

79-1205

NEW

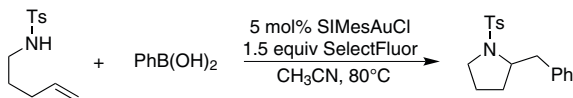
**Chloro[1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene]gold(I), 98% (852445-82-0)
C₂₁H₂₈AuClN₂; FW: 538.86; white powd.
*air sensitive***



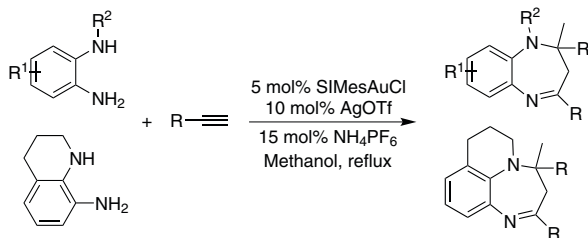
100mg
500mg

Technical Notes:

- Catalyst for the carboheterofunctionalization of alkenes with arylboronic acids
- Catalyst for the synthesis of 1-substituted benzo[b][1,4]diazepines



**Tech. Note (1)
Ref. (1)**



**Tech. Note (2)
Ref. (2)**

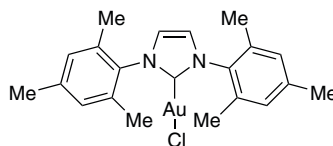
References:

- Tetrahedron*, **2013**, 69, 10375
- J. Organomet. Chem.*, **2014**, 751, 438

79-1200

NEW

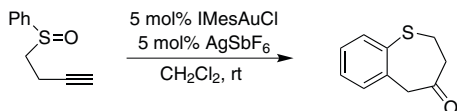
**Chloro[1,3-bis(2,4,6-trimethylphenyl)-2H-imidazol-2-ylidene]gold(I), 98% (852445-81-9)
C₂₁H₂₄AuClN₂; FW: 536.85; white powd.
*air sensitive***



100mg
500mg

Technical Notes:

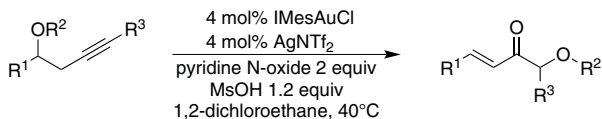
- Catalyst for the rearrangement of alkynyl sulfoxides to benzothiepinones
- Catalyst for the rearrangement of homopropargylic ethers to α,β -unsaturated carbonyl compounds.
- Catalyst for oxidative cyclopropanation of *N*-Allylynamides to 3-aza-bicyclo[3.1.0]-hexan-2-one derivatives
- Catalyst for oxidative rearrangement of homopropargylic ethers to cyclobutanones



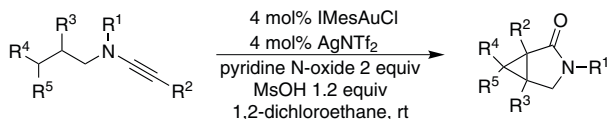
**Tech. Note (1)
Ref. (1)**

GOLD (Compounds)

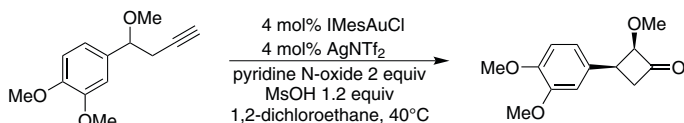
79-1200 Chloro[1,3-bis(2,4,6-trimethylphenyl)2H-imidazol-2-ylidene]gold(I), 98% (852445-81-9)
(continued)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



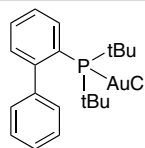
Tech. Note (4)
Ref. (4)

References:

1. *J. Am. Chem. Soc.*, **2007**, *129*, 4160
2. *Org. Lett.*, **2012**, *14*, 4902
3. *Org. Lett.*, **2013**, *15*, 2374
4. *Adv. Synth. Catal.*, **2013**, *355*, 2488

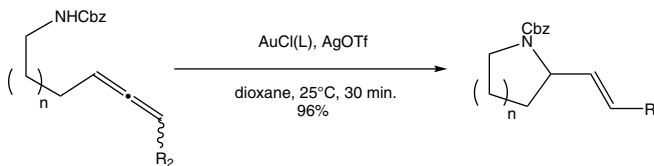
79-0340 Chloro[2-(di-*t*-butylphosphino))-1,1'-biphenyl]gold(I), 99%
(854045-93-5)
C₂₀H₂₇AuClP; FW: 530.82; white powdr.

250mg
1g

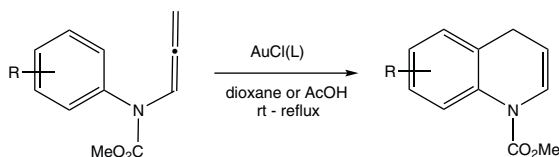


Technical Notes:

1. Highly active gold catalyst for the intramolecular exohydrofunctionalization of allenes.
2. Catalyst used for the hydroarylation of allenes.
3. Catalyst used for the intramolecular cyclization of monopropargyl triols.
4. Synthesis of pyrroles via a gold-catalyzed cascade reaction.
5. Gold-catalyzed carboalkoxylations of 2-ethynylbenzyl ethers.
6. Gold-catalyzed annulations of allenes with N-hydroxy anilines.
7. Gold-catalyzed 1,2-iminonitration of electron-deficient alkynes with nitrosoarenes.
8. Synthesis of substituted biaryls through Au-catalyzed Petasis-Ferrier rearrangement of propargyl ethers.
9. Gold-catalyzed used in the synthesis of dihydroisocoumarin.
10. Gold-catalyzed, dehydrative cyclizations in water at room temperature.
11. Tandem gold-catalyzed dehydrative cyclization/Diels-Alder reactions.



Tech. Note (1)
Ref. (1)



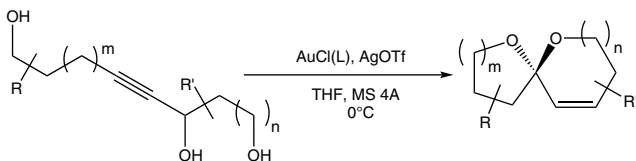
Tech. Note (2)
Ref. (2)

GOLD (Compounds)

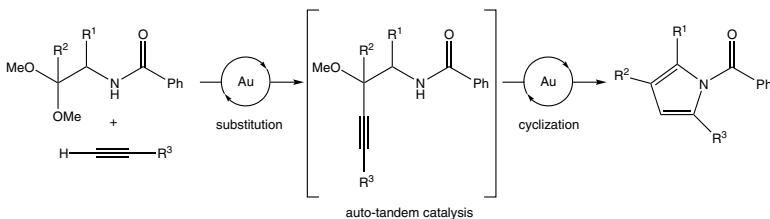
79-0340

Chloro[2-(di-*t*-butylphosphino)-1,1'-biphenyl]gold(I), 99% (854045-93-5)

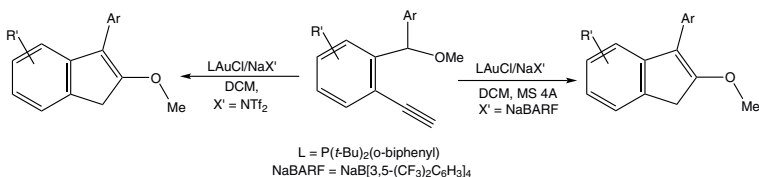
(continued)



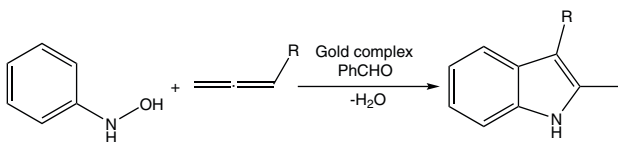
Tech. Note (3)
Ref. (3)



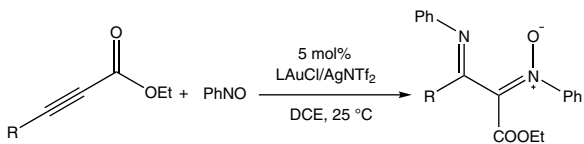
Tech. Note (4)
Ref. (4)



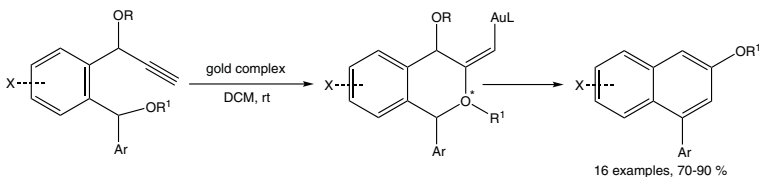
Tech. Note (5)
Ref. (5)



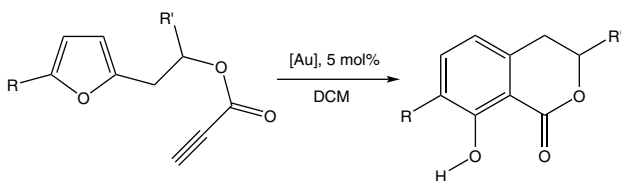
Tech. Note (6)
Ref. (6)



Tech. Note (7)
Ref. (7)



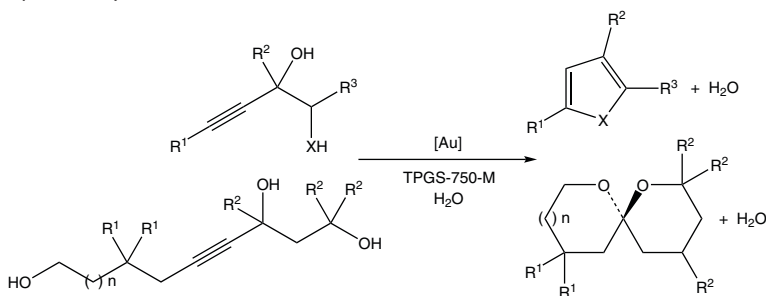
Tech. Note (8)
Ref. (8)



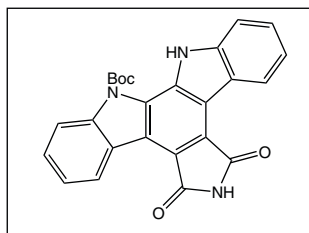
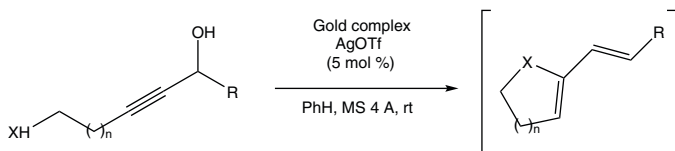
Tech. Note (9)
Ref. (9)

GOLD (Compounds)

79-0340 Chloro[2-(di-*t*-butylphosphino)-1,1'-biphenyl]gold(I), 99% (854045-93-5)
(continued)



Tech. Note (10)
Ref. (10)



Tech. Note (11)
Ref. (11)

References:

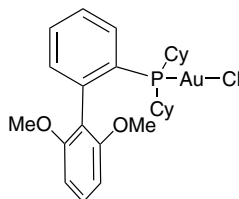
1. *J. Am. Chem. Soc.*, **2006**, *128*, 9066.
2. *Org. Lett.*, **2007**, *9*, 4821.
3. *Org. Lett.*, **2009**, *11*, 121.
4. *Org. Lett.*, **2009**, *16*, 4948.
5. *Org. Biochem. Chem.*, **2014**, *12*, 9831.
6. *Org. Biochem. Chem.*, **2014**, *12*, 737.
7. *ChemCommun.*, **2014**, *50*, 15864.
8. *Eur. J. Org. Chem.*, **2014**, *50*, 737.
9. *Aust. J. Chem.*, **2014**, *67*, 481.
10. *Org. Lett.*, **2014**, *16*, 724.
11. *Org. Lett.*, **2015**, *17*, 1754.

79-0225 Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)gold(I), 98% (854045-95-7)
C₂₆H₃₅AuClO₂P; FW: 642.95; white powdr.

250mg
1g

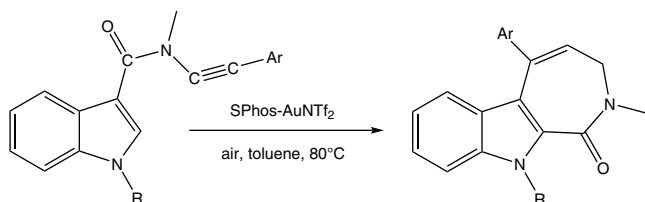
Technical Notes:

1. Highly-efficient and regio-selective catalyst for the selective carbonyl migration in alkynyl-substituted indole-3-carboxamides.
2. Catalyst used in the hydroarylation/aromatization of arene-diyne.
3. Catalyst used in the selective hydration of substituted alkynes at room temperatures.

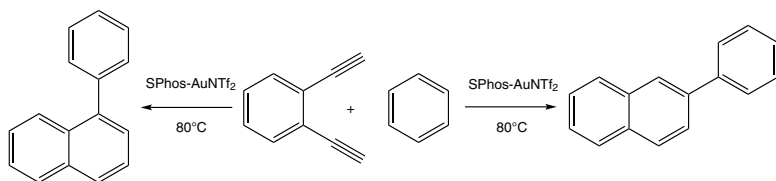


GOLD (Compounds)

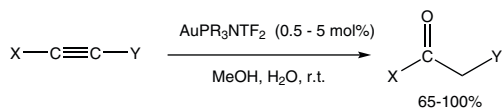
79-0225 Chloro[2-(dicyclohexylphosphino)-2',6'-dimethoxy-1,1'-biphenyl]gold(I), 98% (854045-95-7)
(continued)



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



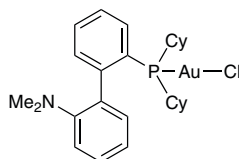
Tech. Note (3)
Ref. (3)

References:

1. *Adv. Synth. Catal.*, **2012**, 354, 1273.
2. *Organometallics*, **2012**, 31, 644.
3. *J. Org. Chem.*, **2009**, 74, 2067.

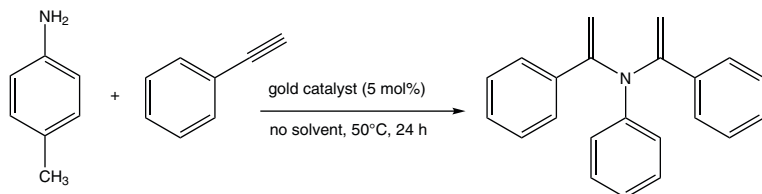
79-0343 Chloro[2-(dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl]gold(I), 98%
(1196707-11-5)
C₂₆H₃₆AuClNP; FW: 625.96; white powd.

250mg
1g

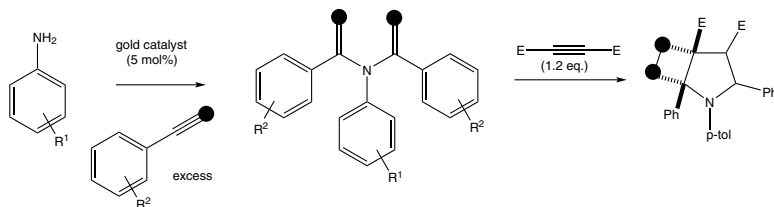


Technical Notes:

1. Catalyst used in the formation of a bisenamines from toluidine and phenylacetylene.
2. Catalyst used for the intermolecular hydroamination of alkynes with amines.
3. Catalyst used for the regio and stereoselective, intermolecular hydroalkylations of alkynes.
4. Catalyst used in the synthesis of dihydroisocoumarins.



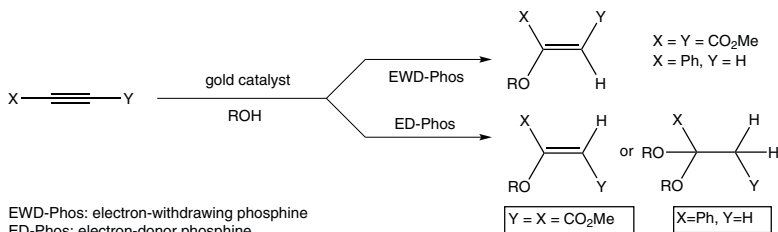
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (1)

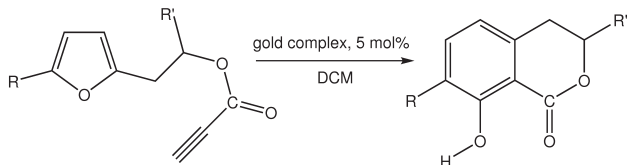
GOLD (Compounds)

79-0343 Chloro[2-(dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl]gold(I), 98%
(continued) (1196707-11-5)



Tech. Note (3)
Ref. (2)

EWD-Phos: electron-withdrawing phosphine
ED-Phos: electron-donor phosphine



Tech. Note (4)
Ref. (3)

References:

1. *J. Org. Chem.*, **2010**, *75*, 7769.
2. *Adv. Synth. Catal.*, **2010**, *352*, 1701.
3. *Aust. J. Chem.*, **2014**, *67*, 481.

79-1122 Chloro(tetrahydrothiophene)gold(I), min. 98% (39929-21-0)

100mg

NEW

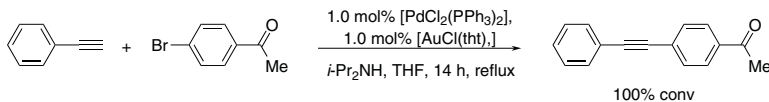
(C₄H₈S)AuCl; FW: 320.59; white to off-white powdr.

500mg

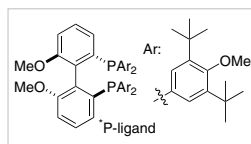
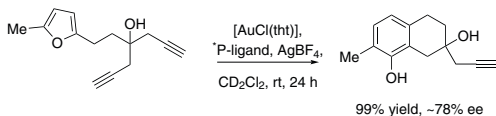
air sensitive, heat sensitive, light sensitive, (store cold)

Technical Notes:

1. Employed as co-catalyst in Pd-catalyzed alkylation.
2. Au-catalyzed phenol synthesis.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

1. *Catalysis Today*, **2007**, *122*, 403.
2. *Chem. Eur. J.*, **2009**, *15*, 13318.

79-0740 Chlorotri-*t*-butylphosphinegold(I), 99%

Cl—Au—P(*t*Bu)₃

250mg

(69550-28-3)

1g

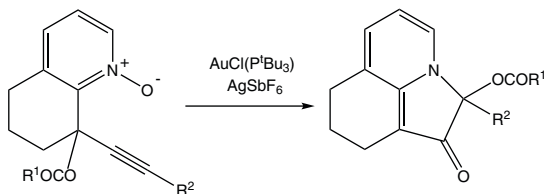
AuCIP(C₄H₉)₃; FW: 434.74; white microxtl.

Technical Notes:

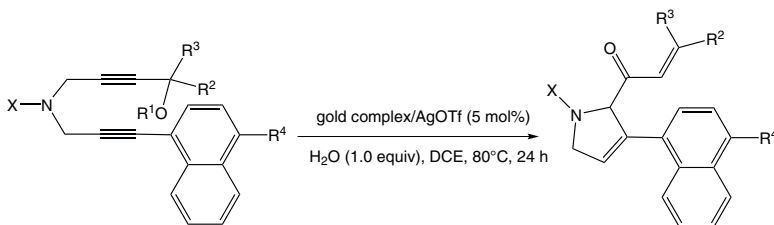
1. Catalyst used for cycloisomerization reactions of 2-(2-propynyl)pyridine N-oxides.
2. Catalyst used for the cycloisomerization of 1,6-diynes.
3. Catalyst used for cycloisomerizations terminated by sp³ C-H bond insertion
4. Synthesis of aromatic ketones by a transition metal-catalyzed tandem sequence.

GOLD (Compounds)

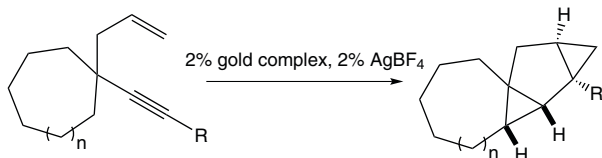
79-0740 Chlorotri-*t*-butylphosphinegold(I), 99% (69550-28-3)
(continued)



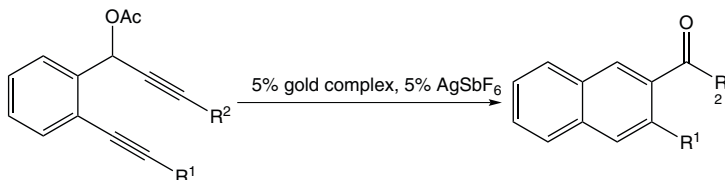
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



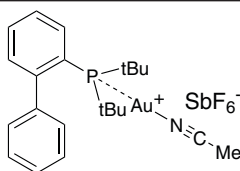
Tech. Note (4)
Ref. (4)

References:

1. *Chem. Commun.*, **2012**, 48, 7622.
2. *Angew. Chem., Int. Ed.*, **2011**, 50, 2583.
3. *J. Am. Chem. Soc.*, **2009**, 131, 2809.
4. *J. Am. Chem. Soc.*, **2006**, 128, 7436.

79-0352 2-(Di-*t*-butylphosphino)-1,1'-biphenyl(ace-
tonitrile)gold(I) hexafluoroantimonate, 99%
(866641-66-9)
C₂₂H₃₀F₆AuNPSb; FW: 772.17;
white to off-white powdr.
air sensitive, moisture sensitive

250mg
1g

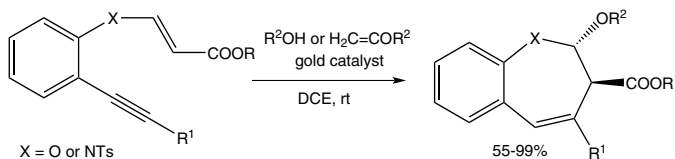


Technical Notes:

1. Gold catalyst used in the regio- and stereoselective synthesis of functionalized benzo[b]oxepines.
2. Gold catalyst used in the cyclization reactions of *o*-(buta-1,3-dien-1-yl)-substituted *N*-aryl ureas.
3. Gold catalyst used in the cycloisomerization of 1,7-enyne esters to structurally diverse *cis*-tetrahydropyridin-4-yl ketones.
4. Catalyst used in the synthesis of coumarin-containing natural products.
5. Catalyst used in the synthesis of benzo[4,5]imidazo[1,2-*a*]quinazolinones.

GOLD (Compounds)

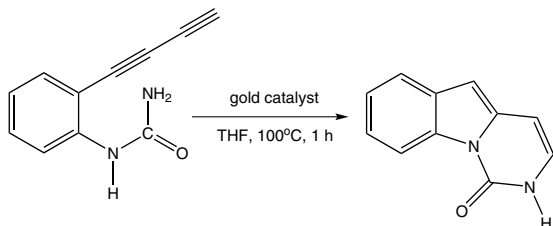
79-0352 2-(Di-*t*-butylphosphino))-1,1'-biphenyl(acetonitrile)gold(I) hexafluoroantimonate, 99%
(continued) (866641-66-9)



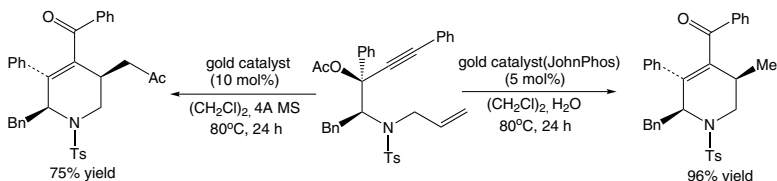
X = O or NTs
R¹ = alkyl, aryl, heteroaryl

55-99%

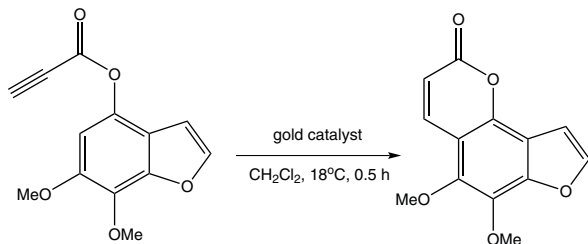
Tech. Note (1)
Ref. (1)



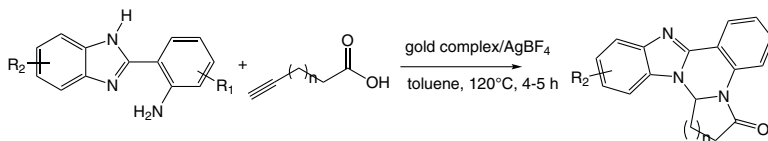
Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)

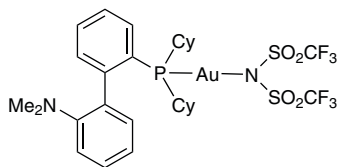
References:

1. *Org. Lett.*, **2012**, *14*, 4742
2. *Org. Lett.*, **2013**, *15*, 2616
3. *J. Org. Chem.*, **2013**, *78*, 3183
4. *J. Org. Chem.*, **2013**, *78*, 9876
5. *J. Org. Chem.*, **2013**, *78*, 4312

GOLD (Compounds)

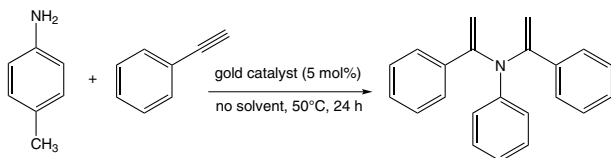
79-0348 [2-(Dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl] [bis(trifluoromethyl) sulfonylimido] gold(I), **98%** (1188507-66-5)
 $C_{28}H_{36}AuF_6N_2O_4PS_2$; FW: 870.66; yellow powd.

250mg
1g



Technical Note:

1. Catalyst used in the formation of a bisenamine from toluidine and phenylacetylene.



Tech. Note (1)
Ref. (1)

References:

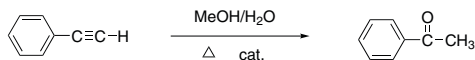
1. *J. Org. Chem.*, **2010**, *75*, 7769

79-5000 Methyl(triphenylphosphine)gold(I), **99%** (23108-72-7)
 $Au(CH_3)P(C_6H_5)_3$; FW: 474.29; white xtl.; m.p. ~150° (dec.)

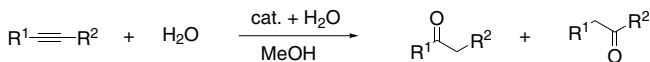
250mg
1g

Technical Notes:

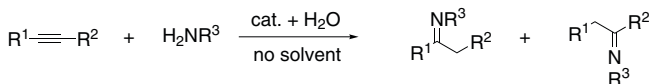
1. Catalyst used for the addition of water to alkynes.
2. Highly efficient catalyst for the intermolecular hydroamination of alkynes.
3. Relay catalysis using a gold(I) complex/ Bronsted acid binary system for the synthesis of benzoxasiloles.
4. Gold(I) catalyzed intermolecular hydroarylation of alkenes with indoles.



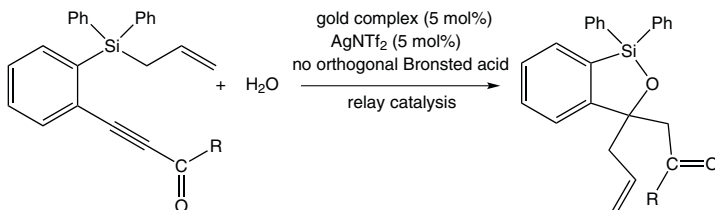
Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (2)



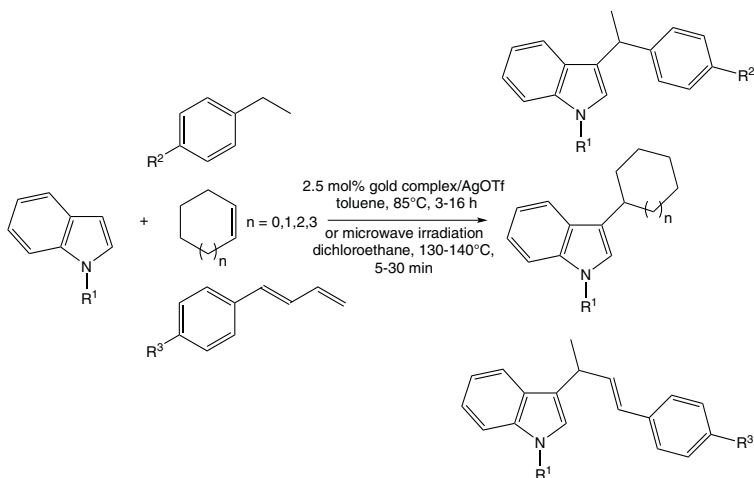
Tech. Note (2)
Ref. (3)



Tech. Note (3)
Ref. (4)

GOLD (Compounds)

79-5000 Methyl(triphenylphosphine)gold(I), 99% (23108-72-7)
(continued)

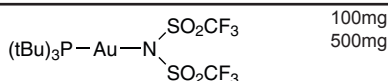


Tech. Note (4)
Ref. (5)

References:

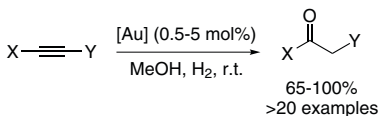
1. *J. Am. Chem. Soc.*, **2003**, *125*, 11925.
2. *Angew. Chem. Int. Ed.*, **2002**, *41*, 4563.
3. *Org. Lett.*, **2003**, *5*, 3349.
4. *RCS Adv.*, **2014**, *4*, 6215.
5. *Chem. Eur. J.*, **2008**, *14*, 8353.

79-0355 Tri-*t*-butylphosphine[bis(trifluoromethyl)sulfonylimido]gold(I), 98% (1121960-93-7)
C₁₄H₂₇AuF₆NO₄PS₂; FW: 679.43; white solid

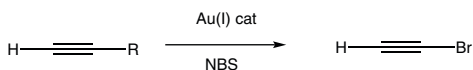


Technical Notes:

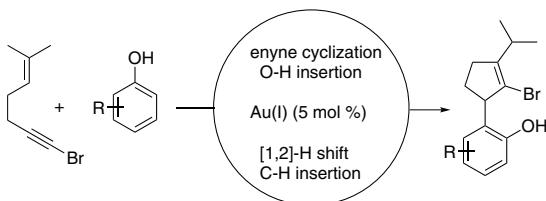
1. Catalyst used for the selective hydration of substituted alkynes at room temperature without acidic promoters.
2. Gold(I) catalyzes bromination of terminal alkynes.
3. Sequential O-H/C-H bond insertion of phenols initiated by the gold(I)-catalyzed cyclization of 1-bromo-1,5-enynes.
4. Ligand-controlled gold-catalyzed cycloisomerization of 1, *n*-enyne esters toward synthesis of dihydronaphthalene.



Tech. Note (1)
Ref. (1)



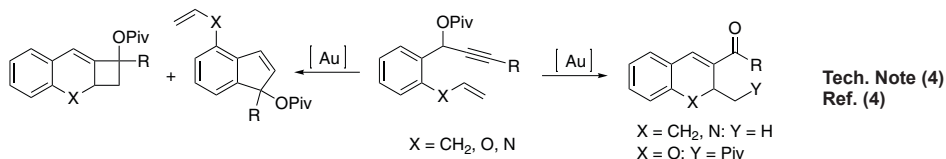
Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

GOLD (Compounds)

79-0355 Tri-*t*-butylphosphine[bis(trifluoromethyl)sulfonylimido]gold(I), 98% (1121960-93-7)
(continued)

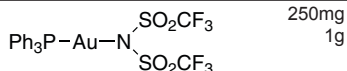


References:

1. *J. Org. Chem.*, **2009**, *74*, 2067
2. *ACS Catalysis*, **2011**, *1*, 601.
3. *Org. Letts.*, **2015**, *17*, 1982.
4. *Chem. Commun.*, **2016**, *52*, 7687.

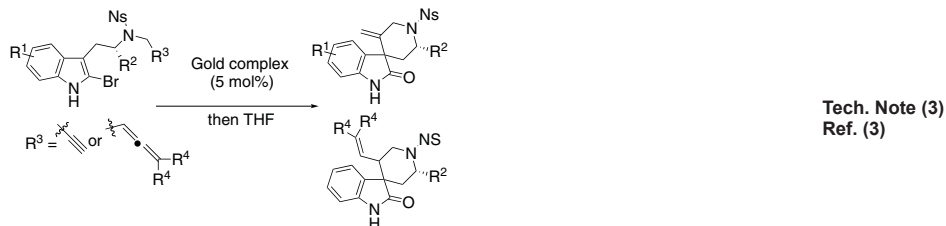
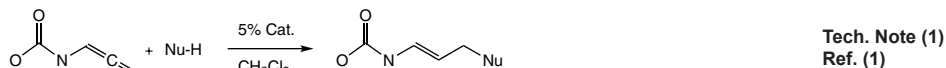
79-3615 Triphenylphosphinegold(I) bis(trifluoromethanesulfonyl)imidate, min. 98% (866395-16-6)

[(C₆H₅)₃PAu]⁺[N(CF₃SO₂)₂]₂⁻; FW: 739.4;
white to off-white powdr.
air sensitive, light sensitive, (store cold)



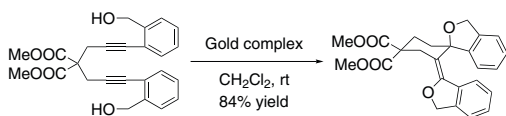
Technical Notes:

1. Catalyst promoting the addition of nucleophiles to alleneamides.
2. Gold- and Bronsted acid-catalyzed cycloisomerization of 1,8-diynyl vinyl acetates to bicycle[2.2.1]hept-2-en-7-ones.
3. Catalyst used for the synthesis of spiro[piperidine-3,3'-oxindoles].
4. Catalyst used in the gold(I)-catalyzed Rautenstrauch rearrangement.
5. Gold-catalyzed π-directed regioselective cyclization of bis(o-alkynyl benzyl alcohols): rapid excess to dihydroisobenzofuran derivatives.
6. Gold compound used in acid-catalyzed cycloisomerization – synthesis of diverse nitrogen-containing spiro heterocycles.
7. Gold catalyst used in the domino synthesis of functionalized benzofurans and tetracyclic isochromans via formal carboalkoxylation.

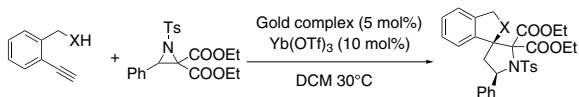


GOLD (Compounds)

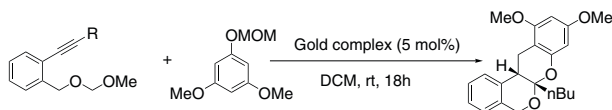
79-3615 Triphenylphosphinegold(I) bis(trifluoromethanesulfonyl)imidate, min. 98% (866395-16-6)
(continued)



Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (6)



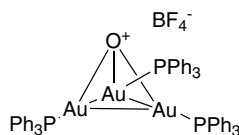
Tech. Note (7)
Ref. (7)

References:

1. *J. Org. Chem.*, **2010**, *75*, 5406.
2. *Org. Lett.*, **2016**, *18*, 5936.
3. *Adv. Synth. Catal.*, **2016**, *358*, 3355.
4. *Org. Lett.*, **2016**, *18*, 5058.
5. *New J. Chem.*, **2016**, *40*, 8211.
6. *Org. Lett.*, **2016**, *18*, 4614.
7. *Org. Lett.*, **2016**, *18*, 4136.

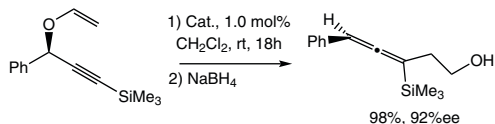
79-3600 Tris(triphenylphosphinegold(I))-oxonium tetrafluoroborate, 98%
(53317-87-6)
[(C₆H₅)₃PAu]₃O⁺BF₄⁻; FW: 1480.56;
off-white powdr.; m.p. 207° dec.
air sensitive

250mg
1g

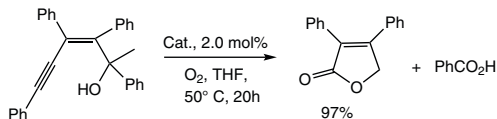


Technical Notes:

1. Catalyst for the Claisen Rearrangement of propargyl vinyl ethers. Chirality is efficiently transferred.
2. Catalyst for the oxidative cleavage of a Carbon-Carbon triple bond in (Z)-Enynols and cyclization.



Tech. Note (1)
Ref. (1)



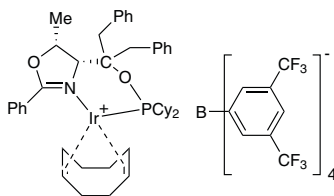
Tech. Note (2)
Ref. (2)

References:

1. *J. Am. Chem. Soc.*, **2004**, *126*, 15978.
2. *J. Am. Chem. Soc.*, **2006**, *128*, 11332.

IRIDIUM (Compounds)

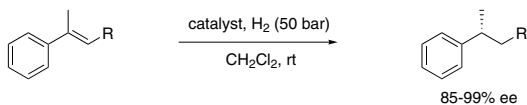
77-5009 ((*4R,5R*)-(+)-*O*-[1-Benzyl-1-(5-methyl-2-phenyl-4,5-dihydrooxazol-4-yl)-2-phenylethyl] (dicyclohexylphosphinite)(1,5-COD)iridium(I) tetrakis(3,5-bis(trifluoromethyl)phenylborate, min. 97% (*R,R*)-[COD]Ir[cy₂PThrePHOX] (880262-14-6)
 Ir(C₈H₁₂)(C₃₇H₄₆NO₂P)*B[C₆H₃(CF₃)₂]₄;
 FW: 1731.35; orange powdr.;
 m.p. 160-161°
air sensitive, moisture sensitive, (store cold)
 Note: Sold in collaboration with Solvias for research purposes only.



100mg
 500mg
 2g
 10g

Technical Note:

1. New class of hydrogenation catalyst which can convert unfunctionalized styrenyl olefins into alkanes with excellent enantioselectivity.



References:

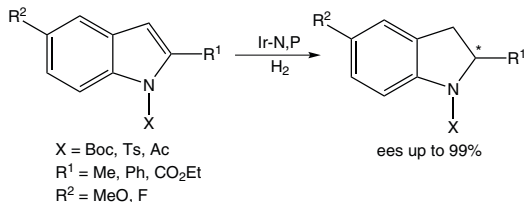
1. *Adv. Synth. Catal.*, **2002**, *344*, 40.
2. *Acc. Chem. Res.*, **2007**, *40*, 1402.

77-5010 ((*4S,5S*)-(-)-*O*-[1-Benzyl-1-(5-methyl-2-phenyl-4,5-dihydrooxazol-4-yl)-2-phenylethyl]-dicyclohexylphosphinite)(1,5-COD)iridium(I) tetrakis(3,5-bis(trifluoromethyl)phenylborate, min. 97% (*S,S*)-[COD]Ir[cy₂PThrePHOX] (583844-38-6)
 Ir(C₈H₁₂)(C₃₇H₄₆NO₂P)*B[C₆H₃(CF₃)₂]₄; FW: 1731.35; orange powdr.; m.p. 160-161°
air sensitive, moisture sensitive, (store cold)
 Note: Sold in collaboration with Solvias for research purposes only.

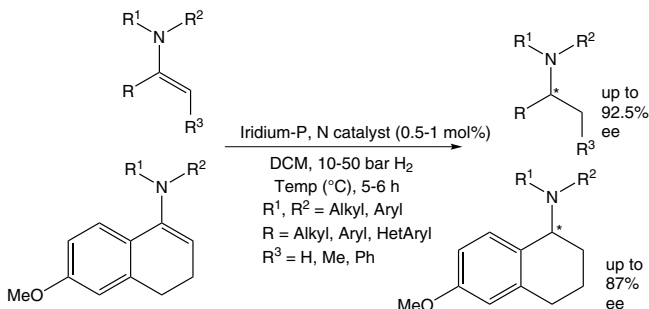
100mg
 500mg
 2g
 10g

Technical Notes:

1. Iridium-catalyzed asymmetric hydrogenation of N-protected indoles.
2. Iridium-catalyzed asymmetric hydrogenation of unfunctionalized enamines.



Tech. Note (1)
 Ref. (1)



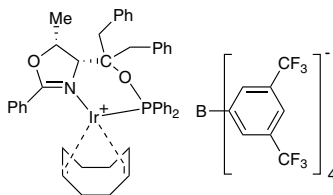
Tech. Note (2)
 Ref. (2)

References:

1. *Chem-Eur. J.*, **2010**, *16*, 2036.
2. *Chem-Eur. J.*, **2009**, *15*, 2266.

IRIDIUM (Compounds)

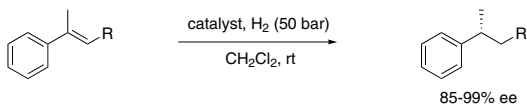
77-5019 ((4*R*,5*R*)-(+)-O-[1-Benzyl-1-(5-methyl-2-phenyl-4,5-dihydrooxazol-4-yl)-2-phenylethyl] (diphenylphosphinite)(1,5-COD)iridium(I) tetrakis(3,5-bis(trifluoromethyl)phenylborate, min. 97% (R,R)-[COD]Ir[Ph₂PThrePHOX] (880262-16-8)
 Ir(C₈H₁₂)(C₃₇H₃₄NO₂P)⁺B[C₆H₃(CF₃)₂]₄⁻;
 FW: 1719.25; orange powdr.;
 m.p. 112-113°
air sensitive, (store cold)
 Note: Sold in collaboration with Solvias for research purposes only.



100mg
 500mg
 2g
 10g

Technical Note:

1. New class of hydrogenation catalyst which can convert unfunctionalized styrenyl olefins into alkanes with excellent enantioselectivity.



References:

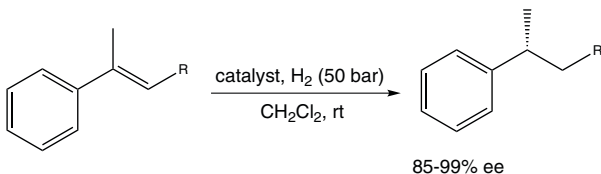
1. *Adv. Synth. Catal.*, **2002**, 344, 40.
2. *Acc. Chem. Res.*, **2007**, 40, 1402.

77-5020 ((4*S*,5*S*)-(-)-O-[1-Benzyl-1-(5-methyl-2-phenyl-4,5-dihydrooxazol-4-yl)-2-phenylethyl]-diphenylphosphinite)(1,5-COD)iridium(I) tetrakis(3,5-bis(trifluoromethyl)phenylborate, min. 97% (S,S)-[COD]Ir[Ph₂PThrePHOX] (405235-55-4)
 Ir(C₈H₁₂)(C₃₇H₃₄NO₂P)⁺B[C₆H₃(CF₃)₂]₄⁻; FW: 1719.25; orange powdr.; m.p. 112-113°
air sensitive, (store cold)
 Note: Sold in collaboration with Solvias for research purposes only.

100mg
 500mg
 2g
 10g

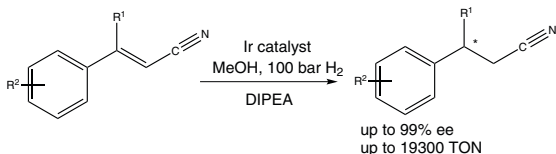
Technical Notes:

1. New class of hydrogenation catalyst which can convert unfunctionalized styrenyl olefins into alkanes with excellent enantioselectivity.
2. Catalyst used for the asymmetric hydrogenation of α,β -unsaturated nitrile.
3. Catalyst used for the chemoselective and enantioselective hydrogenation of (1-chloro-1-alkenyl) boronic esters.
4. Catalyst used for the enantioselective synthesis of chromanes.



Tech. Note (1)
 Ref. (1)

85-99% ee

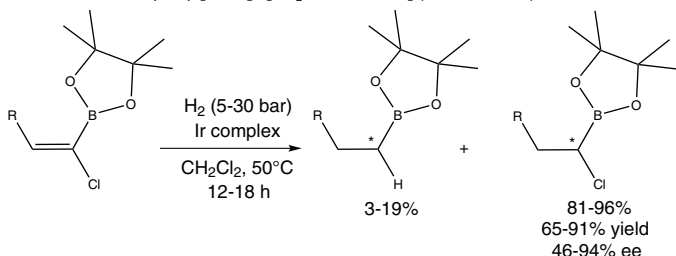


Tech. Note (2)
 Ref. (3)

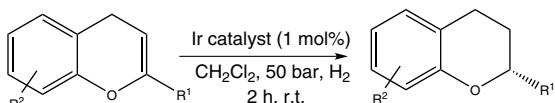
up to 99% ee
 up to 19300 TON

IRIDIUM (Compounds)

77-5020 ((4*S*,5*S*)-(-)-O-[1-Benzyl-1-(5-methyl-2-phenyl-4,5-dihydrooxazol-4-yl)-2-phenylethyl]-diphenylphosphinite)(1,5-COD)iridium(I) tetrakis(3,5-bis(trifluoromethyl)phenyl)borate, min. 97% (S,S)-[COD]Ir[Ph₂PThrePHOX] (405235-55-4)



Tech. Note (3)
Ref. (4)

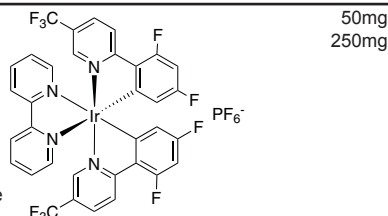


Tech. Note (4)
Ref. (5)

References:

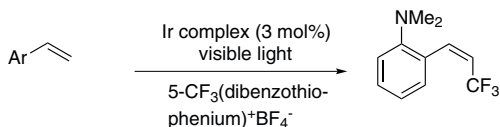
1. *Adv. Synth. Catal.*, **2002**, 344, 40
2. *Acc. Chem. Res.*, **2007**, 40, 1402
3. *Angew. Chem. Int. Ed.*, **2014**, 53, 8668
4. *Angew. Chem. Int. Ed.*, **2012**, 51, 1014
5. *Synlett.*, **2008**, 20, 3167

77-0220 (2,2'-Bipyridine)bis[3,5-difluoro-2-[5-(trifluoromethyl)-2-pyridinyl-kN][phenyl-kC]iridium(III) hexafluorophosphate, 95% (1092775-62-6)
 $\text{C}_{34}\text{H}_{18}\text{F}_{16}\text{IrN}_4\text{P}$; FW: 1009.70; yellow powd.
 air sensitive
 Note: Photocatalyst

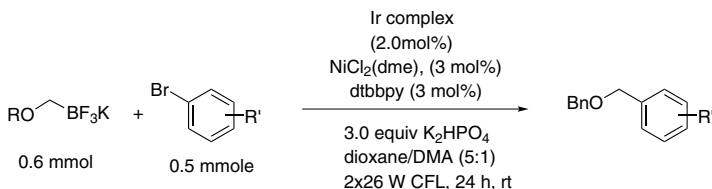


Technical Notes:

1. Photocatalyst used for the chemo-, regio, and stereoselective trifluoromethylation of styrene.
2. Photoredox catalyst used in cross-coupling: Ir/Ni dual catalysts for the synthesis of benzylic ethers.
3. Iridium complex used for catalytic olefin hydroamidation enabled by proton-coupled electron transfer.
4. Catalyst used for visible light photoredox cross-coupling of acyl chlorides with potassium alkoxymethyltrifluoroborates.
5. Iridium catalyst used in the photoredox/nickel dual catalytic cross-coupling of secondary alkyl β -trifluoroborato ketones and -esters with aryl bromides.
6. Photocatalyst used in the cross-coupling of trifluoroalkylboranes.



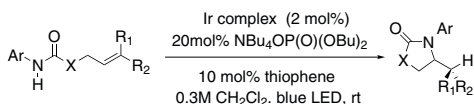
Tech. Note (1)
Ref. (1)



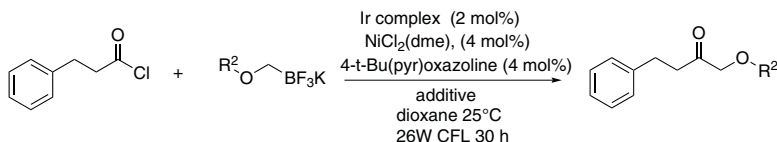
Tech. Note (2)
Ref. (2)

IRIDIUM (Compounds)

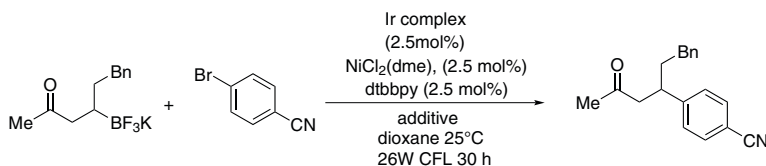
77-0220 (2,2'-Bipyridine)bis[3,5-difluoro-2-[5-(trifluoromethyl)-2-pyridinyl-kN][phenyl-kC]iridium(III) hexafluorophosphate, 95% (1092775-62-6)



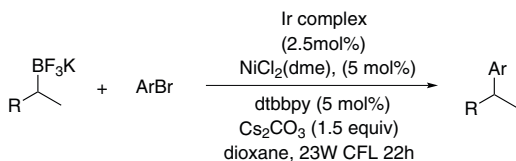
Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (6)

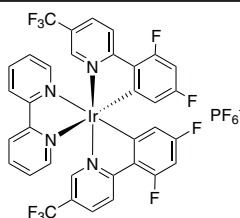
References:

1. *J. Org. Chem.*, **2014**, *79*, 10434.
2. *Org. Lett.*, **2015**, *17*, 3294.
3. *J. Am. Chem. Soc.*, **2015**, *137*, 13492.
4. *Org. Lett.*, **2016**, *18*, 732.
5. *Org. Lett.*, **2016**, *18*, 2994.
6. *Org. Lett.*, **2016**, *18*, 5760.

77-0453 (2,2'-Bipyridine)bis[3,5-difluoro-2-[5-(trifluoromethyl)-2-pyridinyl-kN]phenyl-kC] iridium(III) hexafluorophosphate, 99% (1092775-62-6)

[Ir(C₁₀H₈N₂)(C₁₂H₅F₅N₂)₂] PF₆; FW: 1009.70; yellow powdr.

Note: Photocatalyst



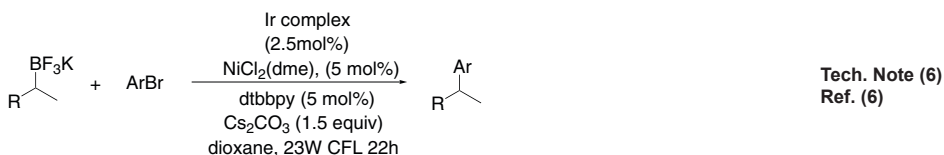
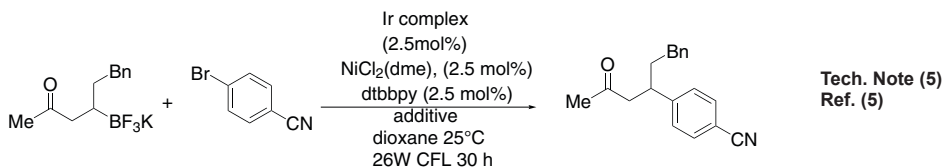
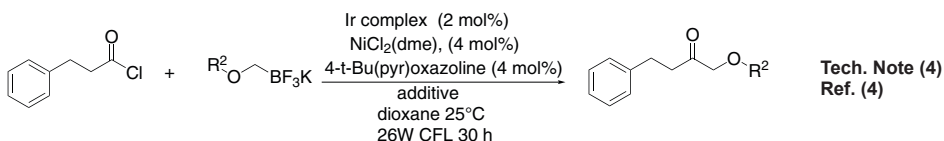
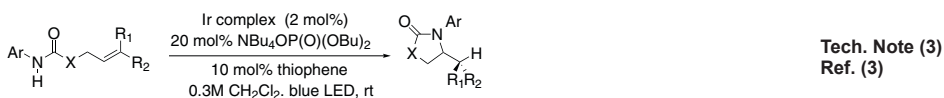
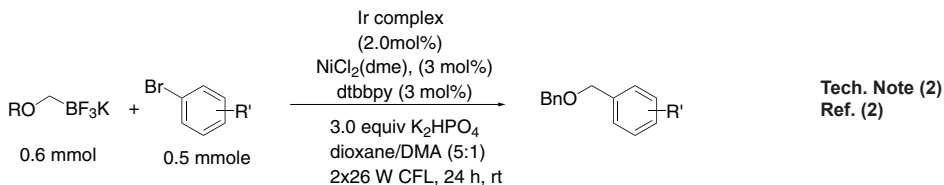
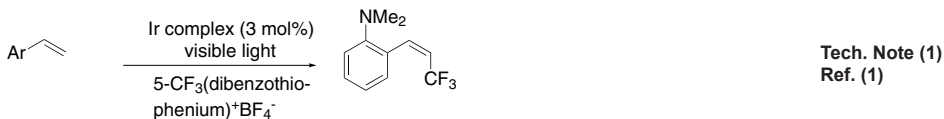
50mg
250mg

Technical Notes:

1. Catalyst used for the chemo-, regio, and stereoselective trifluoromethylation of styrene.
2. Photoredox catalyst used in cross-coupling: Ir/Ni dual catalysts for the synthesis of benzylic ethers.
3. Iridium complex used for catalytic olefin hydroamidation enabled by proton-coupled electron transfer.
4. Catalyst used for visible light photoredox cross-coupling of acyl chlorides with potassium alkoxymethyltrifluoroborates.
5. Iridium catalyst used in the photoredox/nickel dual catalytic cross-coupling of secondary alkyl β-trifluoroboratoketones and -esters with aryl bromides.
6. Photocatalyst used in the cross-coupling of trifluoroalkylboranes.

IRIDIUM (Compounds)

77-0453 (continued) (2,2'-Bipyridine)bis[3,5-difluoro-2-[5-trifluoromethyl-2-pyridinyl-kN]phenyl-kC]iridium(III) hexafluorophosphate, 99% (1092775-62-6)



References:

1. *J. Org. Chem.*, **2014**, *79*, 10446.
2. *Org. Lett.*, **2015**, *17*, 3294.
3. *J. Am. Chem. Soc.*, **2015**, *137*, 13495.
4. *Org. Lett.*, **2016**, *18*, 732.
5. *Org. Lett.*, **2016**, *18*, 2994.
6. *Org. Lett.*, **2016**, *18*, 5760.

IRIDIUM (Compounds)

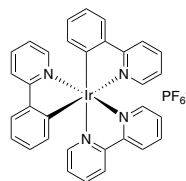
77-0465

NEW

(2,2'-Bipyridine)bis[2-pyridinyl-kN]phenyl-kC] iridium(III) hexafluorophosphate, 99% (106294-60-4)

$[\text{Ir}(\text{C}_{10}\text{H}_8\text{N}_2)(\text{C}_{11}\text{H}_8\text{N})_2]\text{PF}_6^-$; FW: 801.74; yellow powdr.

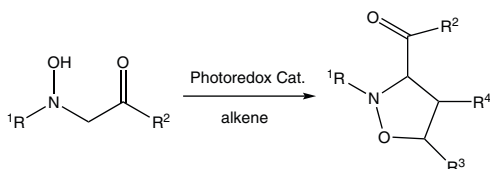
Note: Photocatalyst



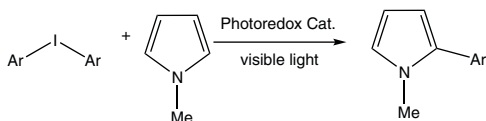
100mg
500mg

Technical Notes:

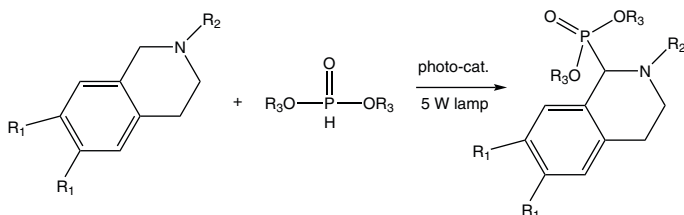
- Catalyst used in the visible-light, photoredox-catalyzed synthesis of nitrones.
- Catalyst used in light-mediated, direct arylation of arenes and heteroarenes.
- Photoredox catalyst used in C-P bond formation reactions.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

References:

- Org. Lett.*, **2014**, *16*, 2872.
- Chem. Lett.*, **2013**, *42*, 1203.
- Chem. Comm.*, **2011**, *47*, 8679.

77-0218

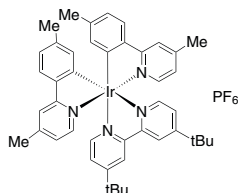
NEW

4,4'-Bis(t-butyl-2,2'-bipyridine)bis[5-methyl-2-(4-methyl-2-pyridinyl-kN)phenyl-kC]iridium hexafluorophosphate, 95% (1607469-49-7)

$\text{C}_{44}\text{H}_{48}\text{F}_6\text{IrN}_4\text{P}$; FW: 970.06; yellow powdr.

air sensitive

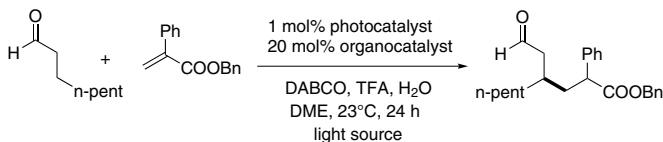
Note: Photocatalyst



50mg
250mg

Technical Note:

- Catalyst used for the direct β -alkylation of aldehydes via photoredox organocatalysis.



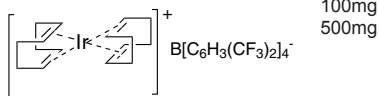
Tech. Note (1)
Ref. (1)

References:

- J. Am. Chem. Soc.*, **2014**, *136*, 6858.

IRIDIUM (Compounds)

77-0225 **Bis(1,5-cyclooctadiene)iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl] borate, 98%** (666826-16-0)
 $\text{Ir}(\text{C}_8\text{H}_{12})_2^+[\text{B}(\text{C}_6\text{H}_3(\text{CF}_3)_2)_4]^-$; FW: 1271.80; black xtl.



100mg
500mg

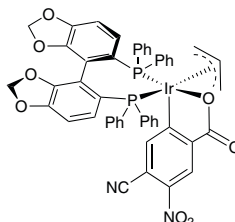
Technical Note:

- Useful starting material for the, in situ, preparation of active iridium catalysts.

References:

- Organometallics*, **2012**, 31, 4114
- Angew, Chem. Int. Ed.*, **2011**, 50, 9598
- Tetrahedron Asymmetry*, **2011**, 22, 36

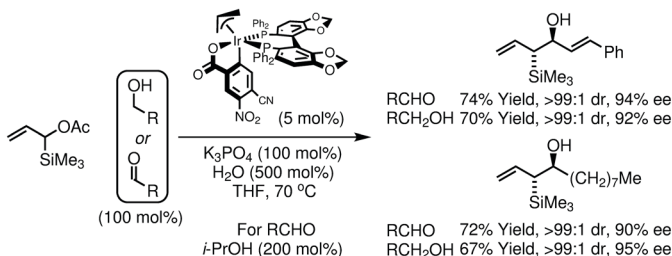
77-5074 **[(R)-(+)-5,5'-Bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole][4-cyano-3-nitrobenzenecarboxylato][1,2,3-n-2-propenyl] iridium(III), min. 97%** (1208092-27-6)
 $\text{C}_{46}\text{H}_{35}\text{IrN}_2\text{O}_5\text{P}_2$; FW: 1033.98; yellow powdr.
 Note: Manufactured under license of Takasago patent.



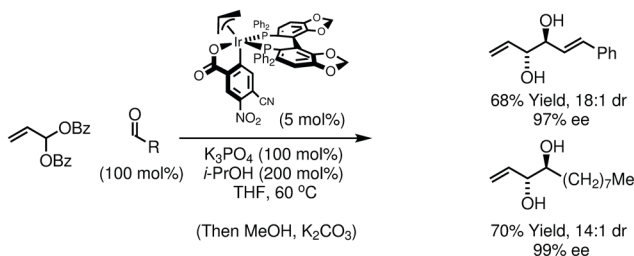
100mg
500mg

Technical Notes:

- Catalyst used for the diastereo- and enantioselective carbonyl (trimethylsilyl)allylation from the alcohol, or aldehyde, oxidation level.
- Catalyst used for the diastereo- and enantioselective carbonyl (hydroxy)allylation to form anti-1,2-diols.
- Catalyst used for the diastereo- and enantioselective carbonyl (hydroxymethyl)allylation from the alcohol, or aldehyde, oxidation level.
- Catalyst used for the diastereo- and enantioselective carbonyl tert-prenylation from the alcohol, or aldehyde, oxidation level.
- Catalyst used for the diastereo- and enantioselective carbonyl double crotylation of 1,3-diols.
- Catalyst used for the diastereo- and enantioselective carbonyl crotylation from the alcohol or aldehyde oxidation level.



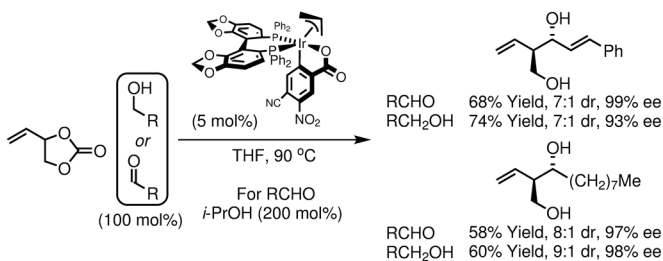
Tech. Note (1)
Ref. (1)



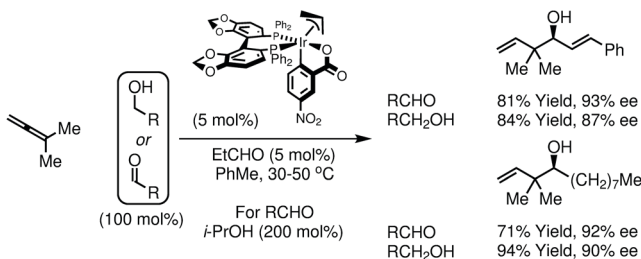
Tech. Note (2)
Ref. (2)

IRIDIUM (Compounds)

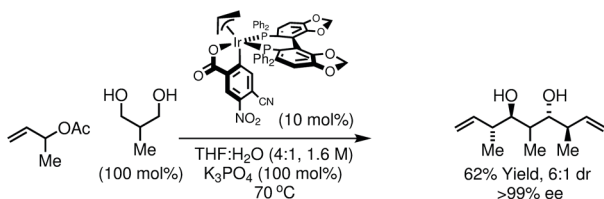
77-5074 [(R)-(+)-5,5'-Bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole][4-cyano-3-nitrobenzenecarboxylato][1,2,3- η -2-propenyl]iridium(III), min. 97% (1208092-27-6)
(continued)



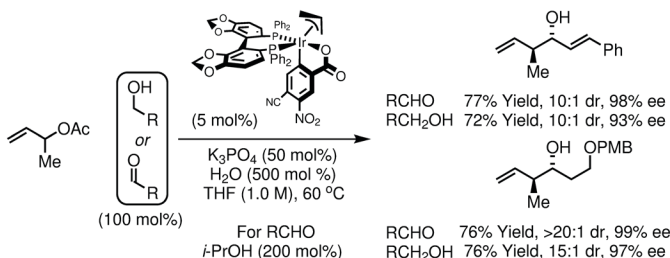
Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (6)

References:

1. *J. Am. Chem. Soc.*, **2010**, 132, 9153.
2. *J. Am. Chem. Soc.*, **2010**, 132, 1760.
3. *J. Am. Chem. Soc.*, **2010**, 132, 4562.
4. *J. Am. Chem. Soc.*, **2009**, 131, 6916.
5. *J. Am. Chem. Soc.*, **2011**, 133, 12795.
6. *J. Org. Chem.*, **2011**, 76, 2350.

77-5075 [(S)-(-)-5,5'-Bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole][4-cyano-3-nitrobenzenecarboxylato][1,2,3- η -2-propenyl]iridium(III), min. 97% (1221768-92-8) 100mg
500mg

$\text{C}_{49}\text{H}_{35}\text{IrN}_2\text{O}_8\text{P}_2$; FW: 1033.98; yellow pwdr.

Note: Manufactured under license of Takasago patent.

Technical Note:

1. See 77-5074 (page 56)

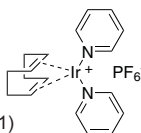
IRIDIUM (Compounds)

77-0440

NEW

Bis(pyridine)(1,5-cyclooctadiene)iridium(I) hexafluoro-phosphate, 99% (56678-60-5)

(C₅H₅N)₂(C₈H₁₂)Ir⁺PF₆⁻; FW: 603.56; orange powdr.
air sensitive



250mg
1g

Technical Notes:

1. This complex is used in the isomerization of primary allylic alcohols. (Ref. 1)
2. The catalyst is used for ortho-directed hydrogen-isotope exchange. (Ref. 2)

References:

1. *Eur. J. Inorg. Chem.*, **2012**, 3320
2. *J. Labelled Compd. Rad.*, **2010**, 53, 695

96-7650

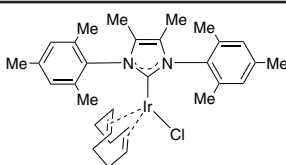
CATHy™ Catalyst Kit for Asymmetric Transfer Hydrogenation of Ketones and Imines
See page 332

77-1845

NEW

Chloro(1,5-cyclooctadiene)[4,5-dimethyl-1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene] iridium(I), min. 98% (1118917-09-1)

C₃₁H₄₀ClIrN₂; FW: 668.33; yellow powdr.;
m.p. >200C (dec)



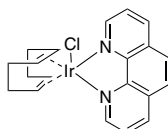
100mg
500mg

77-0258

NEW

Chloro(1,5-cyclooctadiene)(1,10-phenanthroline) iridium(I) THF adduct, min. 98% (41396-69-4)

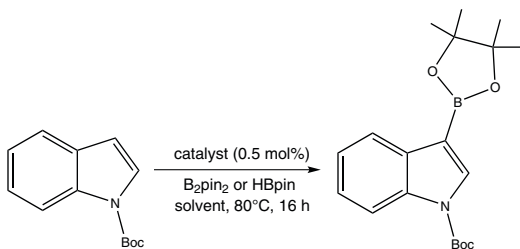
C₂₀H₂₀ClIrN₂; FW: 516.05; purple solid
air sensitive



250mg
1g
5g

Technical Note:

1. Catalyst used in the C-H borylation of N-Boc-indoles.



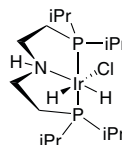
References:

1. *Organometallics*, **2014**, 33, 3514

77-0500

Chlorodihydrido[bis(2-di-i-propylphosphinoethyl)amine] iridium(III), min. 98% (791629-96-4)

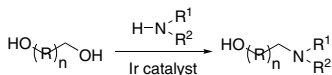
IrClH₂(C₁₆H₃₇NP₂); FW: 535.10; white powdr.
Note: Sold under license from Kanata for research purposes only. Patent WO04096735; US 10/985,058.



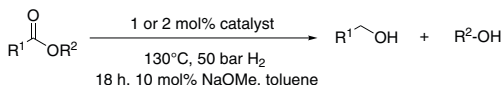
250mg
1g

Technical Notes:

1. Amination of aliphatic alcohols and diols using an iridium pincer catalyst.
2. Iridium-catalyzed hydrogenation of carboxylic acid esters.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

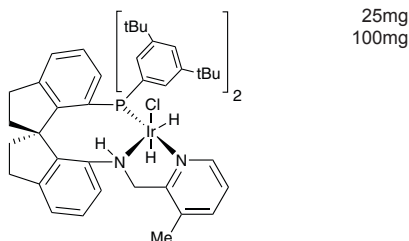
1. *ChemCatChem.*, **2010**, 2, 640
2. *ChemCatChem*, **2014**, 6, 2810.

IRIDIUM (Compounds)

77-4035

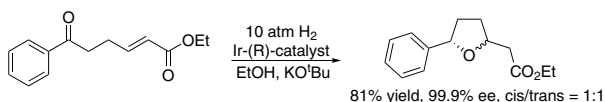
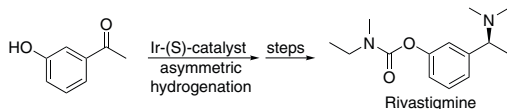
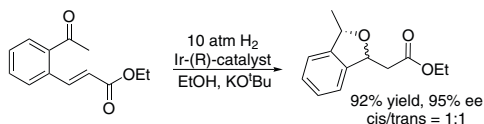
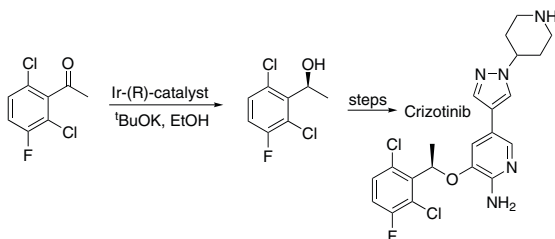
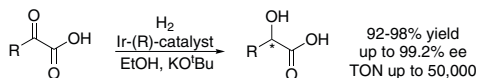
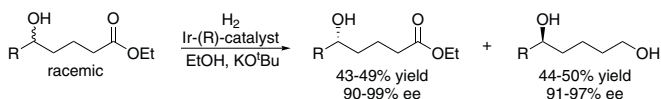
NEW

Chlorodihydrido{(R)-(+)-7-Bis(3,5-di-*t*-butylphenyl)phosphino-7'-[(3-methylpyridine-2-ylmethyl)amino]-2,2',3,3'-tetrahydro-1,1'-spirobiindane}iridium(III), >97% (>99% ee) Ir-(R)-DTB-SpiroPAP-3-Me (1396201-63-0)
 $C_{52}H_{67}ClIrN_2P$; FW: 978.75; yellow-green solid

25mg
100mg

Technical Notes:

1. Catalyst for the enantioselective synthesis of chiral disubstituted oxa-cyclic ethers
2. Catalyst for the enantioselective hydrogenation for the asymmetric synthesis of Rivastigmine
3. Catalyst for the asymmetric hydrogenation for the synthesis of Crizotinib
4. Catalyst for the asymmetric hydrogenation of α -keto acids
5. Catalyst for the kinetic resolution of racemic aliphatic alcohols via selective asymmetric hydrogenation

Tech. Note (1)
Ref. (1)Tech. Note (2)
Ref. (2)Tech. Note (3)
Ref. (3)Tech. Note (4)
Ref. (4)Tech. Note (5)
Ref. (5)

References:

1. *Org. Lett.*, **2012**, *14*, 4758.
2. *Org. Process. Res. Dev.*, **2013**, *17*, 307.
3. *Tetrahedron Lett.*, **2014**, *55*, 1528.
4. *Chem. Commun.*, **2014**, *50*, 15987.
5. *J. Am. Chem. Soc.*, **2014**, *136*, 17426.

IRIDIUM (Compounds)

77-4036 Chlorodihydrido(S)-(-)-7-Bis(3,5-di-*t*-butylphenyl)phosphino-7'-[(3-methylpyridine-2-ylmethyl)amino]-2,2',3,3'-tetrahydro-1,1'-spirobiindane) iridium(III), >97% (>99% ee) Ir-(S)-DTB-SpiroPAP-3-Me (1418483-59-6)
 $C_{52}H_{67}ClIrN_2P$; FW: 978.75; yellow-green solid

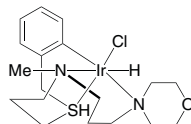
NEW

25mg
100mg

Technical Note:

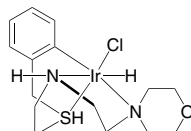
- See 77-4035 (page 59)

77-0560 Chlorohydro[2-[[[3-[methyl[3-(4-morpholinyl-κN4)propyl]amino-κN]propyl]thio-κS]methyl]phenyl-κC] iridium(III) (1839552-43-0)
 $C_{16}H_{30}ClIrN_2OS$; FW: 550.18; yellow xtl.
 Note: U.S. Patent: PCT/US2015/034793.



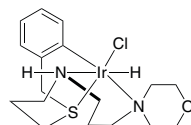
50mg

77-0570 Chlorohydro[2-[[[2-[(R)-[2-(4-morpholinyl-κN4)ethyl]amino-κN]ethyl]thio-κS]methyl]phenyl-κC] iridium(III) (1799787-26-0)
 $C_{16}H_{24}ClIrN_2OS$; FW: 508.10; white powdr.
 Note: U.S. Patent: PCT/US2015/034793.



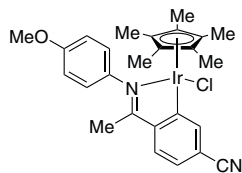
50mg

77-0550 Chlorohydro[2-[[[3-[3-(4-morpholinyl-κN4)propyl]amino-κN]propyl]thio-κS]methyl]phenyl-κC] iridium(III) (1799787-28-2)
 $C_{17}H_{28}ClIrN_2OS$; FW: 536.15; white powdr.
 Note: U.S. Patent: PCT/US2015/034793.



25mg

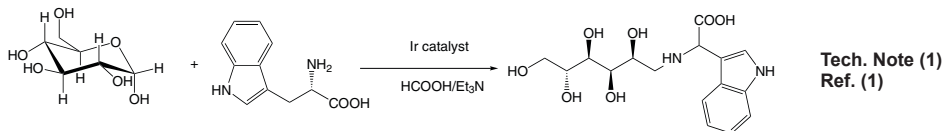
77-0424 Chloro(pentamethylcyclopentadienyl){5-cyano-2-[1-[(4-methoxyphenyl)imino-κN]ethyl]phenyl-κC} iridium(III), 99% Iridicycle-CN (1258964-46-3)
 $C_{26}H_{28}ClIrN_2O$; FW: 612.18; red powdr.
 Note: Sold in collaboration with Yorkshire Process Technology for research purposes only. Developed by Prof. J. Xiao, Liverpool University. Patents GB 1206572.8 and GB 1206573.6 Iridicycle Catalyst Kit component.



100mg
500mg

Technical Note:

- Catalyst used in the reductive amination of carbonyl groups with unprecedented substrate scope, selectivity and activity.

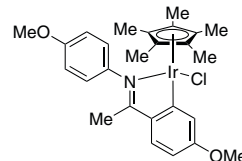


Tech. Note (1)
Ref. (1)

References:

- Angew. Chem. Int. Ed., 2010, 49, 7548

77-0418 Chloro(pentamethylcyclopentadienyl){5-methoxy-2-[1-[(4-methoxyphenyl)imino-κN]ethyl]phenyl-κC} iridium(III), 99% Iridicycle-MeO (1258964-48-5)
 $C_{26}H_{31}ClIrNO_2$; FW: 617.20; orange powdr.
 Note: Sold in collaboration with Yorkshire Process Technology for research purposes only. Developed by Prof. J. Xiao, Liverpool University. Patents GB 1206572.8 and GB 1206573.6 Iridicycle Catalyst Kit component.



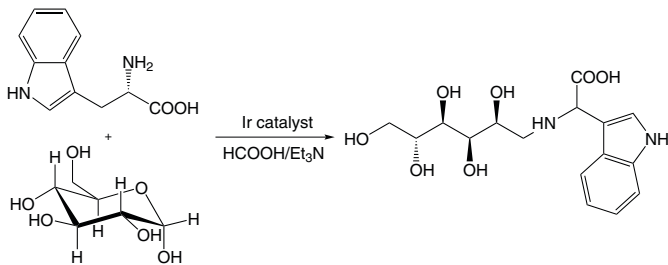
100mg
500mg

Technical Notes:

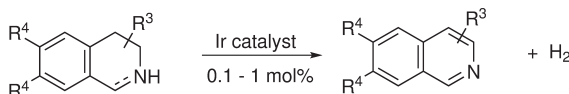
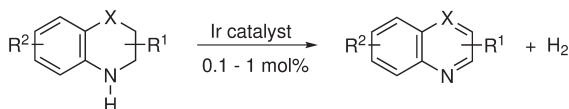
- A versatile catalyst for reductive amination by hydrogen transfer.
- Acceptorless dehydrogenation of nitrogen heterocycles with a versatile iridium catalyst.

IRIDIUM (Compounds)

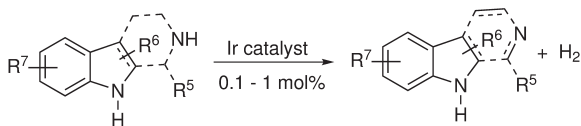
77-0418 Chloro(pentamethylcyclopentadienyl){5-methoxy-2-[1-[(4-methoxyphenyl)imino-kN]ethyl]phenyl-kC}iridium(III), 99% Iridicycle-MeO (1258964-48-5)



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

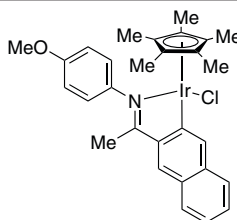


References:

1. *Angew. Chem. Int. Ed.*, **2010**, 49, 7548
2. *Angew. Chem. Int. Ed.*, **2013**, 52, 6983.

77-0428 Chloro(pentamethylcyclopentadienyl) {2-[1-[(4-methoxyphenyl)imino-kN]ethyl]naphthyl-kC}iridium(III), 99% Iridicycle-Naphth (1469467-94-4)

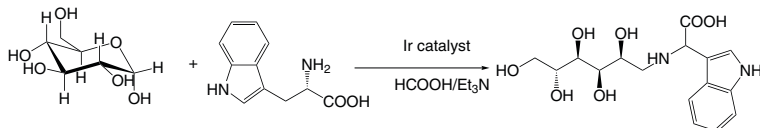
C₂₉H₃₁ClIrNO; FW: 637.23; red-orange powder.
Note: Sold in collaboration with Yorkshire Process Technology for research purposes only. Developed by Prof. J. Xiao, Liverpool University. Patents GB 1206572.8 and GB 1206573.6 Iridicycle Catalyst Kit component.



100mg
500mg

Technical Notes:

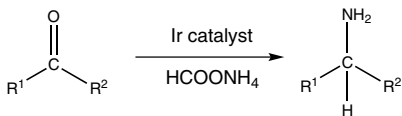
1. Catalyst used in the reductive amination of carbonyl groups with unprecedented substrate scope, selectivity and activity.
2. Catalyst used for the synthesis of primary amines by the transfer hydrogenative reductive amination of ketones.
3. Catalyst used for the efficient transfer hydrogenation of N-heterocycles in water.



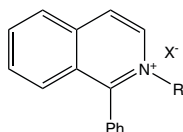
Tech. Note (1)
Ref. (1)

IRIDIUM (Compounds)

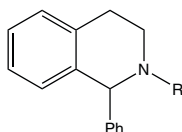
77-0428 Chloro(pentamethylcyclopentadienyl){2-[1-[(4-methoxyphenyl)imino-kN]ethyl]naphthyl-kC}iridium(III), 99% Iridicycle-Naphth (1469467-94-4)



Tech. Note (2)
Ref. (2)



Ir catalyst
0.01-0.1 mole%



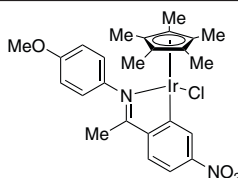
Tech. Note (3)
Ref. (3)

References:

1. *Angew. Chem. Int. Ed.*, **2010**, 49, 7548.
2. *Chem. Eur. J.*, **2014**, 20, 245.
3. *Chem. Eur. J.*, **2015**, 21, 5370.

77-0430 Chloro(pentamethylcyclopentadienyl){5-nitro-2-[1-[(4-methoxyphenyl)imino-kN]ethyl]phenyl-kC}iridium(III), 99% Iridicycle-NO2 (1439402-25-1)

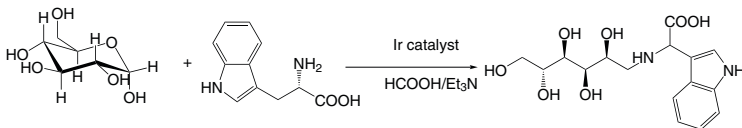
C₂₅H₂₈ClIrN₂O₃; FW: 632.17; brown powdr.
Note: Sold in collaboration with Yorkshire Process Technology for research purposes only. Developed by Prof. J. Xiao, Liverpool University. Patents GB 1206572.8 and GB 1206573.6 Iridicycle Catalyst Kit component.



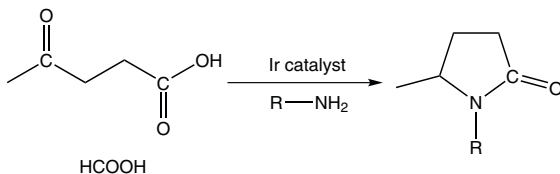
100mg
500mg

Technical Notes:

1. Catalyst used in the reductive amination of carbonyl groups with unprecedented substrate scope, selectivity and activity.
2. Catalyst used in the efficient transformation of levulinic acid into pyrrolidinones.



Tech. Note (1)
Ref. (1)



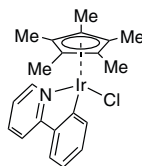
Tech. Note (2)
Ref. (2)

References:

1. *Angew. Chem. Int. Ed.*, **2010**, 49, 7548
2. *Chem. Comm.*, **2013**, 49, 5408

IRIDIUM (Compounds)

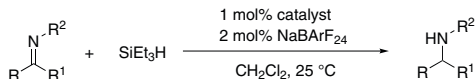
77-0650 Chloro(pentamethylcyclopentadienyl)[(2-pyridinyl-kN)phenyl-kC]iridium(III), 99% (945491-51-0)
 $\text{IrCl}(\text{C}_{10}\text{H}_{15})(\text{C}_{11}\text{H}_8\text{N})$; FW: 517.08; orange pwdr.



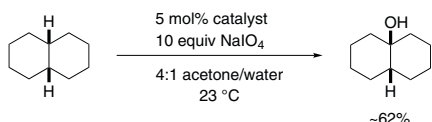
100mg
500mg

Technical Notes:

1. Highly active catalyst for water oxidation.
2. Catalyst for the hydrosilylation of imines.
3. Catalyst for C–H oxidation.



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

References:

1. *J. Am. Chem. Soc.*, **2009**, *131*, 8730.
2. *Catal. Sci. Technol.*, **2015**, *5*, 1452.
3. *Organometallics*, **2013**, *32*, 957.

77-0900 1,5-Cyclooctadiene(acetylacetonato)iridium(I), 99% (99.9%-Ir) (12154-84-6)
 $\text{Ir}(\text{C}_8\text{H}_{12})(\text{C}_5\text{H}_7\text{O}_2)$; FW: 399.49; yellow xtl.; m.p. 145–150° dec.

100mg
500mg

Technical Note:

1. Convenient precursor to a variety of Iridium complexes and catalysts.

77-5040 1,5-Cyclooctadiene((4S)-(+)-2-[(5S)-6-(diphenylphosphino)spiro[4.4]nona-1.6-dien-1-yl]-4,5-dihydro-4-benzylloxazole}iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, 97% (S,S)-(COD) Ir[Bn-SpinPHOX] (1194050-19-5)
 $\text{C}_{39}\text{H}_{42}\text{IrNOP}(\text{C}_{32}\text{H}_{12}\text{BF}_4)$; FW: 1627.16; red solid; m.p. 49–51°
air sensitive

25mg
100mg

Note: Sold in collaboration with SIOC for research purposes only. Patents CN200910051314.3, CN 101555259. SpinPHOX-Ir Catalyst Kit component.

77-5046 1,5-Cyclooctadiene((4S)-(+)-2-[(5S)-6-(diphenylphosphino)spiro[4.4]nona-1.6-dien-1-yl]-4,5-dihydro-4-phenylloxazole}iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, 97% (S,S)-(COD) Ir[Ph-SpinPHOX] (1194050-21-9)
 $\text{C}_{38}\text{H}_{40}\text{IrNOP}(\text{C}_{32}\text{H}_{12}\text{BF}_4)$; FW: 1613.13; orange pwdr.; m.p. 197–198°
air sensitive

25mg
100mg

Note: Sold in collaboration with SIOC for research purposes only. Patents CN200910051314.3, CN 101555259. SpinPHOX-Ir Catalyst Kit component.

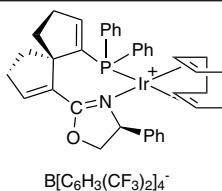
Technical Note:

1. See 77-5047 (page 63)

77-5047 1,5-Cyclooctadiene((4S)-(-)-2-[(5R)-6-(diphenylphosphino)spiro[4.4]nona-1.6-dien-1-yl]-4,5-dihydro-4-phenylloxazole}iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, 97% (R,S)-(COD)Ir[Ph-SpinPHOX] (1195511-59-1)
 $\text{C}_{38}\text{H}_{40}\text{IrNOP}(\text{C}_{32}\text{H}_{12}\text{BF}_4)$; FW: 1613.13; red pwdr.; m.p. 172–174°
air sensitive

25mg
100mg

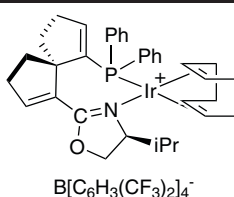
Note: Sold in collaboration with SIOC for research purposes only. Patents CN200910051314.3, CN 101555259. SpinPHOX-Ir Catalyst Kit component.



$\text{B}[\text{C}_6\text{H}_3(\text{CF}_3)_2]_4^-$

IRIDIUM (Compounds)

77-5050 1,5-Cyclooctadiene((4S)-(+)-2-[(5S)-6-(diphenylphosphino)spiro[4.4]nona-1.6-dien-1-yl]-4,5-dihydro-4-(i-propyl)oxazole)iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl] borate, 97% (S,S)-(COD)Ir[iPr-SpinPHOX] (1194050-23-1)
 $C_{35}H_{42}IrNOP(C_{23}H_{12}BF_{24})$; FW: 1579.11; red-orange powdr.; m.p. 201-203°
air sensitive
 Note: Sold in collaboration with SIOC for research purposes only. Patents CN200910051314.3, CN 101555259. SpinPHOX-Ir Catalyst Kit component.

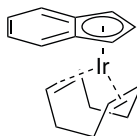


25mg
100mg

Technical Note:

- Highly efficient catalyst for the enantioselective hydrogenation of a diverse class of ketimines and α,β -unsaturated substrates.

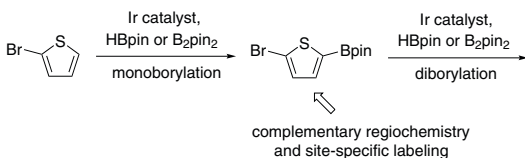
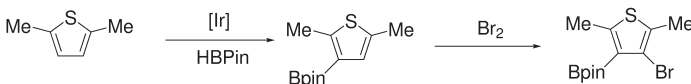
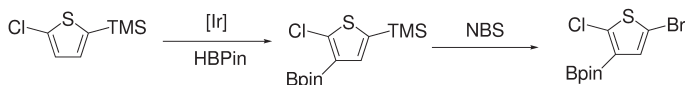
77-0950 1,5-Cyclooctadiene(η^5 -indenyl)iridium(I), 99% (102525-11-1)
 $C_{17}H_{19}Ir$; FW: 415.55; yellow xtl.



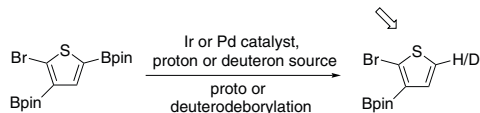
250mg
1g

Technical Notes:

- Iridium-catalyzed borylation of thiophenes: versatile, synthetic elaboration founded on selective C-H functionalization.
- Harnessing C-H borylation/deborylation for selective deuteration, synthesis of boronate esters, and late stage functionalization.



Tech. Note (1)
Ref. (1)

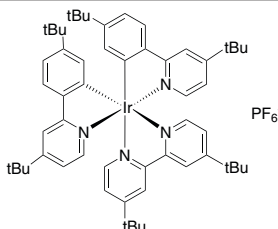


Tech. Note (2)
Ref. (2)

References:

- Tetrahedron*, **2008**, *64*, 6103.
- J. Org. Chem.*, **2015**, *80*, 8341.

77-0285 [4,4'-Di-t-butyl-2,2'-bipyridine][bis[5-(t-butyl)-2-[4-(t-butyl)-2-pyridinyl-kN]phenyl-kC] iridium(III) hexafluorophosphate, 95% (808142-80-5)
 $C_{56}H_{72}F_6IrN_4P$; FW: 1138.38; yellow powdr.
air sensitive
 Note: Photocatalyst



50mg
250mg

IRIDIUM (Compounds)

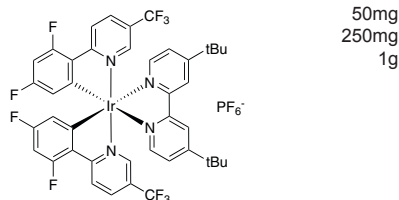
77-0425

NEW

(4,4'-Di-*t*-butyl-2,2'-bipyridine)bis[3,5-difluoro-2-[5-trifluoromethyl-2-pyridinyl-*k*N)phenyl-*k*C]iridium(III) hexafluorophosphate, 99% (870987-63-6)

$[\text{Ir}(\text{C}_{18}\text{H}_{24}\text{N}_2)(\text{C}_{12}\text{H}_8\text{F}_5\text{N})_2]^+\text{PF}_6^-$; FW: 1121.91; yellow xtl.

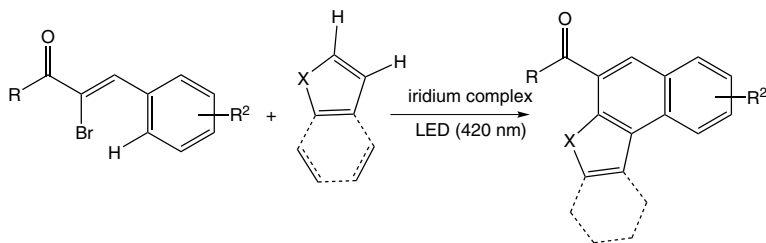
Note: Photocatalyst



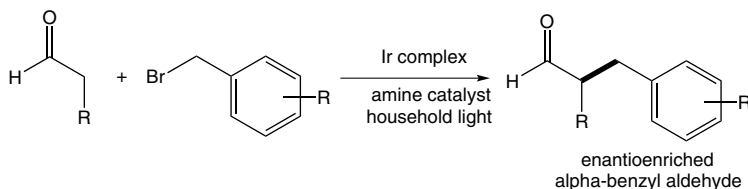
50mg
250mg
1g

Technical Notes:

- Visible light photoredox-catalyzed cascade cyclizations of α -bromoaldehydes or α -bromocinnamates with heteroarenes.
- Enantioselective α -benzylation of aldehydes via photoredox organocatalysis.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

- Adv. Synth. Cat.*, **2014**, 356, 557
- J. Amer. Chem. Soc.*, **2010**, 132, 13600

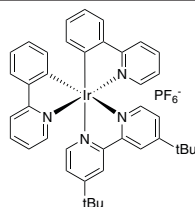
77-0410

NEW

(4,4'-Di-*t*-butyl-2,2'-bipyridine)bis[2-(2-pyridinyl-*k*N)phenyl-*k*C]iridium(III) hexafluorophosphate, 99% (676525-77-2)

$[\text{Ir}(\text{C}_{18}\text{H}_{24}\text{N}_2)(\text{C}_{11}\text{H}_8\text{N})_2]^+\text{PF}_6^-$; FW: 913.95; yellow xtl.

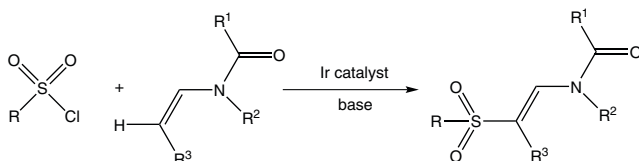
Note: Photocatalyst



100mg
500mg

Technical Notes:

- This Iridium catalyst is used in the synthesis of β -amidovinyl sulfones via visible-light photoredox catalysis.
- Numerous uses of this photoredox catalyst are reported (see Ref. 2).



Tech. Note (1)
Ref. (1)

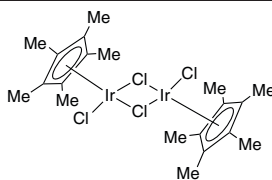
References:

- Adv. Synth. Cat.*, **2013**, 355, 809
- Chem. Rev.*, **2013**, 113, 5322, review

IRIDIUM (Compounds)

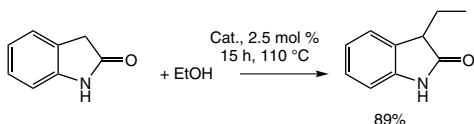
77-1060 Dichloro(pentamethylcyclopentadienyl) iridium(III) dimer, 98% (12354-84-6)
 $[(CH_3)_5C_5IrCl_2]_2$; FW: 796.67; orange xtl.
 Note: CATHy™ Catalyst Kit component.

100mg
 500mg
 2g

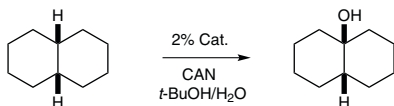


Technical Notes:

1. Iridium-catalyzed C-3 alkylation of oxindole with alcohols.
2. Precursor to N-heterocyclic carbene catalyst effective for hydrogenation and alkylation of amines and alcohols.
3. Precursor to efficient phosphine free catalyst for enantioselective hydrogenation of quinoline derivatives.
4. Catalyst for oxidative C–H activation.
5. Precursor to an effective water oxidation catalyst.



Tech. Note (1)
 Ref. (1)



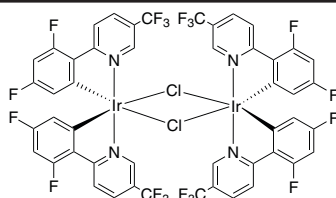
Tech. Note (4)
 Ref. (4)

References:

1. *Tetrahedron*, **2009**, 65, 4375
2. *Organometallics*, **2009**, 321
3. *Org Lett.*, **2008**, 5265
4. *J. Am. Chem. Soc.*, **2010**, 132, 12550
5. *Organometallics*, **2011**, 30, 965

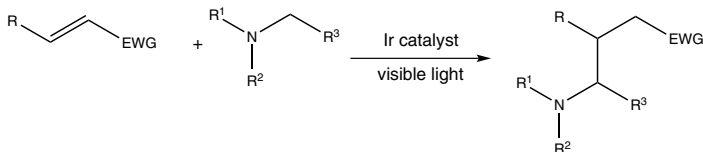
77-0468 Di- μ -chlorotetrakis[3,5-difluoro-2-(2-trifluoromethyl-2-pyridinyl-kN)phenyl-kC]diiridium(III), 99%
 (870987-64-7)
 $C_{48}H_{20}Cl_2F_{20}Ir_2N_4$; FW: 1488.01;
 yellow xtl.
 Note: Precursor for Photocatalyst Synthesis

50mg
 250mg



Technical Note:

1. Addition to electron-deficient alkenes using a photoredox catalyst.



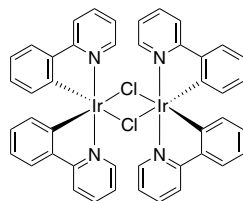
Tech. Note (1)
 Ref. (1)

References:

1. *J. Am. Chem. Soc.*, **2012**, 134, 3338.

77-0455 Di- μ -chlorotetrakis[2-(2-pyridinyl-kN)phenyl-kC]diiridium(III), 99%
 (603109-48-4)
 $C_{44}H_{32}Cl_2Ir_2N_4$; FW: 1072.09;
 yellow-green xtl.
 Note: Precursor for Photocatalyst Synthesis

250mg
 1g



Technical Note:

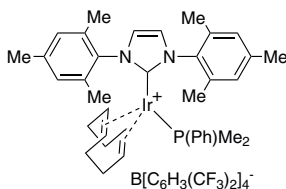
1. Iridium complex is a photoredox precatalyst having numerous uses in electroluminescent materials and devices, organic light-emitting diodes, display devices and chemosensors.

IRIDIUM (Compounds)

77-1850

NEW

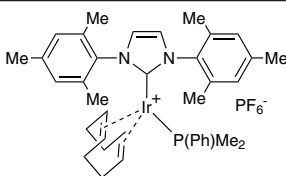
Dimethylphenylphosphine(1,5-cyclooctadiene)[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]iridium(I) tetrakis(3,5-bis(trifluoromethyl)phenyl)borate, min. 98% (1884137-92-1)
 $C_{37}H_{47}IrN_2P(C_{32}H_{17}BF_3)_4$; FW: 1606.18; red solid; m.p. 146-149



100mg
500mg

77-1830

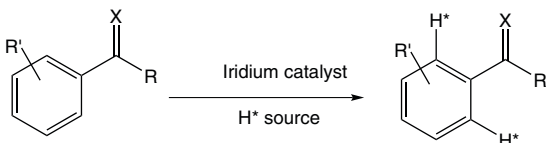
(Dimethylphenylphosphine)(1,5-cyclooctadiene)[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]iridium(I) hexafluorophosphate, min. 98% (1019853-03-2)
 $[Ir(C_8H_{12})(C_{21}H_{24}N_2)(C_6H_{11}P)]^+PF_6^-$; FW: 887.93; red xtl.



100mg
500mg

Technical Notes:

- Highly active iridium(I) complex used for catalytic hydrogen isotope exchange.
- Highly active iridium(I) complex used for catalytic hydrogenation processes.



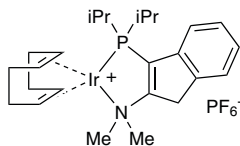
Tech. Note (1)
Ref. (1,2)

References:

- Chem. Commun.*, **2008**, 1115.
- J. Label. Compd. Radiopharm.*, **2010**, 53, 662.
- Chem. Commun.*, **2011**, 47, 11653.

77-1115

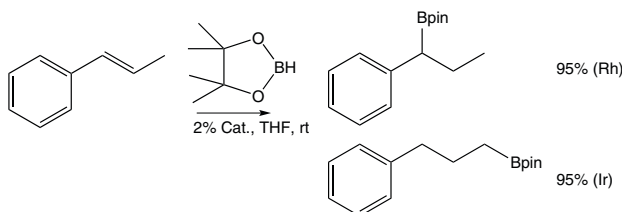
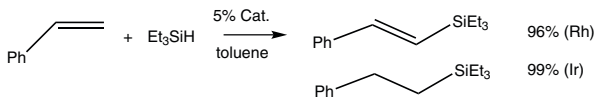
3-Di-i-propylphosphino-2-(N,N-dimethylamino)-1H-indene(1,5-cyclooctadiene)iridium(I) hexafluorophosphate, min. 98% (870077-94-4)
 $[IrC_{25}H_{38}NP]^+PF_6^-$; FW: 720.73; orange powdr.



250mg
1g

Technical Note:

- Zwitterionic hydrogenation, hydrosilylation and hydroboration catalyst soluble in non-polar solvents.



References:

- Organometallics*, **2007**, 26, 594
- Organometallics*, **2006**, 25, 5965

IRIDIUM (Compounds)

77-2510

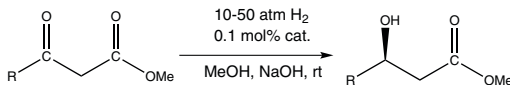
NEW

{{(R)-(+)-7-[N-(1,3-Dithian-2-yl)methylamino]-7'-[bis(3,5-di-*t*-butylphenyl)phosphino]-2,2',3,3'-tetrahydro-1,1'-spirobindane} chlorodihydroiridium(III), 97+% [Ir-(R)-DTB-SpiroSAP]

C₅₀H₆₈ClIrNPS₂; FW: 1005.86; pale yellow solid

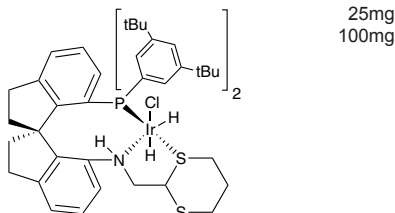
Technical Note:

- Catalyst used for the asymmetric hydrogenation of β-alkyl-β-ketoesters.



R = alkyl, aryl

91-96% yield
95-99.9% ee
TON up to 355,000



25mg
100mg

Tech. Note (1)
Ref. (1)

References:

- Angew. Chem. Int. Ed.*, 2015, 54, 8791

77-2511

NEW

{{(S)-(-)-7-[N-(1,3-Dithian-2-yl)methylamino]-7'-[bis(3,5-di-*t*-butylphenyl)phosphino]-2,2',3,3'-tetrahydro-1,1'-spirobindane} chlorodihydroiridium(III), 97+% [Ir-(S)-DTB-SpiroSAP]

C₅₀H₆₈ClIrNPS₂; FW: 1005.86; pale yellow solid

Technical Note:

- See 77-2510 (page 68)

96-3745

Iridicycle Catalyst Kit

See page 342

96-7780

Iridium Photocatalyst Kit

See page 343

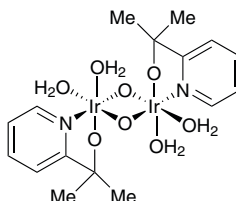
77-0025

NEW

[2-(Pyridine-2-yl)-2-propanato]iridium(IV) dimer solution 97% (1 mM in 0.1 Molar aqueous NaIO₃) (1446713-81-0)

C₁₆H₂₈IrNO₃; FW: 728.84; blue liq.

Note: Sold under license from Catalytic Innovations, LLC for research purposes only. US Patent Publication No. US20150021194 A1.



10ml
50ml

Standard Operating Procedure

Heterogenization of the material is straightforward and can be performed in air, at ambient temperature, with no additives, applied potential or other treatment required. For most carbon-based or metal oxide substrates:

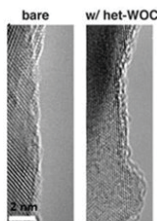
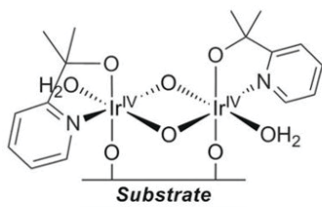
- Dip substrate in het-WOC deposition solution (or disperse powders, if powder).
- Wait 4-12 hours (typically overnight).
- Remove substrate from solution (or filter out powder) and rinse with clean water.

This will cause the monolayer Ir material to be deposited on the substrate, with a surface structure as shown¹ (TEM image on iron oxide shown to the right):

The het-WOC deposition solution may be diluted, in order to increase its coverage over large substrates. As stated in the SDS, the het-WOC deposition solution it is mostly comprised of water, therefore dilution with water is best. It can also be re-used repeatedly to load multiple substrates with the Ir monolayer – each loading only uses a small amount of the Ir present in solution, depending on surface area of substrate.

IRIDIUM (Compounds)

77-0025 [2-(Pyridine-2-yl)-2-propanato]iridium(IV) dimer solution 97%
 (continued) (1 mM in 0.1 Molar aqueous NaIO₃) (1446713-81-0)

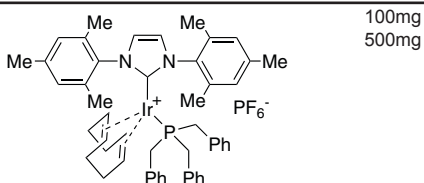


References:

1. *J. Am. Chem. Soc.*, **2013**, *135*, 10837.
2. *J. Am. Chem. Soc.*, **2014**, *136*, 13826.
3. *Nat. Commun.*, **2015**, *6*, 6469.
4. *Angew. Chem. Int. Ed.*, **2015**, *54*, 11428.
5. *Energy Environ. Sci.*, **2016**, *9*, 1794.

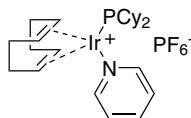
96-7710 SpinPHOX-Ir Catalyst Kit for enantioselective hydrogenation
 See page 348

77-1810 Tribenzylphosphine(1,5-cyclooctadiene) [1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]iridium(I) hexafluorophosphate, min. 98% (1019853-01-0)
 [Ir(C₈H₁₂)(C₂₁H₂₄N₂)(C₂₁H₂₁P)]⁺PF₆⁻;
 FW: 1054.15; red xtl.



100mg
500mg

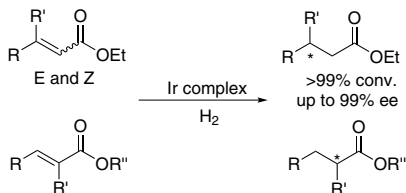
77-9500 (Tricyclohexylphosphine)(1,5-cyclooctadiene) (pyridine)iridium(I)hexafluorophosphate, 99%
CRABTREE'S CATALYST (64536-78-3)
 [(C₆H₁₁)₃P][C₈H₁₂][C₅H₅N]Ir⁺PF₆⁻; FW: 804.89;
 orange xtl.
moisture sensitive



50mg
250mg
1g

Technical Notes:

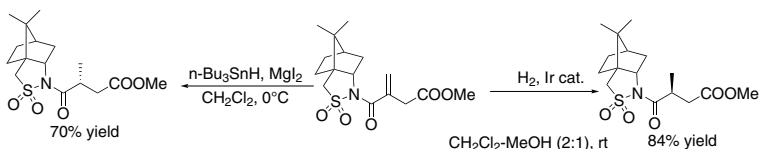
1. Iridium catalyst used for the highly enantioselective hydrogenation of α,β -unsaturated esters.
2. Iridium catalyst used for the stereoselective catalytic hydrogenation and conjugate reduction of 4-methylitaconate derivatives bearing a chiral auxiliary.
3. Iridium catalyst used in the synthesis of thiophene-based TAK-779 analogues via C-H arylation.
4. Iridium catalyst used in the practical synthetic approach to chiral (α -chloroalkyl)boronic esters via an iridium-catalyzed, chemoselective hydrogenation of chloro-substituted alkenyl boronates.
5. Iridium catalyst used in the regioselective C-H activation and hydrogen-isotope exchange of non-aromatic unsaturated functionality.



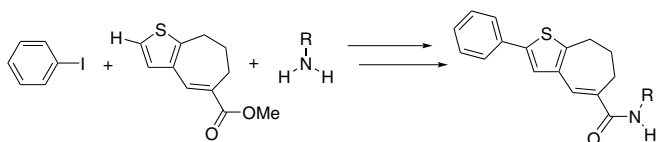
Tech. Note (1)
 Ref. (1)

IRIDIUM (Compounds)

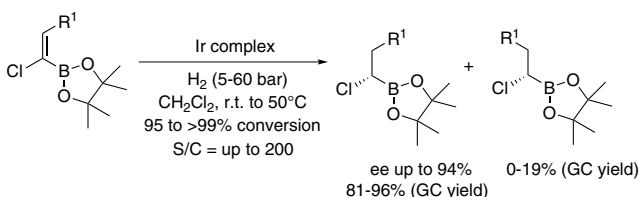
77-9500 (Tricyclohexylphosphine)(1,5-cyclooctadiene)(pyridine)iridium(I)hexafluorophosphate, **(continued)** **99% CRABTREE'S CATALYST** (64536-78-3)



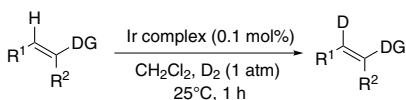
Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)

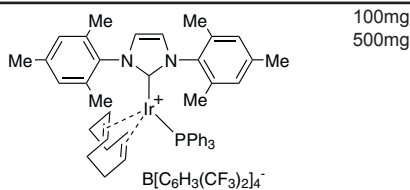


Tech. Note (5)
Ref. (5)

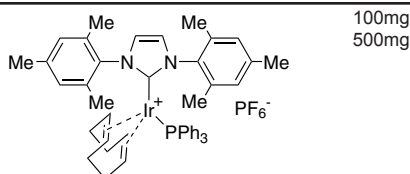
References:

1. *Chemistry-A Eur. J.*, **2012**, *18*, 10609.
2. *Tetrahedron*, **2013**, *69*, 3486
3. *J. Org. Chem.*, **2013**, *78*, 5579.
4. *Synthesis***2013**, *45*, 2824.
5. *Chemistry-A Eur. J.*, **2014**, *20*, 14604.

77-1840 **NEW** **Triphenylphosphine(1,5-cyclooctadiene) [1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]iridium(I) tetrakis(3,5-bis(trifluoromethyl)phenyl)borate, min. 98%** (1628471-64-6)
 $\text{C}_{47}\text{H}_{51}\text{IrN}_2\text{P}(\text{C}_{22}\text{H}_{12}\text{BF}_6)_4$; FW: 1730.32; red solid; m.p. > 156C (dec)



77-1825 **Triphenylphosphine(1,5-cyclooctadiene) [1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]iridium(I) hexafluorophosphate, min. 98%** (1019853-00-9)
 $[\text{Ir}(\text{C}_8\text{H}_{12})(\text{C}_{21}\text{H}_{24}\text{N}_2)(\text{C}_{18}\text{H}_{15}\text{P})]\cdot\text{PF}_6^-$; FW: 1012.08; red xtl.



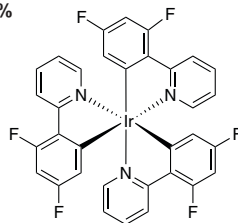
IRIDIUM (Compounds)

77-7030

NEW

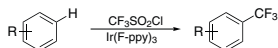
Tris[2-(2,4-difluorophenyl)pyridine]iridium(III), 95%
 (387859-70-3)
 $C_{33}H_{18}F_6IrN_3$; FW: 762.72; yellow pwdr.
air sensitive
 Note: Photocatalyst

50mg
250mg

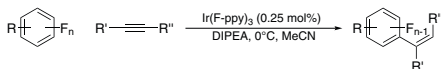


Technical Notes:

1. Photoredox catalysis for trifluoromethylation of arenes and heteroarenes.
2. Photocatalyst for C–F alkenylation coupling reactions between perfluoroarenes and alkynes.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

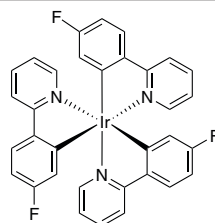
1. *Nature*, **2011**, 480, 224.
2. *Chem. Sci.*, **2016**, 7, 6796.

77-6100

NEW

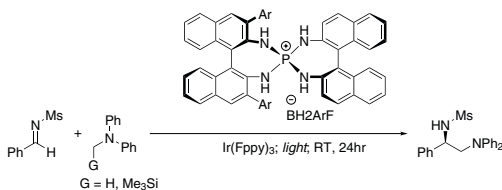
Tris[5-fluoro-2-(2-pyridinyl-kN)phenyl-kC] iridium(III), 95% (370878-69-6)
 $C_{33}H_{21}F_3IrN_3$; FW: 708.75; yellow pwdr.
air sensitive
 Note: Photocatalyst

50mg
250mg

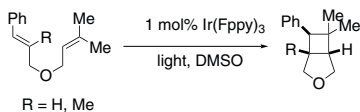


Technical Notes:

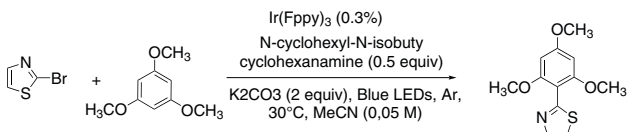
1. Photosensitizer for the enantioselective coupling reaction between (N-arylamino)methanes and (N-methanesulfonyl)-aldimines catalyzed by P-Spiro chiral (arylamino)phosphonium catalyst.
2. Photocatalyst for [2+2] styrene cycloadditions.
3. Photocatalyst for azoylation of trimethoxybenzene by via C–H functionalization.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

References:

1. *J. Org. Chem.*, **2016**, 81, 6953.
2. *Chem. Sci.*, **2016**, 7, 6796.
3. *Org. Lett.*, **2016**, 18, 3996.

IRIDIUM (Compounds)

77-7015

Tris(2-phenylpyridinato-C2,N)iridium(III), 95%

(94928-86-8)

C₃₃H₂₄IrN₃; yellow powdr.

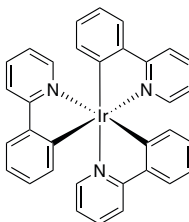
air sensitive

Note: Photocatalyst

NEW

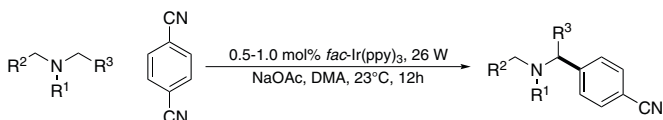
50mg

250mg

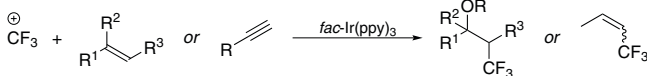


Technical Notes:

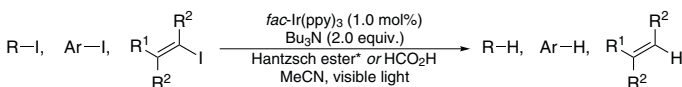
1. Photocatalyst for α -amino C–H arylation of cyano(hetero) arenes by tertiary amines
2. Photocatalyst for trifluoromethylation of alkenes and alkynes
3. Photocatalyst for reduction of alkyl, alkenyl, aryl iodides (a) and intramolecular reductive cyclizations (d)
4. Photocatalyst for organocatalyst assisted direct arylation of allylic sp³ C–H bonds
5. Photocatalyst for the generation multifluorinated biaryls via functionalization of the C–F bond of a perfluoroarene and C–H bond of the other arene in the presence of amines
6. Photocatalyst for visible-light photoredox arylation of thiols with various aryl halides



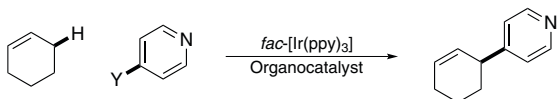
Tech. Note (1)
Ref. (1)



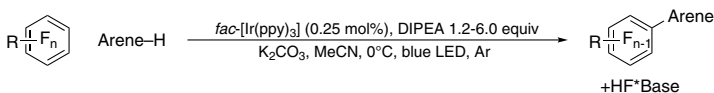
Tech. Note (2)
Ref. (2,3)



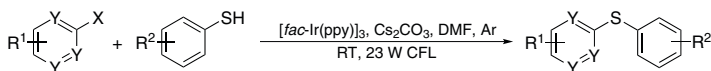
Tech. Note (3)
Ref. (4)



Tech. Note (4)
Ref. (5)



Tech. Note (5)
Ref. (6)



Tech. Note (6)
Ref. (7)

X=I, Br, Cl, F
Y=CH, N

References:

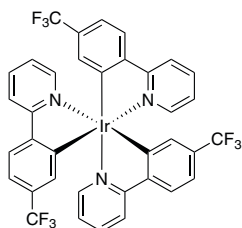
1. *Science* **2011**, 334, 1114
2. *Angew. Chem. Int. Ed.* **2012**, 51, 9567
3. *Angew. Chem. Int. Ed.* **2014**, 53, 539
4. *Nat. Chem.* **2012**, 4, 854
5. *Nature* **2015** 519, 74
6. *J. Am. Chem. Soc.* **2016**, 138, 2520
7. *Angew. Chem. Int. Ed.* **2017**, 56, 874

IRIDIUM (Compounds)

77-6580

NEW

Tris[(2-(2-pyridinyl-kN)-5-(trifluoromethyl)phenyl-kC]iridium(III), 95% (500295-52-3)
 $C_{36}H_{21}F_9IrN_3$; FW: 858.78; yellow solid
air sensitive
 Note: Photocatalyst



50mg
250mg

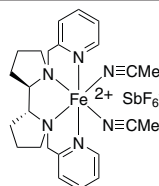
IRON (Compounds)

45-0205

1,1'-Bis(di-i-propylphosphino)ferrocene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (157772-65-1)
 See page 199

26-0061

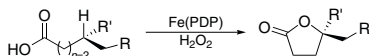
(2R,2'R)-(-)-[N,N'-Bis(2-pyridylmethyl)-2,2'-bipyrolidinebis(acetonitrile)iron(II) hexafluoroantimonate Fe(R,R-PDP) White-Chen Catalyst (1361315-26-5)
 $[C_{24}H_{32}FeN_6](SbF_6)_2$; FW: 931.90; purple pwdr.
air sensitive
 Note: Patent pending.



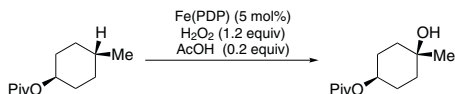
100mg
500mg

Technical Note:

1. Metal complex used in the iron-catalyzed, selective oxidation of C-H bonds



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (2)

References:

1. *Nat. Chem.*, 2011, 3, 216.
2. *Science*, 2012, 335, 807.

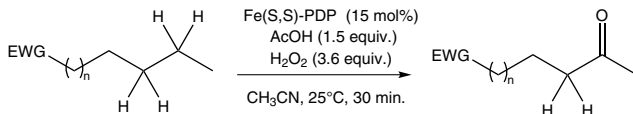
26-0060

(2S,2'S)-(-)-[N,N'-Bis(2-pyridylmethyl)-2,2'-bipyrolidinebis(acetonitrile)iron(II) hexafluoroantimonate Fe(S,S-PDP) White-Chen Catalyst (959395-10-9)
 $[C_{24}H_{32}FeN_6] \cdot 2 (SbF_6)_2$; FW: 931.90; purple pwdr.
air sensitive
 Note: Patent pending.

100mg
500mg

Technical Note:

1. Metal complex used in the iron-catalyzed, selective oxidation of C-H bonds.



Tech. Note (1)
Ref. (1)

yield: ~50%

References:

1. *Science*, 2010, 327, 566

IRON (Compounds)

26-0873

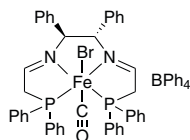
NEW

Bromocarbonyl[(1*S*,2*S*)-2,3-diphenylethylenediamine-*N,N'*-bis(2-diphenylphosphinoethylidene)] iron(II) tetrakisbromate, FeATHER-II Catalyst (1257252-03-1)

C₆₇H₆₅BBrFeN₂OP₂; FW: 1122.75; yellow pwdr.

air sensitive, moisture sensitive

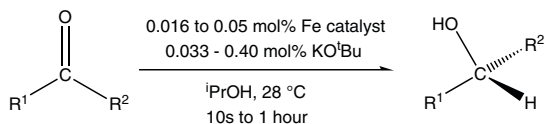
Note: Sold in collaboration with GreenCentre for research purposes only. Patents: PCT/CA2013/050405, PCT 2013/010275.



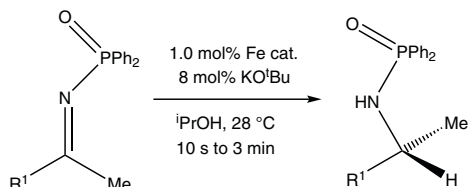
100mg
500mg

Technical Note:

1. Catalyst used in the transfer hydrogenation of ketones and imines.



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)

References:

1. *Science*, 2013, 342, 1080.

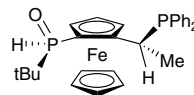
26-1270

(*R,S*(p), *R*(*S*P*O*)-(1-*t*-Butylphosphino)ethyl)-2-[1-(diphenylphosphino)ethyl]ferrocene, min. 97% JoSPOphos (1221745-90-9)

C₂₈H₃₂FeOP₂; FW: 502.35; orange pwdr.

(store cold)

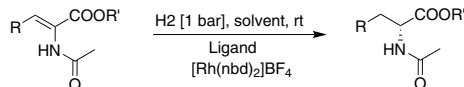
Note: Sold in collaboration with Solvias for research purposes only.



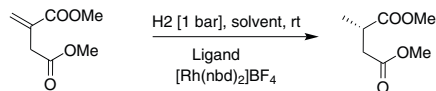
100mg
500mg
2g
10g

Technical Notes:

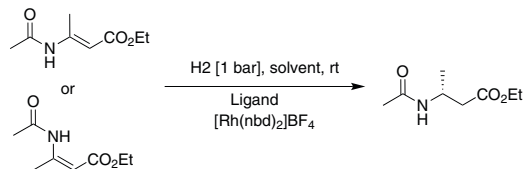
1. Ligands used for the Rh-catalyzed asymmetric hydrogenation of functionalized alkenes.
2. Ligands used for the Ru-catalyzed asymmetric hydrogenation of β-ketoesters.
3. Ligands used for the Rh-catalyzed asymmetric hydrogenation of α-ketoesters.
4. Ligand for the highly selective coupling of benzotriazoles with allenes.



Tech. Note (1)
Ref. (1)

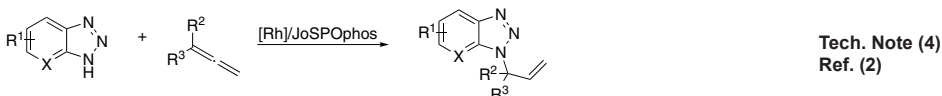
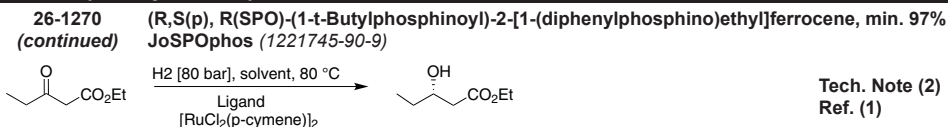


Tech. Note (1)
Ref. (1)



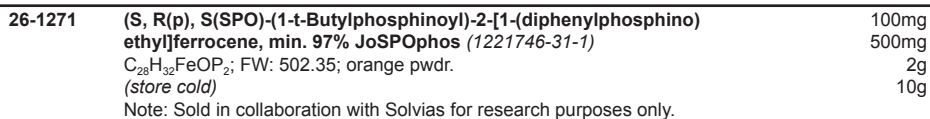
Tech. Note (1)
Ref. (1)

IRON (Compounds)



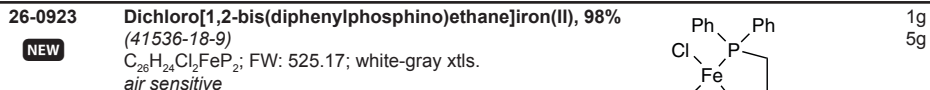
References:

1. *Angew. Chem. Int. Ed.*, **2010**, 49, 6873.
2. *Angew. Chem. Int. Ed.*, **2014**, 53, 7268.



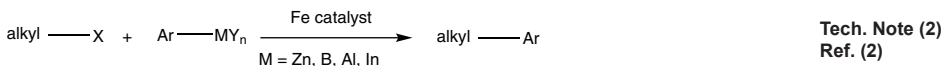
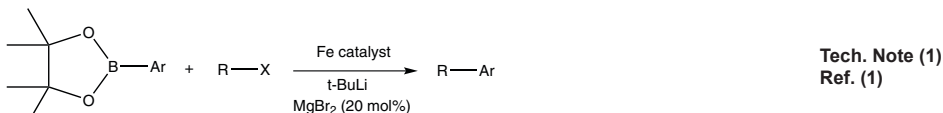
Technical Note:

1. See 26-1270 (page 74)



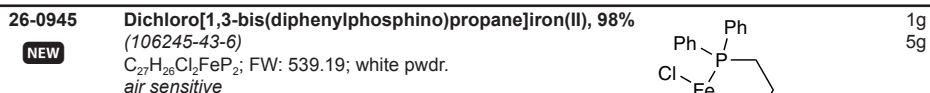
Technical Notes:

1. Catalyst used for the coupling of alkyl, benzyl and allyl halides with arylboronic esters.
2. Catalyst used for general cross-coupling reactions.



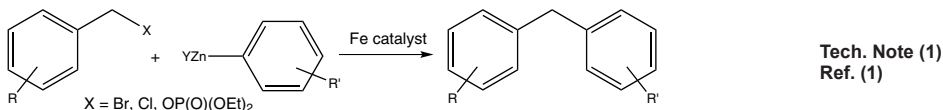
References:

1. *Chem. Eur. J.*, **2014**, 20, 7935
2. *Angew. Chem. Int. Ed.*, **2013**, 52, 1285



Technical Notes:

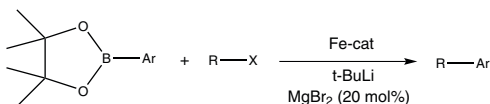
1. Iron precatalyst used in the cross-coupling of benzylhalides and phosphates.
2. Expedient iron-catalyzed coupling of alkyl, benzyl and allyl halides with arylboronic esters.



IRON (Compounds)

26-0945 Dichloro[1,3-bis(diphenylphosphino)propane]iron(II), 98% (106245-43-6)

(continued)



Tech. Note (2)
Ref. (1)

R = alkyl, benzyl, allyl

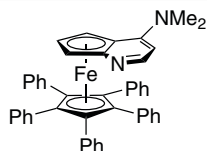
References:

1. *Chem. Commun.*, **2009**, 5, 600
2. *Chem-Eur. J.*, **2014**, 20, 7935

26-1410 (R)-(+)-4-Dimethylaminopyrindinyl(pentaphenylcyclopentadienyl)iron, min. 98% (R)-C₅Ph₅-DMAP (187682-64-0)

C₄₅H₃₆FeN₂; FW: 660.60; purple xtl.; m.p. 231-234°

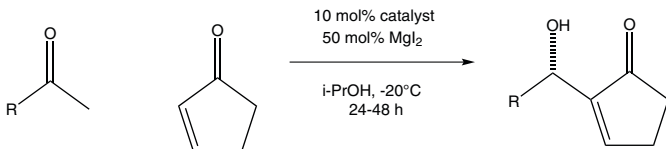
Note: Limited quantities available.



100mg

Technical Notes:

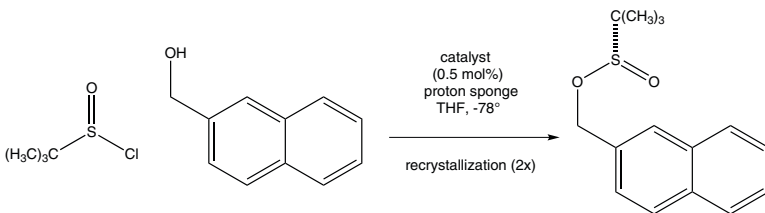
1. Catalyst used for the magnesium iodide-accelerated enantioselective Morita-Baylis-Hillman reactions of cyclopentenone.
2. Catalyst used for the enantioselective synthesis of sulfinate esters through dynamic resolution.



Tech. Note (1)
Ref. (1)

R = aromatic or aliphatic

yields up to 96%
ees up to 98%



Tech. Note (2)
Ref. (2)

61% yield
(>99% ee)

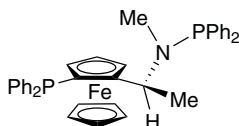
References:

1. *J. Chem. Soc. Chem. Comm.*, **2010**, 46, 2644
2. *J. Am. Chem. Soc.*, **2004**, 126, 8134

26-2515 (R)-1-[(S)-2-Diphenylphosphinoferrocenyl](N-methyl)(N-diphenylphosphino)ethylamine (R)-Me-Bophoz (406680-94-2)

C₃₇H₃₅FeNP₂; FW: 611.50; yellow solid

Note: Sold in collaboration with JM for research purposes only.



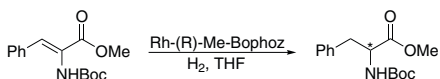
100mg
500mg

Technical Notes:

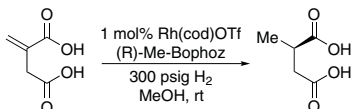
1. Ligand for Rhodium-catalyzed asymmetric hydrogenation of dehydro- α -amino acid derivatives.
2. Ligand for Rhodium-catalyzed asymmetric hydrogenation of itaconate derivatives.
3. Ligand for Iridium-catalyzed asymmetric hydrogenation in the synthesis of an α,β integrin antagonist intermediate.
4. Ligand for Rhodium-catalyzed asymmetric hydrogenation of β -amino-vinylphosphonates to β -aminophosphonates

IRON (Compounds)

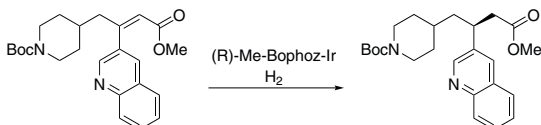
26-2515 (R)-1-[(S)-2-Diphenylphosphinoferrocenyl](N-methyl)(N-diphenylphosphino)ethylamine
 (continued) (R)-Me-Bophoz (406680-94-2)



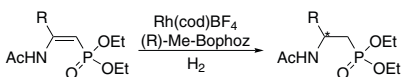
Tech. Note (1)
 Ref. (1)



Tech. Note (2)
 Ref. (2)



Tech. Note (3)
 Ref. (3)



Tech. Note (4)
 Ref. (4)

References:

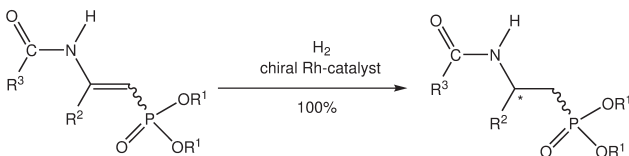
1. *Org. Lett.*, **2002**, 4, 2421.
2. *J. Org. Chem.*, **2005**, 70, 1872.
3. *Tetrahedron: Asymmetry*, **2008**, 938.
4. *Tetrahedron: Asymmetry*, **2008**, 1189.

26-2516 (S)-1-[(R)-2-Diphenylphosphinoferrocenyl](N-methyl)(N-diphenylphosphino)ethylamine (S)-Me-Bophoz (406681-09-2)
 C₃₇H₃₅FeNP₂; FW: 611.50; yellow solid
 Note: Sold in collaboration with JM for research purposes only.

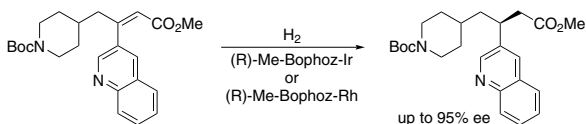
100mg
 500mg

Technical Notes:

1. Ligand used in the rhodium-catalyzed, asymmetric hydrogenation of β-amido-vinylphosphonates.
2. Ligand used in the rhodium or iridium-catalyzed asymmetric hydrogenation of α,β-unsaturated esters.



Tech. Note (1)
 Ref. (1)

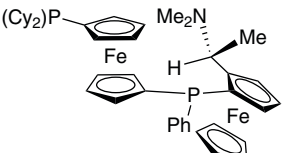


Tech. Note (2)
 Ref. (2)

References:

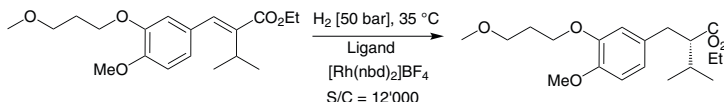
1. *Tetrahedron Asymm.*, **2008**, 19, 1189.
2. *Tetrahedron Asymm.*, **2008**, 19, 938.

IRON (Compounds)

26-1266	<p>1-[(R)-Ferrocenyl-2-(S)-ethyl-1-dimethylamino)phenyl]-(R)-phosphino)-1'-dicyclohexylphosphinoferrocene, min. 97% Chenphos (952586-19-5) $C_{42}H_{53}Fe_2NP_2$; FW: 745.51; orange powdr. Note: Sold in collaboration with Solvias for research purposes only.</p>		<p>100mg 500mg 2g 10g</p>
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Technical Note:

1. Ligand used for the Rh-catalyzed asymmetric hydrogenation of α -substituted acrylic acids.



Tech. Note (1)
Ref. (1)

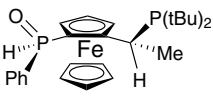
References:

1. Patent number US 8,106,227, B2.

26-1265	<p>1-[(S)-Ferrocenyl-2-(R)-ethyl-1-dimethylamino)phenyl]-(S)-phosphino)-1'- dicyclohexylphosphinoferrocene, min. 97% Chenphos (1036373-39-3) $C_{42}H_{53}Fe_2NP_2$; FW: 745.51; orange powdr. Note: Sold in collaboration with Solvias for research purposes only.</p>	<p>100mg 500mg 2g 10g</p>
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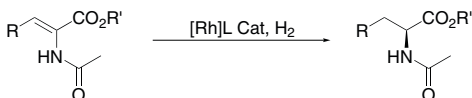
Technical Note:

1. See 26-1266 (page 78)

26-1268	<p>(R,S(p), R(SPO)-1-Phenylphosphino)-2-[1-(di-t-butylphosphino)ethyl]ferrocene, min. 97% JoSPOphos (1221746-66-2) $C_{26}H_{36}FeOP_2$; FW: 482.36; orange powdr. (store cold) Note: Sold in collaboration with Solvias for research purposes only.</p>		<p>100mg 500mg 2g 10g</p>
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Technical Notes:

1. Ligands used for the rhodium-catalyzed asymmetric hydrogenation of functionalized alkenes, α - and β -ketoesters.
2. Ligand for rhodium -catalyzed enantioselective formation of tertiary and quaternary allylic C–N bonds via allylation of tetrazoles.
3. Ligand for rhodium-catalyzed highly regio- and enantioselective addition of pyrazoles to terminal allenes.

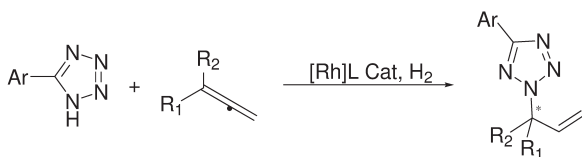


Tech. Note (1)
Ref. (1)

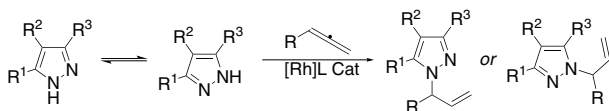


IRON (Compounds)

26-1268 (R,S(p), R(SPO)-1-Phenylphosphinoyl)-2-[1-(di-t-butylphosphino)ethyl]ferrocene, min. 97% (continued) JoSPOphos (1221746-66-2)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3,4)

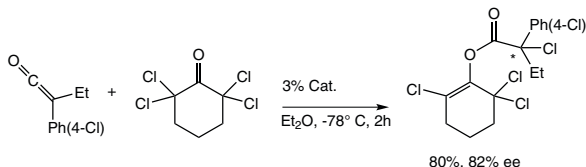
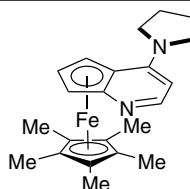
References:

1. *Angew. Chem. Int. Ed.*, **2010**, *49*, 6873.
2. *Chem. Commun.*, **2015**, *51*, 10861.
3. *Angew. Chem. Int. Ed.*, **2015**, *54*, 7149.
4. *Chem. Eur. J.*, **2016**, *22*, 6547.

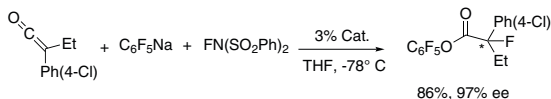
26-3700 (R)-(+)-4-Pyrrolidinopyrindinyl(pentamethylcyclopentadienyl) iron, min. 98% (R)-PPY* (217459-10-4)
C₂₂H₂₈FeN₂; FW: 376.30; dark red xtl.; m.p. 163-164°
Note: Limited quantities available. 100mg

Technical Notes:

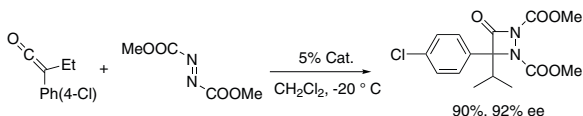
1. Planar-chiral catalyst useful in a variety of enantioselective addition and cycloaddition reactions of ketenes.
2. For a review on nucleophilic catalysis using planar-chiral derivatives of DMAP, see Ref (4).



Tech. Note (1)
Ref. (1)



Ref. (2)



Ref. (3)

References:

1. *Angew. Chem. Int. Ed.*, **2007**, *46*, 977
2. *J. Am. Chem. Soc.*, **2014**, *136*, 8899
3. *Angew. Chem., Int. Ed.*, **2008**, *47*, 7048
4. *Acc. Chem. Res.*, **2004**, *37*, 542

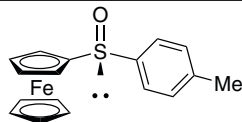
26-3701 (S)-(-)-4-Pyrrolidinopyrindinyl(pentamethylcyclopentadienyl)iron, min. 98% (S)-PPY* (217459-11-5)
C₂₂H₂₈FeN₂; FW: 376.30; dark red xtl.; m.p. 163-164°
Note: Limited quantities available. 100mg

Technical Note:

1. See 26-3700 (page 79)

IRON (Compounds)

26-3705 (R)-(-)-(p-Toluenesulfinyl)ferrocene, min. 98% (130225-27-3)
 $C_{17}H_{16}FeOS$; FW: 324.22; orange powdr.; m.p. 143°



100mg
500mg

Technical Note:

- Starting material for the synthesis of a variety of ferrocene-based catalysts.

References:

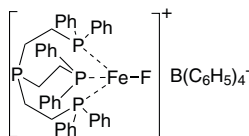
- Org. Lett.*, **2007**, 9, 3089
- J. Org. Chem.*, **2005**, 70, 8332
- Angew. Chem. Int. Ed.*, **2002**, 41, 4708

26-3706 (S)-(+)-(p-Toluenesulfinyl)ferrocene, min. 98% (164297-25-0)
 $C_{17}H_{16}FeOS$; FW: 324.22; orange powdr.; m.p. 143°

Technical Note:

- See 26-3705 (page 80)

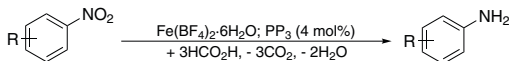
26-3955 Tris[[2-(diphenylphosphino)ethyl]phosphine] (fluoro)iron(II) tetraphenylborate, min. 98% (NEW)
 $C_{66}H_{62}FeBFP_4$; FW: 1064.75; purple solid



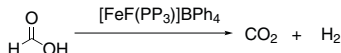
100mg
500mg

Technical Notes:

- Catalyst for base free reductive hydrogenation of nitroarenes to anilines.
- Catalyst for hydrogen generation from formic acid.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

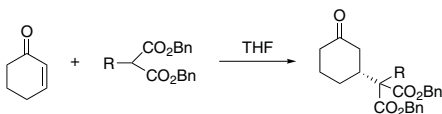
- J. Am. Chem. Soc.*, **2011**, 133, 12875.
- Chem. Eur. J.*, **2014**, 20, 13589.

LANTHANUM (Compounds)

57-0201 Di-[3-(S)-2,2'-dihydroxy-1,1'-binaphthylmethyl]ether, lanthanum(III) salt, tetrahydrofuran adduct SCT-(S)-BINOL (293293-33-1)
 $C_{42}H_{27}LaO_5 \cdot C_4H_8O$; FW: 750.58 (822.69); pale yellow powdr.

Technical Note:

- Stable, reusable complex for the catalytic, asymmetric Michael reaction.

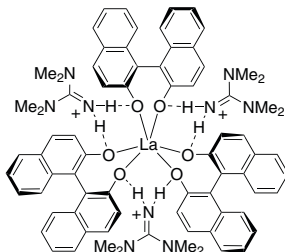


R= H, alkyl

References:

- J. Am. Chem. Soc.*, **2000**, 112, 6506
- Tetrahedron Lett.*, **2002**, 43, 4661

57-1250 Tris[N,N,N-tetramethylguanidinium] [tris(1S)-(1,1'-binaphthalene)-2,2'-diolato] lanthanate La-HTMG-B (1611526-71-6) (NEW)
 $C_{75}H_{78}N_6O_6La$; FW: 1340.38; tan powdr.
 Note: U.S. Patent 14/898,925.



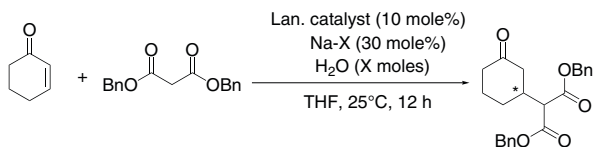
250mg
1g

Technical Notes:

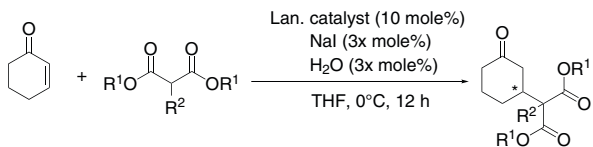
- Catalyst used for an asymmetric Michael addition.
- Catalyst used for an asymmetric Michael addition of 1,3-dicarbonyls to enones.
- Catalyst used for the asymmetric aza-Michael addition of methylhydroxylamine to chalcone derivatives.
- Catalyst used for the asymmetric direct aldol reaction of acetophenone and pivaldehyde.

LANTHANUM (Compounds)

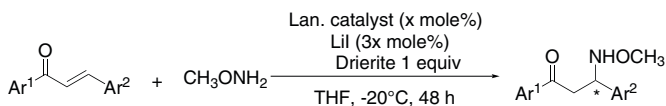
57-1250 Tris[N,N,N,N-tetramethylguanidinium][tris(1S)-(1,1'-binaphalene)-2,2'-diolato]lanthanate
(continued) La-HTMG-B (1611526-71-6)



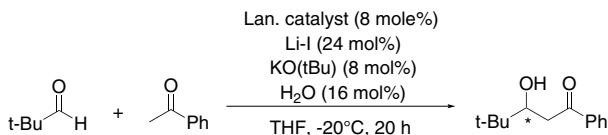
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (1)



Tech. Note (4)
Ref. (1)

References:

1. *J. Am. Chem. Soc.*, **2014**, 136, 8034.

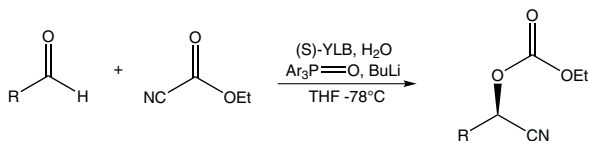
LITHIUM (Compounds)

03-2010 Lithium tris(S-(-)-1,1'-binaphthyl-2,2'-diolato)yttrate(III) tetrahydrofuran adduct, min. 97% (500995-67-5)
3Li⁺[(C₂₀H₁₂O₂)₃Y]³⁻·XC₄H₈O; FW: 962.65; white powdr.
hygroscopic

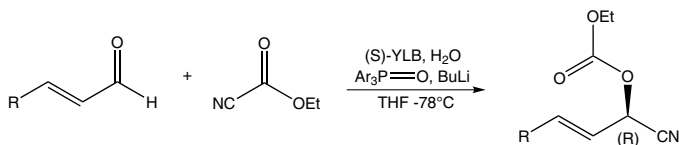
250mg
1g

Technical Notes:

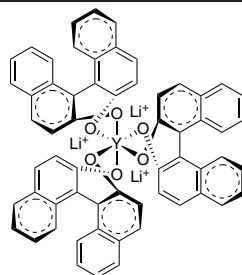
1. Catalyst used for the asymmetric cyano-ethoxycarbonylation reaction of aldehydes.
2. Catalyst used for the efficient, two-step conversion of α,β -unsaturated aldehydes to optically active γ -oxy- α,β -unsaturated nitriles.
3. Catalyst used for the asymmetric 1,4-addition of O-alkylhydroxyamine to enones.



Tech. Note (1)
Ref. (1)

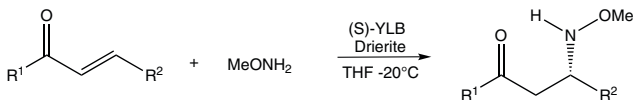


Tech. Note (2)
Ref. (2)



LITHIUM (Compounds)

03-2010 Lithium tris(S-(-)-1,1'-binaphthyl-2,2'-diolato)yttrate(III) tetrahydrofuran adduct, min. 97%
(continued) (500995-67-5)



Tech. Note (3)
 Ref. (3)

References:

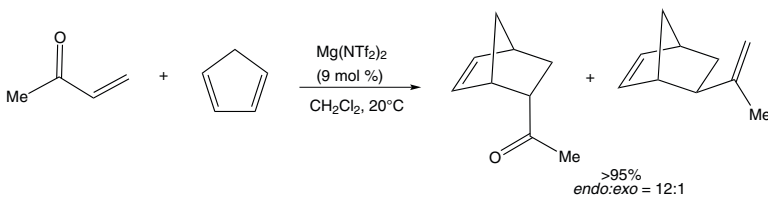
1. *J. Am. Chem. Soc.*, **2005**, 127, 3413
2. *Org. Lett.*, **2003**, 5, 3021
3. *J. Am. Chem. Soc.*, **2003**, 125, 16178

MAGNESIUM (Compounds)

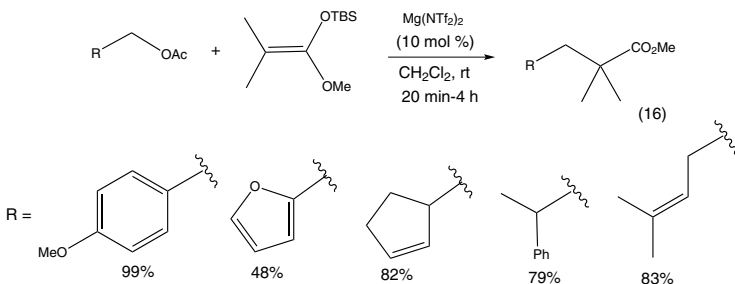
12-1200 Magnesium bis(trifluoromethylsulfonyl) imide, min. 97% (133395-16-1) $(\text{F}_3\text{CO}_2\text{S})_2\text{N}-\text{Mg}-\text{N}(\text{SO}_2\text{CF}_3)_2$ 1g
 Mg[(CF₃SO₂)₂N]₂; FW: 584.60; white powdr. 5g
moisture sensitive

Technical Notes:

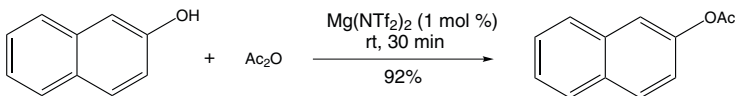
1. Useful catalyst for the Diels-Alder reaction.
2. Efficient catalyst for the nucleophilic substitution of allylic and benzylic acetates.
3. Catalyst used in the acylation of phenols, alcohols, and thiols with anhydrides.
4. Catalyst in asymmetric radical additions to olefins.
5. Catalyst in the enantioselective 1,3-Dipolar Cycloaddition of diazoacetates and olefins.
6. Precatalyst for enantioselective synthesis of isoxazolidinones.
7. Used to prepare ionic liquids for electrochemical applications including batteries.
8. Used as a catalyst to prepare N-protected homoallylic amines.
9. Used as a catalyst for conjugate radical additions.



Tech. Note (1)
 Ref. (1)



Tech. Note (2)
 Ref. (2)



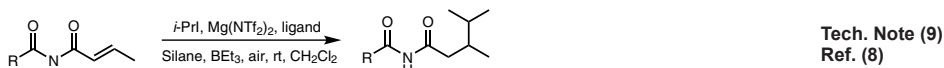
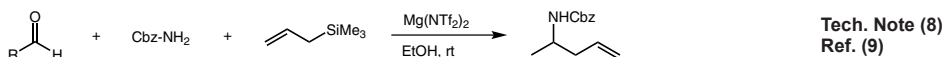
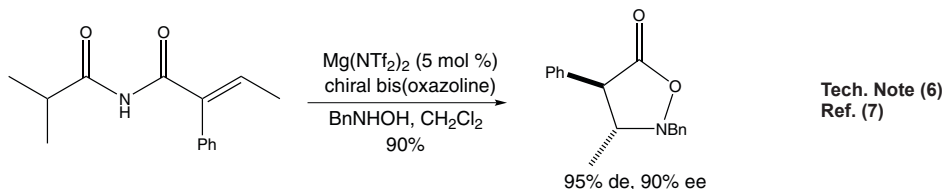
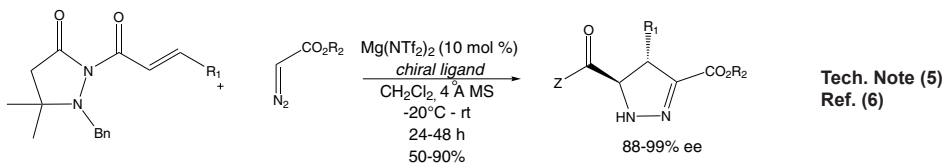
Tech. Note (3)
 Ref. (3)



Tech. Note (4)
 Ref. (4,5)

MAGNESIUM (Compounds)

12-1200 Magnesium bis(trifluoromethylsulfonyl)imide, min. 97% (133395-16-1)
(continued)

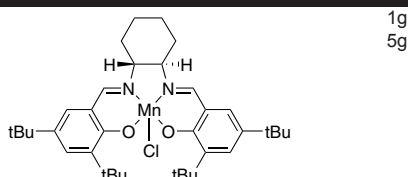


References:

1. *Chem. Lett.*, **1995**, 24, 307
2. *Tetrahedron Lett.*, **1997**, 38, 2645
3. *J. Org. Chem.*, **2006**, 71, 5785
4. *Org. Lett.* **2008**, 10, 5349
5. *J. Org. Chem.* **2008**, 73, 8973
6. *Org. Lett.* **2007**, 9, 1553
7. US Patent 8034974.
8. *Org. Lett.*, **2008**, 10, 5349.
9. *Bull. Korean. Chem. Soc.*, **2011**, 32, 2203
10. *J. Electrochem. Soc.*, **2014**, 161, A943

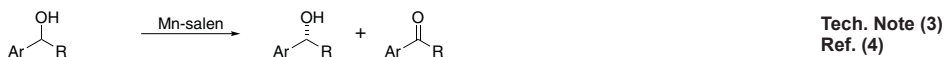
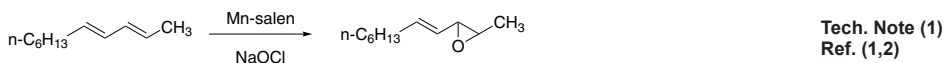
MANGANESE (Compounds)

25-0300 (1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-*t*-butylsalicylidene)] manganese(III) chloride, 98% (R,R)-Jacobsen Cat. (138124-32-0)
C₃₆H₅₂ClMnN₂O₂; FW: 635.22; brown pwdr.; m.p. 324-326°



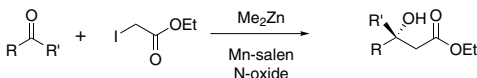
Technical Notes:

1. Catalyst for the conversion of olefins to chiral epoxides in high enantiomeric excess.
2. Pharmaceutically important, single enantiomer amino alcohols are efficiently produced from the corresponding chiral epoxide by acid or base-catalyzed epoxide ring-opening reactions.
3. Asymmetric Kinetic resolution of secondary alcohols in water.
4. Enantioselective Reformatsky reaction with ketones.



MANGANESE (Compounds)

25-0300 (1R,2R)-(-)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]manganese(III) chloride, 98% (R,R)-Jacobsen Cat. (138124-32-0)



Tech. Note (4)
Ref. (5)

References:

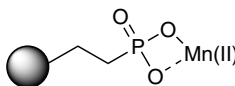
1. *J. Org. Chem.*, **1993**, 58, 6939
2. *J. Am. Chem. Soc.*, **1994**, 116, 6937
3. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, 7, 4585
4. *Angew. Chem. Int. Ed. Eng.*, **2003**, 42, 1042
5. *Angew. Chem. Int. Ed. Eng.*, **2006**, 45, 2951

25-0301 (1S,2S)-(+)-[1,2-Cyclohexanediamino-N,N'-bis(3,5-di-t-butylsalicylidene)]manganese(III) chloride, 98% (S,S)-Jacobsen Cat. (135620-04-1) 1g
C₃₆H₅₂ClMnN₂O₂; FW: 635.22; brown pwdr.; m.p. 325-326° 5g

Technical Note:

1. See 25-0300 (page 83)

25-1200 Manganese(II) ethyl/butyl phosphonate Silica (PhosphonicS POMn) 5g
white solid; SA: >350 m²/g 25g
Note: Sold in collaboration with PhosphonicS Ltd. for research purposes only. PhosphonicS Metal Oxidation Catalyst Kit component.



Particle size range: 70-200 microns
Average pore size: 60Å
Effective loadings: 0.3 to 0.5 mmol/g

96-6770 PhosphonicS Metal Oxidation Catalyst Kit
See page 346

METALS SCAVENGING AGENTS (Compounds)




06-1522 Chelating/scavenger resin with aminophosphonic - S940 50g
spherical beads (wet) 5x50g
NEW (store cold)

Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 425-850 micron; Purolite S940 is a chelating resin of macroporous structure, with a polystyrene matrix crosslinked with divinylbenzene (DVB) substituted with weakly acidic aminophosphonic active groups. This chemical structure facilitates the formation of complexes with metallic ions. The aminophosphonic chelating resins have a greater affinity for certain cations, and form more stable complexes with cations of low atomic mass metals than their iminodiacetic resin counterparts. Hence Purolite S940 is capable of fixing one or more specific cations from a larger range even from solutions which are highly concentrated. Sold in collaboration with Purolite for research purposes only.

06-1525 Chelating/scavenger resin with aminophosphonic - S950 50g
spherical beads (wet) 5x50g
NEW (store cold)

Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-1000 micron; Purolite S950 is a macroporous aminophosphonic acid chelating resin, designed for the removal of cations of toxic metals such as lead, copper and zinc from industrial effluents at low pH. At somewhat higher pH values, calcium, magnesium and barium, as well as the toxic metals cadmium, nickel, and cobalt are strongly complexed and may be separated from quite high concentrations of univalent cations. Purolite S950 is highly selective (under the appropriate conditions) for a range of both heavy metal and common divalent ions. Hence its use may be recommended where it is necessary to remove calcium or magnesium in order to avoid possible precipitation, or where its selectivity for a particular range of metals offers advantages. Sold in collaboration with Purolite for research purposes only.

METALS SCAVENGING AGENTS (Compounds)

06-1508 	Chelating/scavenger resin with aminoxime - S910 spherical beads (wet) <i>(store cold)</i> Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-1200 micron; Purolite® S910 is an amidoxime chelating resin, designed for the removal of cations of metals such as copper and iron from water or other solvent even at relatively low pH. It can also be used for the recovery of traces of precious metals from dilute solutions. It cannot be used for removal of alkaline earth metals. Sold in collaboration with Purolite for research purposes only.	50g 5x50g
06-1530 	Chelating/scavenger resin with bispicolylamine - S960 spherical beads (wet) <i>(store cold)</i> Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 425-1000 micron; Purolite® S960 is a macroporous poly-styrene divinylbenzene copolymer within which weakly basic bis-picolylamine chelating functional groups are covalently bonded. This resin has high selectivity for metals such as nickel, copper, and cobalt as compared to iron, aluminum, calcium, and magnesium. Purolite® S960 is active within the pH range of 0-8 and may function outside that range depending on the metals involved. Sold in collaboration with Purolite for research purposes only.	50g 5x50g
06-1520 	Chelating/scavenger resin with iminodiacetic - S930Plus spherical beads (wet) <i>(store cold)</i> Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 425-1000 micron; Purolite S930Plus is a macroporous polystyrene; based chelating resin, with iminodiacetic groups designed for the removal of heavy metals from industrial effluents. Purolite S930Plus finds use in processes for extraction and recovery of metals from ores, galvanic plating solutions, pickling baths and effluents. Further uses include the decalcification of brine for chloralkali processes, where Purolite S930Plus shows advantages under certain operating conditions over the typically used aminophosphonic type resins such as Purolite S940. Purolite S930Plus has high selectivity and capacity for hardness and strontium and has excellent osmotic stability. Purolite S930Plus is susceptible to oxidation. Hence direct treatment of brine solutions containing free chlorine should be avoided, for instance by preliminary reaction with sulphur dioxide, sulphide or, by use of a treatment with activated carbon. Brine solutions can often contain significant concentrations of chlorates. In this case it is necessary to ensure that the displacement rinse prior to the acid regeneration is efficient, so as to avoid the formation of free chlorine from contact of chlorates in the brine solution with the regeneration acid. Sold in collaboration with Purolite for research purposes only.	50g 5x50g

METALS SCAVENGING AGENTS (Compounds)

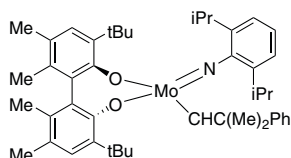
06-1514	<p>Chelating/scavenger resin with isothiuronium - S920Plus</p> <p>spherical beads (wet) (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-1200 micron; Purolite® S920Plus is a macroporous polystyrenic based chelating resin, with thiouronium groups designed for the selective removal of mercury and for the recovery of precious metals from industrial effluents. Mercury is strongly bound to the functional groups to form highly stable complexes, with high selective affinity compared with those of other heavy metals. These properties are largely unaffected by high chloride (or sulfate) content of the effluent. Effluent solutions which may typically contain 2 - 20 ppm of mercury can be treated to reduce the concentration in solution to less than 0.005 ppm. Purolite S920Plus can load up to 200g of mercury, or gold, or approximately 60g of platinum or palladium for each liter of resin, equivalent to 12.5, and 3.75 lb/ft³ respectively. Purolite S920Plus is designed for the removal of low concentrations of soluble mercury salts from waste streams and for the recovery of precious metals from rinse waters in the galvanic and electronic industries. It is also used in hydrometallurgy for the separation of precious metals from acid liquors. Mercury and precious metals are so strongly held, and run lengths are so long (thousands of hours) that it is not normally considered economic to regenerate the resin for reuse. Purolite S920Plus is more resistant to oxidation than many thiol based resins and contact with the atmosphere is not detrimental, however free chlorine and other strong oxidizing agents may damage the resin and their removal from solution by filtering through activated carbon is recommended. Sold in collaboration with Purolite for research purposes only.</p>	50g 5x50g
06-1501	<p>Chelating/scavenger resin with N-methylglucamine - S108</p> <p>spherical beads (wet) (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 425-630 micron; Purolite® S108 is a macroporous polystyrenic based resin with excellent kinetics and functional groups specially designed for the selective removal of salts of boron from aqueous solutions. It is effective for such solutions over a wide range of pH values, and over a wide range of boron concentrations. The presence of boron ions in water for potable and agriculture/horticulture use, even in relatively small (ppm) concentrations can give rise to major problems. Even where concentrations of other ions are reasonably high, Purolite® S108 will reduce boron concentrations by an order of magnitude. Sold in collaboration with Purolite for research purposes only.</p>	50g 5x50g
06-1528	<p>Chelating/scavenger resin with phosphonic and sulfonic acid - S957</p> <p>spherical beads (wet) (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 425-1000 micron; Purolite S957 is a specially developed Monophos chelating resin, which incorporates phosphonic, and sulfonic functional groups on a mechanically and osmotically resistant matrix. These combined properties give it high selectivity for iron and other transitional metals, even in acidic solutions. Purolite S957 has been especially designed for the selective removal of ferric iron from acidic solutions, such as copper electrolyte or from nickel, cobalt and zinc processing solutions. Purolite S957 can also be used in potable water applications for the selective removal of trace levels of selected metals from neutral pH waters. Its selectivity for uranium and other lanthanide elements should give good opportunities for its successful employment in other areas. Sold in collaboration with Purolite for research purposes only.</p>	50g 5x50g

METALS SCAVENGING AGENTS (Compounds)

06-1532	Chelating/scavenger resin with polyamine - S985	50g
NEW	<p>spherical beads (wet) (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-1200 micron; Purolite® S985 is a high capacity, macroporous, weak base anion exchange resin with a polyacrylic matrix supporting functional groups of the polyamine type. The carefully formulated, macroporous acrylic matrix ensures excellent exchange kinetics for the removal of trace heavy metals from waste water streams and the special polyamine functionality produces very interesting operating capacities and makes the uptake of metallic cations possible even when they are present in the waste stream as organic anionic complexes. Its tough and resilient macroporous structure also affords excellent mechanical, strength and resistance to osmotic shock. Sold in collaboration with Purolite for research purposes only.</p>	5x50g
06-1518	Chelating/scavenger resin with thiol - S924	50g
NEW	<p>spherical beads (wet) (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-1000 micron; Purolite S924 is a chelating resin, polystyrene based and designed for the selective removal of mercury. The mercury is strongly bound to the functional groups to form highly stable complexes with high selective affinity compared with those of other heavy metals. Even so the high selectivity for metals such as silver, copper, lead, cadmium, nickel and cobalt, makes this resin useful in waste treatment and hydrometallurgical processes. The high selectivity for mercury is largely unaffected by high chloride or sulphate content of the effluent. Effluent solutions that may typically contain 0.01-25ppm of mercury can be treated to reduce the concentration to significantly less than 5ppb residual mercury. Purolite S924 can load up to 150 g (16 lb/cu.ft) of mercury per litre of resin. Purolite S924 is designed for the removal of moderately low concentrations of soluble mercury salts from brine streams used to produce caustic soda and chlorine where mercury cells are used, and may be regenerated with concentrated hydrochloric acid solutions. In the process for the manufacture of caustic soda and chlorine from brine, where all or part of the production uses mercury cells, the mercury rich regenerant acid may be neutralized with the sodium hydroxide to produce a recovered brine solution that may be recycled to the mercury cell process. Mercury may be present at very low concentrations and consequently run lengths are often long (thousands of hours). It is sometimes not economic to regenerate the resin for re-use. In such cases Purolite S920 may be preferred because of its higher capacity. Purolite S924 is prone to oxidation and long-term contact with the atmosphere is detrimental. It is recommended that this resin is shipped and stored under water. Also, free chlorine and other strong oxidizing agents may damage the resin. Their removal from solution by filtering through activated carbon is recommended. Sold in collaboration with Purolite for research purposes only.</p>	5x50g
06-1512	Chelating/scavenger resin with thiourea - S914	50g
NEW	<p>spherical beads (wet) (store cold)</p> <p>Note: Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; Particle Size: 300-1200 micron; Purolite S914 is a macroporous type chelating resin with thiourea functionality. It has very high selectivity for mercury and platinum group metals such as platinum, gold and silver. Purolite S914 is stable over the whole pH range. The applications include mercury removal from brine and effluent in chloralkali process, mercury removal from flue gas scrubber effluent, recovery of platinum group metals from effluents amongst others. Sold in collaboration with Purolite for research purposes only.</p>	5x50g

MOLYBDENUM (Compounds)

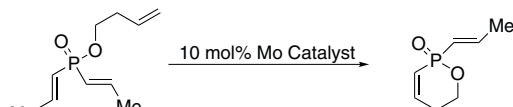
42-1213
amp
2,6-Diisopropylphenylimidoneophylidene [(R)-(+)-BIPHEN]molybdenum(VI), min.97% (R) SCHROCK-HOVEYDA CATALYST (329735-77-5)
Mo(C₁₀H₁₂)(C₁₂H₁₇N)(C₂₄H₃₂O₂); FW: 755.93; red xtl.
air sensitive, moisture sensitive, (store cold)



25mg
100mg

Technical Note:

1. Catalyst used for the asymmetric ring-closing metathesis of phosphine oxides.



Tech. Note (1)
Ref. (1)

References:

1. *Angew. Chem. Int. Ed.* **2009**, *48*, 762.

42-1214
amp
2,6-Diisopropylphenylimidoneophylidene[(S)-(-)-BIPHEN]molybdenum(VI), min. 97% (S) SCHROCK-HOVEYDA CATALYST (205815-80-1)
Mo(C₁₀H₁₂)(C₁₂H₁₇N)(C₂₄H₃₂O₂); FW: 755.93; red xtl.
air sensitive, moisture sensitive, (store cold)

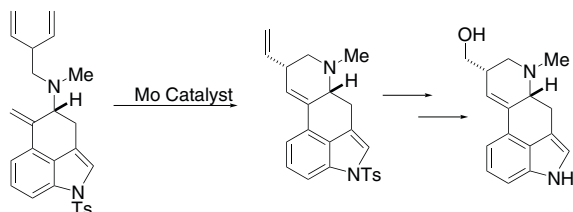
25mg
100mg

Technical Notes:

1. Catalyst used for the enantioselective ring-closing metathesis of aminobenzenes,
2. Catalyst used for the enantioselective synthesis of (+)-Isolysergol via ring-closing metathesis.



Tech. Note (1)
Ref. (1,2)

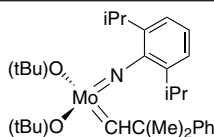


Tech. Note (2)
Ref. (3)

References:

1. *J. Am. Chem. Soc.*, **2002**, *124*, 6991.
2. *Nature*, **2008**, *456*, 933.
3. *Org. Lett.*, **2010**, *12*, 2610.

42-1200
amp
2,6-Diisopropylphenylimidoneophylidene molybdenum(VI) bis(t-butoxide) (126949-65-3)
Mo(C₁₀H₁₂)(C₁₂H₁₇N)(OC₄H₉)₂; FW: 549.65; yellow to orange pwd.
air sensitive, moisture sensitive, (store cold)



100mg
500mg

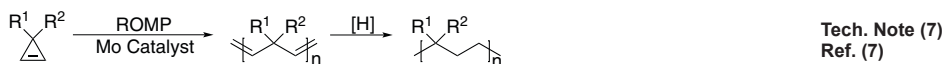
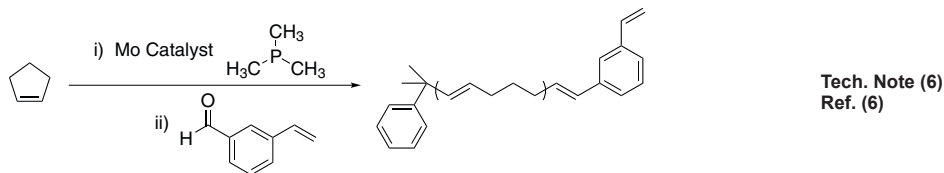
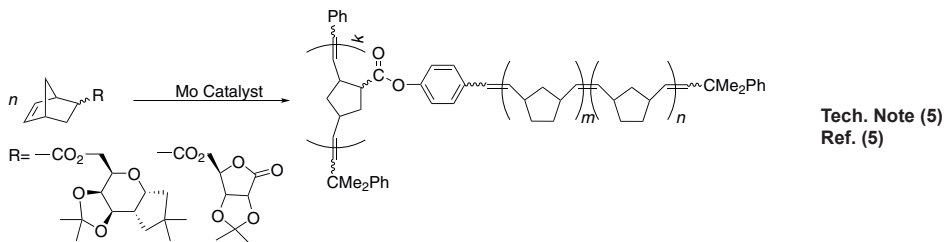
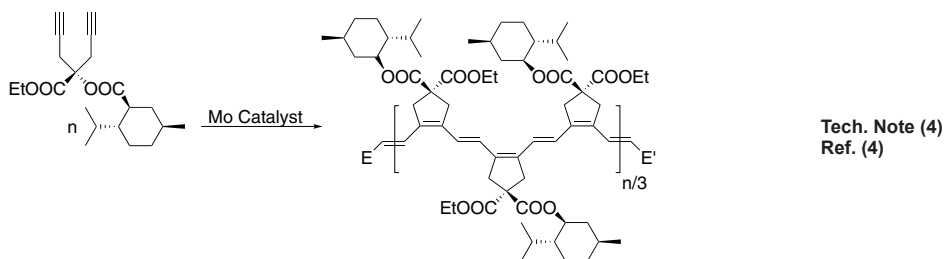
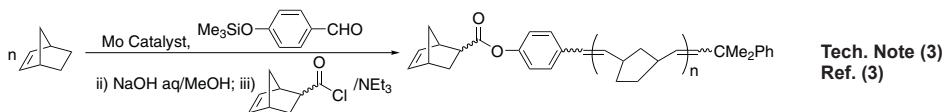
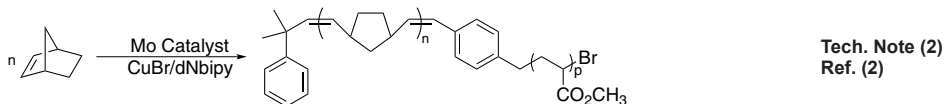
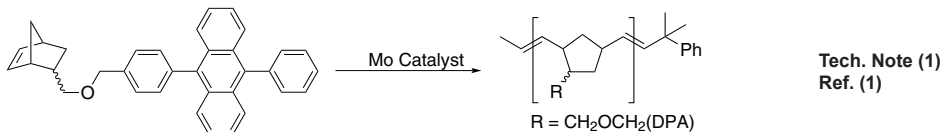
Technical Notes:

1. Catalyst for synthesis of blue-light-emitting electroluminescent diphenylanthracene polymer from norbornene monomer by ROMP.
2. Catalyst for transformation of ROMP into controlled atom transfer radical polymerization for the preparation of block copolymers.
3. Catalyst for synthesis of various ring-opened poly(norbornene) derivatives by the ring-opening metathesis polymerizations.
4. Catalysts for stereoselective cyclopolymerization of 1,6-heptadiynes.
5. Catalyst for synthesis various (linear, triarms, ABA or ABCBA type) amphiphilic multiblock copolymers containing acetal-protected sugars by the coupling of an end-functionalized ROMP copolymer with poly(ethylene glycol).
6. Catalyst for two-step method synthesis of ROMP/AP polycyclopentene/polystyrene and polynorbornene/polystyrene diblock copolymers.

MOLYBDENUM (Compounds)

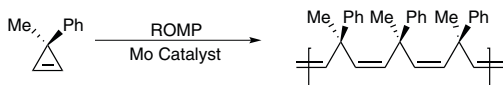
42-1200 2,6-Diisopropylphenylimidoneophylidene molybdenum(VI) bis(*t*-butoxide) (126949-65-3) (continued)

7. Catalyst for synthesis of poly(homoisobutylene) and poly(homo- α -methylstyrene) via ROMP.
8. Catalyst for the *Z*-selective and syndioselective polymerization of NBDF6 and MPCP.
9. Catalyst for regioselective cyclopolymerization of 1,7-octadiynes.
10. Catalyst for stereospecific ring-opening metathesis polymerization of norbornene and tetracyclododecene.

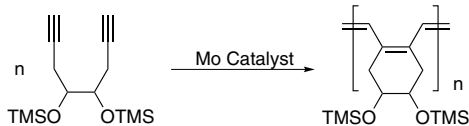


MOLYBDENUM (Compounds)

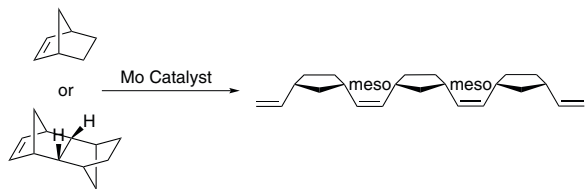
42-1200 2,6-Diisopropylphenylimidoneophylidene molybdenum(VI) bis(t-butoxide) (126949-65-3)
(continued)



Tech. Note (8)
Ref. (8)



Tech. Note (9)
Ref. (9)



Tech. Note (10)
Ref. (10)

References:

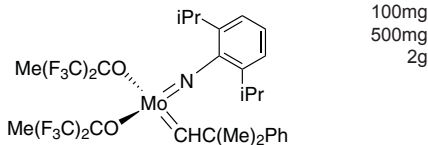
1. *Macromolecules* **1997**, 30, 3553.
2. *Macromolecules* **1997**, 30, 6513.
3. *Macromolecules* **2001**, 34, 4712.
4. *Angew. Chem. Int. Ed.* **2002**, 41, 4004.
5. *Chem. Eur. J.* **2007**, 13, 8985.
6. *Macromolecules* **2008**, 41, 5283.
7. *Macromolecules* **2008**, 41, 8405.
8. *Macromolecules* **2010**, 43, 7515.
9. *Macromolecules* **2011**, 44, 8380.
10. *Macromolecules* **2015**, 48, 2493.

42-1205 2,6-Diisopropylphenylimidoneophylidene molybdenum(VI) bis(hexafluoro-t-butoxide) SCHROCK'S CATALYST

(139220-25-0)

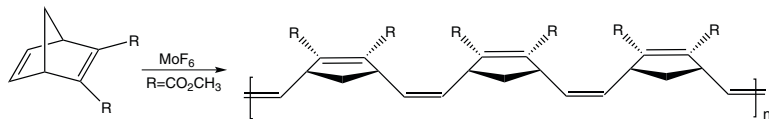
Mo(C₁₀H₁₂)(C₁₂H₁₇N)[OC(CH₃)(CF₃)₂]₂;
FW: 765.53; yellow to orange powdr.

air sensitive, moisture sensitive, (store cold)

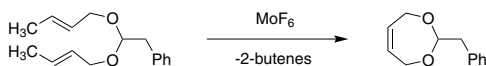


Technical Notes:

1. Unlike Mo(C₁₀H₁₂)(C₁₂H₁₇N)(OC₄H₉)₂, the bis(hexafluoro-t-butoxide) (MoF₆) derivative will metathesize many ordinary olefins, especially terminal olefins, and will ROMP many norbornene or substituted norbornadiene monomers to give all cis, and often isotactic, polymers.
2. Useful for the "ring-closing" of dienes or the coupling of terminal olefins.
3. Useful for cross-metathesis of aliphatic alkenes with 2-vinyl aromatics.



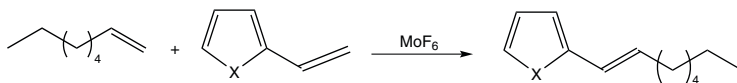
Tech. Note (1)
Ref. (1,2)



Tech. Note (2)
Ref. (3,4)

MOLYBDENUM (Compounds)

42-1205 **2,6-Diisopropylphenylimidoneophylidene molybdenum(VI) bis(hexafluoro-t-butoxide)**
(continued) **SCHROCK'S CATALYST (139220-25-0)**



X = CH=CH, S, O

Tech. Note (3)
Ref. (6)

References:

1. *J. Am. Chem. Soc.*, **1994**, *116*, 3414.
2. *J. Am. Chem. Soc.*, **1993**, *115*, 4413.
3. *J. Am. Chem. Soc.*, **1992**, *114*, 5426.
4. *J. Am. Chem. Soc.*, **1992**, *114*, 7324.
5. *Tetrahedron*, **1998**, *54*, 4413. (review article)
6. *J. Mol. Catal. Chem.*, **2002**, *190*, 45.

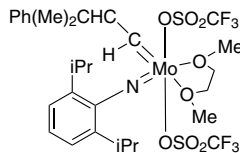
42-1210 **2,6-Diisopropylphenylimidoneophylidene molybdenum(VI) bis(trifluoromethanesulfonate) dimethoxyethane adduct (126949-63-1)**

Mo(C₁₀H₁₂)(C₁₂H₁₇N)(OSO₂CF₃)₂(C₄H₁₀O₂);

FW: 791.68; yellow to orange powdr.

air sensitive, moisture sensitive, (store cold)

Note: **Limited quantities available**



100mg

Technical Note:

1. Used as a starting material for preparations of various molybdenum metathesis catalysts.

References:

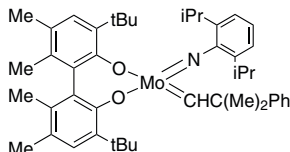
1. *J. Am. Chem. Soc.*, **2004**, *126*, 10945.
2. *Organometallics* **2006**, *25*, 1412.
3. *J. Am. Chem. Soc.* **2006**, *128* 16373.
4. *Organometallics* **2008**, *27*, 6570.
5. *Angew. Chem. Int. Ed.*, **2011**, *50*, 7829.
6. *Organometallics* **2014**, *33*, 5334.

42-1212 **2,6-Diisopropylphenyl-imidoneophylidene[racemic-BIPHEN]molybdenum(VI), min. 97% rac-SCHROCK-HOVEY-DA CATALYST (300344-02-9)**
amp

Mo(C₁₀H₁₂)(C₁₂H₁₇N)(C₂₄H₃₂O₂); FW: 755.93;

red xtl.

air sensitive, moisture sensitive, (store cold)



100mg

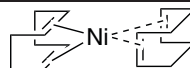
500mg

Technical Note:

1. A ring-closing metathesis catalyst.

NICKEL (Compounds)

28-0010 **Bis(1,5-cyclooctadiene)nickel (0), 98+% (1295-35-8)**
HAZ (C₈H₁₂)₂Ni; FW: 275.08; yellow xtl.; m.p. 60° dec. (under N₂)
air sensitive, (store cold)



2g

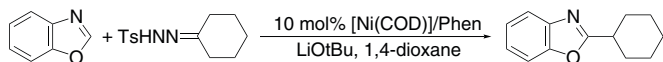
10g

Technical Notes:

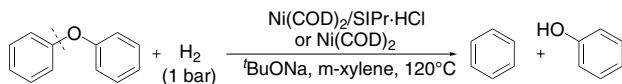
1. Pre-catalyst for the coupling of benzoxazole with N-tosylhydrazine.
2. Catalyst precursor for heterogeneously nickel-catalysed hydrogenolysis of aryl ethers without arene hydrogenation.
3. Pre-catalyst for reductive cleavage of C-OMe bonds with silanes as reducing agents.
4. Pre-catalyst for the cross-coupling reactions of benzylic pivalates with arylboroxines.
5. Pre-catalyst for the cross-coupling of benzylic carbamates with arylboronic esters.
6. Pre-catalyst for the direct arylation of C(sp³)-H Bonds in aliphatic amides via bidentate-chelation.
7. Pre-catalyst for the cross-coupling reactions of potassium alkoxyalkyl- and benzyltrifluoroborates with an array of aryl bromides and co-catalyzed by iridium photoredox catalyst under visible light at ambient temperature.
8. Pre-catalyst for highly regioselective indoline synthesis, co-catalyzed by Iridium photoredox catalyst.
9. Catalyst for conversion of amides to esters via the activation of amide C-N bonds.
10. Catalyst for borylation of aryl fluorides via C-F cleavage.
11. Catalyst for Suzuki-Miyaura coupling of amides.
12. Catalyst for the cross-coupling reaction of the aryl methyl ether alkylation.

NICKEL (Compounds)

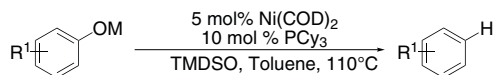
28-0010 Bis(1,5-cyclooctadiene)nickel (0), 98+% (1295-35-8)
(continued)



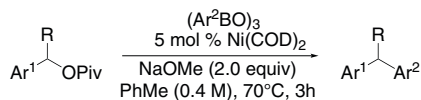
Tech. Note (1)
Ref. (1)



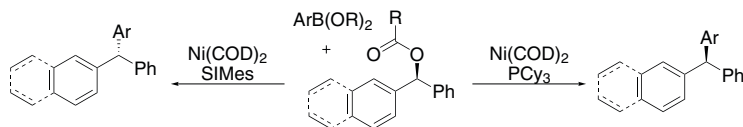
Tech. Note (2)
Ref. (2)



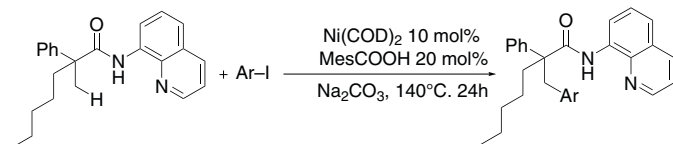
Tech. Note (3)
Ref. (3)



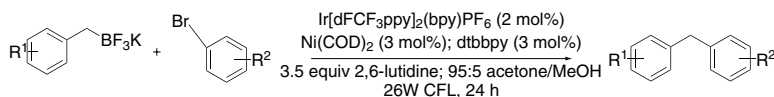
Tech. Note (4)
Ref. (4)



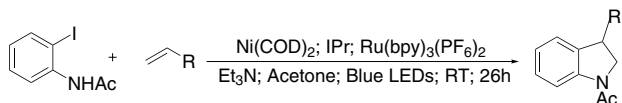
Tech. Note (5)
Ref. (5)



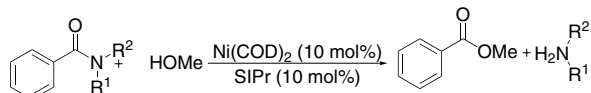
Tech. Note (6)
Ref. (6)



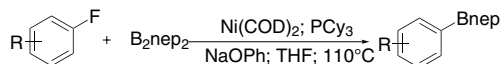
Tech. Note (7)
Ref. (7)



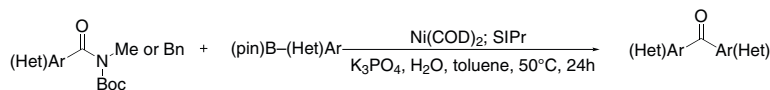
Tech. Note (8)
Ref. (8)



Tech. Note (9)
Ref. (9)



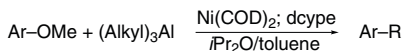
Tech. Note (10)
Ref. (10)



Tech. Note (11)
Ref. (11)

NICKEL (Compounds)

28-0010 Bis(1,5-cyclooctadiene)nickel (0), 98+% (1295-35-8)
(continued)

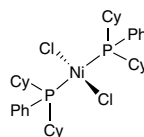


Tech. Note (12)
Ref. (12)

References:

1. *Angew. Chem. Int. Ed.*, **2012**, 51,775.
2. *J. Am. Chem. Soc.*, **2012**, 134, 20226.
3. *J. Am. Chem. Soc.*, **2013**, 135, 1997.
4. *J. Am. Chem. Soc.*, **2013**, 135, 3307.
5. *J. Am. Chem. Soc.*, **2013**, 135, 3303.
6. *J. Am. Chem. Soc.*, **2014**, 136, 898.
7. *Science*, **2014**, 345, 433.
8. *J. Am. Chem. Soc.*, **2015**, 137, 9531.
9. *Nature*, **2015**, 524, 79.
10. *J. Am. Chem. Soc.*, **2015**, 137, 12470.
11. *Nature Chemistry*, **2016**, 8, 75.
12. *Angew. Chem. Int. Ed.*, **2016**, 55, 6093.

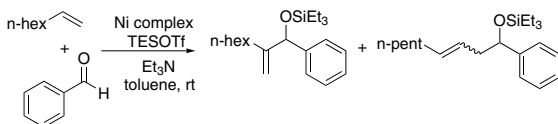
28-1330 trans-Bis(dicyclohexylphenylphosphino)nickel(II) chloride, 99% (19232-03-2)
C₃₆H₅₄Cl₂NiP₂; FW: 678.40; purple powdr.



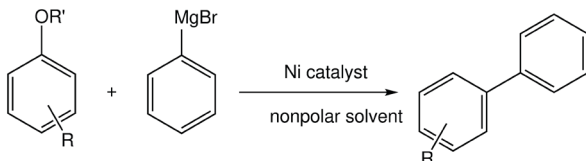
250mg
1g

Technical Notes:

1. Catalyst used for the coupling of alkenes, aldehydes, and silyl triflates.
2. Catalyst used for the cross-coupling of aryl Grignard reagents with aromatic ethers.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

1. *J. Am. Chem. Soc.*, **2005**, 127, 14194
2. *Angew. Chem. Int. Ed.*, **2004**, 43, 2428

28-1720 Bis[P,P'-1,5-diphenyl-3,7-bis[(4-hydrogenphosphonate) phenyl]-1,5,3,7-diazadiphosphocine} nickel(II) bromide (hydrogen bromide adduct) (1514896-39-9)
C₆₀H₆₉Br₃N₄NiO₁₂P₈; FW: 1584.41; red-brown xtls.
air sensitive, moisture sensitive

5mg
25mg

NEW

Technical Notes:

1. Synthetic nickel catalyst used for photocatalytic reduction of aqueous protons to hydrogen.
2. Catalyst containing phosphonate anchor groups for immobilization on metal oxide semiconductor surfaces, enabling light-driven hydrogen evolution.

References:

1. *Angew. Chem. Int. Ed.*, **2014**, 53, 11538
2. *J. Amer. Chem. Soc.*, **2014**, 136, 356

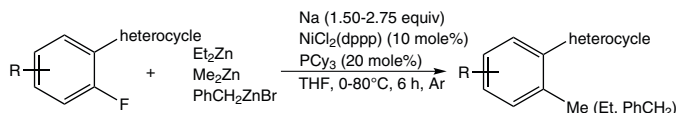
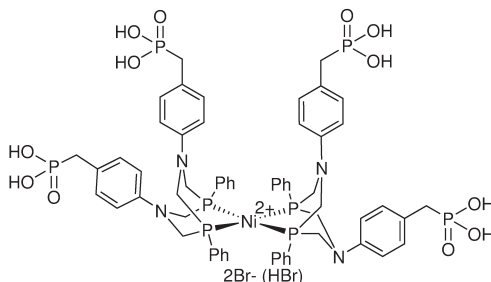
NICKEL (Compounds)

28-0080 1,3-Bis(diphenylphosphino)propane nickel(II) chloride, 99%
(15629-92-2)
[(C₆H₅)₂PCH₂CH₂CH₂P(C₆H₅)₂]₂NiCl₂;
FW: 542.08; red xtl.

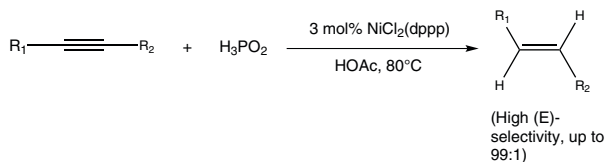
5g
25g

Technical Notes:

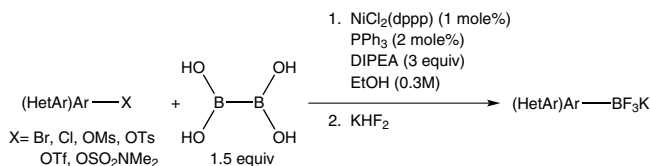
1. Nickel catalyst used in the N-heterocycle-directed cross-coupling of fluorinated arenes with organozinc reagents.
2. Nickel catalyst used in the (E)-selective semihydrogenation of internal alkynes.
3. Nickel catalyst used in the borylation of halides and pseudohalides.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

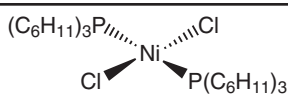


Tech. Note (3)
Ref. (3)

References:

1. *Tetrahedron*, **2014**, *70*, 4405
2. *J. Organomet. Chem.*, **2014**, *749*, 51
3. *J. Org. Chem.*, **2013**, *78*, 6427

28-0091 Bis(tricyclohexylphosphine)nickel(II) chloride, 99% (19999-87-2)
[(C₆H₁₁)₃P]₂NiCl₂; FW: 690.46;
dark red-purple xtl.



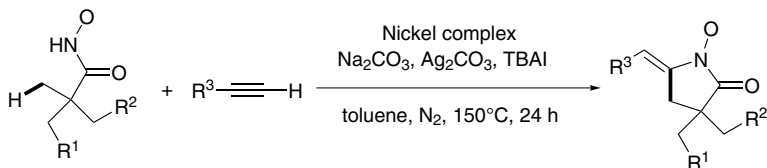
1g
5g

Technical Notes:

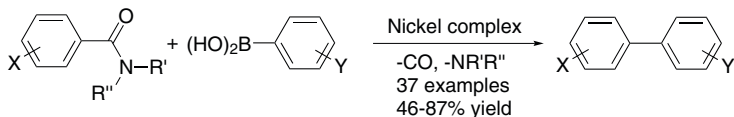
1. An approach to five-membered lactams from aliphatic amides and terminal acetylenes by nickel catalysis.
2. Synthesis of biaryls through nickel-catalyzed Suzuki-Miyaura coupling of amides by carbon-nitrogen bond cleavage.
3. Ni-catalyzed borylation of aryl fluorides via C-F cleavage.
4. Nickel- and palladium-catalyzed coupling of aryl fluorosulfonates with aryl boronic acids enabled by sulfuryl fluoride.
5. Nickel-catalyzed one-pot synthesis of biaryls from phenols and arylboronic acids via C-O activation using TCT reagents.

NICKEL (Compounds)

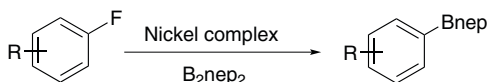
28-0091 Bis(tricyclohexylphosphine)nickel(II) chloride, 99% (19999-87-2)
(continued)



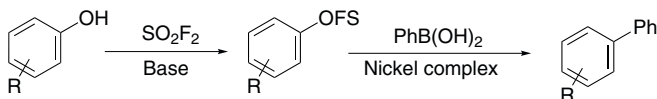
Tech. Note (1)
Ref. (1)



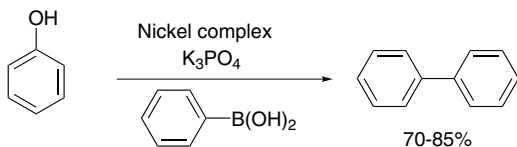
Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)

References:

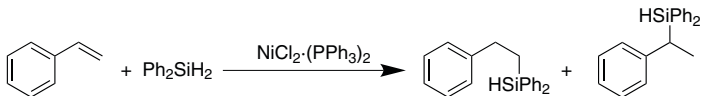
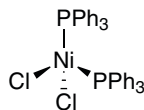
1. *Advanced Synthesis & Catalysis* **2016**, 358, 1778.
2. *Angew. Chem. Int. Ed.*, **2016**, 55, 6959
3. *J. Am. Chem. Soc.*, **2015**, 137, 12470.
4. *ACS Catalysis* **2015**, 5, 5041.
5. *J. Organomet. Chem.*, **2015**, 781, 6.

28-0095 Bis(triphenylphosphine)nickel(II) chloride, 99%
(14264-16-5)
[(C₆H₅)₃P]₂NiCl₂; FW: 654.20; green xtl.

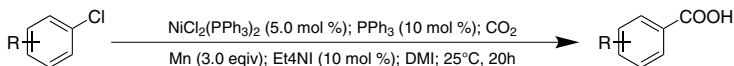
5g
25g

Technical Notes:

1. Catalyst for hydrosilylation of styrene with diphenylsilane
2. Catalyst for carboxylation of various aryl chlorides and other derivatives
3. Catalyst for C-P cross-coupling reactions of diphenylphosphine oxide with aryl chloride
4. Catalyst for N-Heterocyclic carbene-assisted cross-coupling reactions of diarylboronic acids with aryl chlorides, tosylates, and sulfamates
5. Catalyst for Negishi biaryl ketone synthesis by cross-coupling of amides with aryl zinc halides via carbon-nitrogen bond cleavage



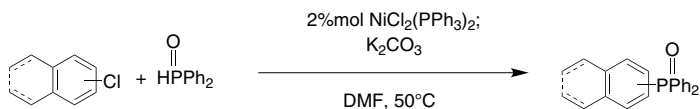
Tech. Note (1)
Ref. (1)



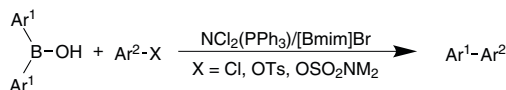
Tech. Note (2)
Ref. (2)

NICKEL (Compounds)

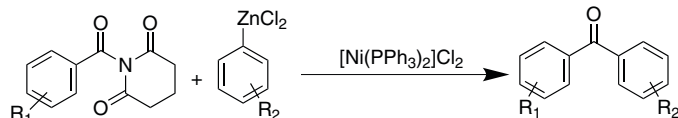
28-0095 Bis(triphenylphosphine)nickel(II) chloride, 99%
(continued)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)

References:

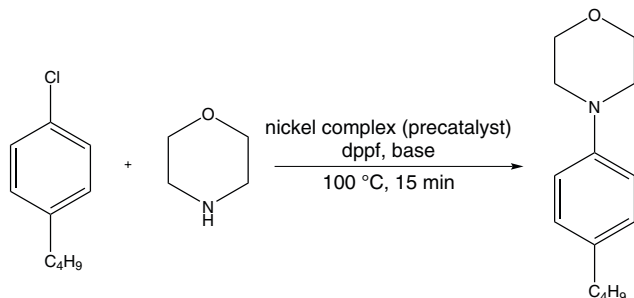
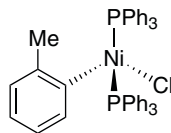
1. *Org. Lett.*, **2012**, 14, 914.
2. *J. Am. Chem. Soc.*, **2012**, 134, 9106
3. *Org. Biomol. Chem.*, **2012**, 10, 9627
4. *J. Org. Chem.*, **2014**, 79, 7132
5. *Chem. Eur. J.* **2016**, 22, 10420

28-0096 Bis(triphenylphosphino)(2-methylphenyl)chloronickel(II), 99% (27057-09-6)
NEW C₄₃H₃₇ClNiP₂; FW: 709.85; yellow powdr.

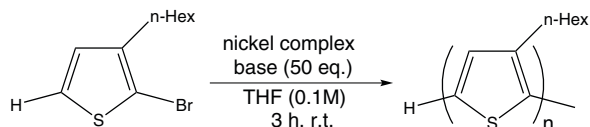
250mg
1g

Technical Notes:

1. This complex is used as an air-stable nickel precatalyst for the amination of aryl chlorides, sulfamates, mesylates, and triflates.
2. This nickel precatalyst is used for the polymerization of halothiophenes.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

1. *Org. Lett.*, **2014**, 16, 220
2. *Organometallics*, **2012**, 31, 2263

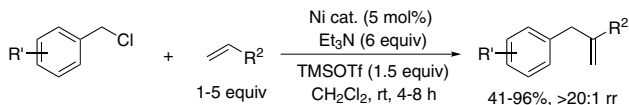
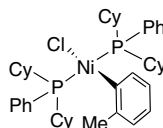
NICKEL (Compounds)

28-0150 Chlorobis(dicyclohexylphenylphosphino) (2-methylphenyl)nickel(II), 99% (1419179-26-2)
 $C_{43}H_{61}ClNiP_2$; FW: 734.04; yellow pwdr.

100mg
500mg

Technical Note:

1. An air-stable nickel precatalyst for the Internally-selective benzylation of terminal alkenes.



Tech. Note (1)
Ref. (1)

References:

1. *J. Am. Chem. Soc.*, **2013**, *135*, 1585.
2. *Organometallics*, **2014**, *33*, 2012.

28-0110 Chlorobis(triphenylphosphino)phenylnickel(II), 98% (33571-43-6)
NEW $C_{42}H_{35}ClNiP_2$; FW: 695.78; yellow pwdr.
air sensitive, moisture sensitive

500mg
2g

Technical Notes:

1. Self-immobilizing, binuclear neutral nickel catalyst for ethylene polymerization.
2. Ligand steric and electronic effects on β -ketiminato neutral nickel(II) olefin polymerization catalysts.
3. Accessible, highly active single-component β -ketiminato neutral nickel(II) catalysts for ethylene polymerization.
4. Highly active neutral nickel(II) catalysts for ethylene polymerization bearing modified β -ketoiminato ligands.

References:

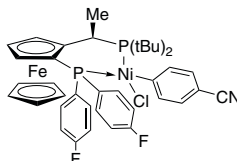
1. *J. Mol. Catal. A: Chem.*, **2013**, *380*, 139
2. *Organometallics*, **2012**, *31*, 966
3. *Organometallics*, **2010**, *29*, 2306
4. *Organometallics*, **2009**, *28*, 5697

28-0178 Chloro(4-cyanophenyl){(R)-1-[(S)-2-(bis(4-fluorophenyl)phosphino)ferrocenyl]ethyl(diphenylphosphino)nickel(II) (2049086-37-3)
NEW $C_{39}H_{42}ClF_2FeNiP_2$; FW: 774.69; red-violet solid
 Note: Sold in collaboration with Solvias for research purposes only.

100mg
500mg

Technical Note:

1. See 28-0170 (page 98)

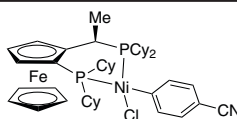


28-0172 Chloro(4-cyanophenyl){(R)-1-[(S)-2-(dicyclohexylphosphino)ferrocenyl]ethyl (dicyclohexylphosphine)nickel(II) (2049086-35-1)
NEW $C_{43}H_{60}ClFeNiP_2$; FW: 802.88; orange solid
 Note: Sold in collaboration with Solvias for research purposes only.

100mg
500mg

Technical Note:

1. See 28-0170 (page 98)

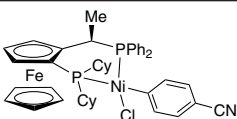


28-0175 Chloro(4-cyanophenyl){(R)-1-[(S)-2-(dicyclohexylphosphino)ferrocenyl]ethyl (diphenylphosphine)nickel(II) (2049086-36-2)
NEW $C_{43}H_{48}ClFeNiP_2$; FW: 790.79; orange solid
 Note: Sold in collaboration with Solvias for research purposes only.

100mg
500mg

Technical Note:

1. See 28-0170 (page 98)

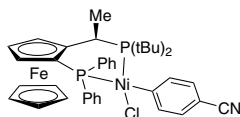


NICKEL (Compounds)

28-0170

NEW

Chloro(4-cyanophenyl){(R)-1-[(S)-2-(diphenylphosphino)ferrocenyl]ethyl(di-*t*-butyl)phosphine} nickel(II) (2049086-34-0)
 $C_{39}H_{44}ClFeNNiP_2$; FW: 738.71; red-violet solid
 Note: Sold in collaboration with Solvias for research purposes only.



100mg
500mg

Technical Notes:

1. Versatile, air-stable, low cost nickel catalyst alternative to palladium for carbon-carbon and carbonheteroatom cross-coupling reactions.
2. Used to react substituted aryl and heteroaryl halides and tosylates with ammonia to produce diverse aryl and heteroaryl amines¹.
3. Used in monoarylation experiments using commercially available ammonia gas, ammonium salts or ammonia stock solutions^{2,3}.
4. Catalyzes the coupling of aryl chlorides with gaseous amines in the form of their hydrochloride salts³.

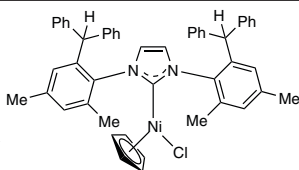
References:

1. *Org. Process Res. Dev.*, **2015**, *19*, 1936.
2. *Angew. Chem, Int. Ed.*, **2015**, *54*, 3773.
3. *Angew. Chem, Int. Ed.*, **2015**, *54*, 3768.

28-1095

NEW

Chloro(cyclopentadienyl){1,3-bis[2-(diphenylmethyl)-4,6-dimethylphenyl]1H-imidazolium}nickel(II) (1955555-28-8)
 $C_{50}H_{46}ClN_2Ni$; FW: 769.06; pink purple pwdr.



100mg
500mg

Technical Note:

1. Complexes of this type are pre-catalysts for Suzuki-Miyaura² and Buchwald-Hartwig^{3,4} cross-couplings, and for hydrosilylation⁴ and hydrothiolation⁵ of alkenes.

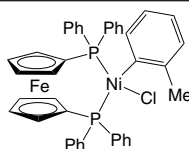
References:

1. *Dalton Trans.* **2016**, *45*, 11772
2. *Dalton Trans.* **2010**, *39*, 8153
3. *Organometallics* **2013**, *32*, 6265
4. *Organometallics* **2005**, *24*, 3442-3447.
5. *Organometallics* **2006**, *25*, 4462

28-0518

NEW

Chloro(2-methylphenyl)[1,1'-bis(diphenylphosphino)ferrocene]nickel (II), **98%** (1501945-23-8)
 $C_{41}H_{35}ClFeNiP_2$; FW: 739.66; yellow pwdr.
air sensitive



100mg
500mg

Technical Note:

1. Air-stable nickel precatalyst for the amination of aryl chlorides, sulfamates, mesylates and triflates.

2.5-10 mol% Ni catalyst
 LiOt-Bu or K_3PO_4



60-98% yield

X= Cl, OTf,
 OSO₂NMe₂, OMs

Tech. Note (1)
Ref. (1)

References:

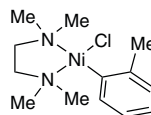
1. *Org. Lett.*, **2014**, *16*, 220.

NICKEL (Compounds)

28-0165

NEW

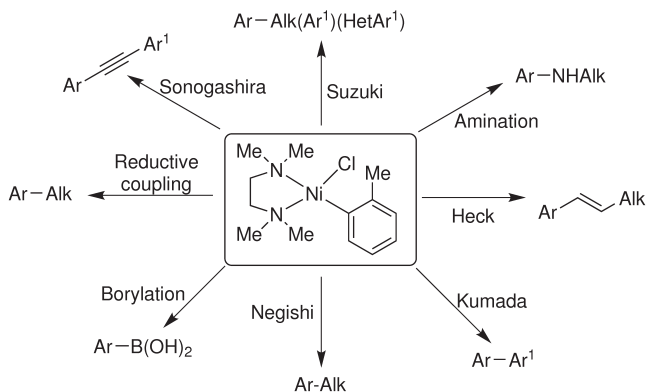
Chloro(2-methylphenyl)(N,N,N',N'-tetramethyl-1,2-ethylenediamine)nickel(II), 99% (contains about 5% o-chlorotoluene) NiCl(o-tolyl)(TMEDA)
(1702744-45-3)
C₁₃H₂₃ClN₂Ni; FW: 301.48; dark-orange powdr.
air sensitive



500mg
2g
10g

Technical Notes:

1. Air-Stable Nickel precatalyst for cross-coupling
2. Precatalyst allowing various ligands to be used (mono- and bidentate phosphines, diimines and NHCs)



Tech. Note (1,2)
Ref. (1,2)

References:

1. *ACS Catal.*, **2015**, *5*, 3120
2. *Org. Lett.*, **2015**, *17*, 2166

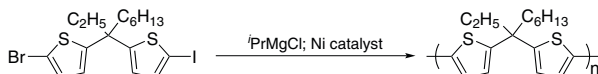
28-0500

Dichloro[1,1'-bis(diphenylphosphino)ferrocene]nickel(II), 98%
(67292-34-6)
[(C₅H₄P(C₆H₅)₂)₂Fe]NiCl₂; FW: 684.00; green micro xtl.

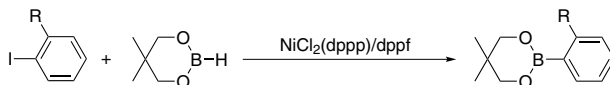
1g
5g

Technical Notes:

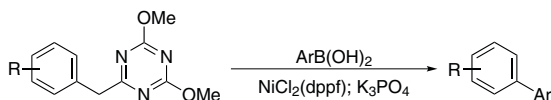
1. Catalyst for Grignard metathesis chain-growth polymerization of Poly(bithienylmethylene)s
2. Catalyst for neopentylglycolborylation of ortho-substituted aryl halides
3. Catalyst for Suzuki-Miyaura coupling reactions of heteroaryl ethers with arylboronic acids
4. Catalyst for carboxylation of naphthyl pivalates with CO₂
5. Catalyst decarboxylative C-P cross-coupling of alkenyl acids with P(O)H compounds
6. Catalyst for direct amination of phenols via C-O Bond Activation using 2,4,6-Trichloro-1,3,5-triazine as reagent
7. Catalyst for conversion of aryl, heteroaryl and pharmaceutically relevant chlorides to the correspondingtrifluoromethyl sulphides
8. Catalytic precursor for Suzuki-Miyaura cross-coupling reactions in water under very mild reaction conditions:
(a) aryl-heteroaryl cross-couplings; (b) Hetero-heteroaryl cross-couplings



Tech. Note (1)
Ref. (1)



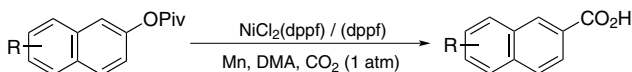
Tech. Note (2)
Ref. (2)



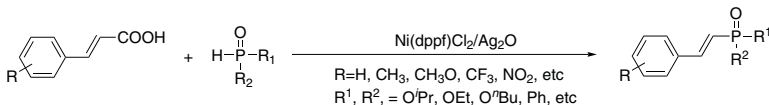
Tech. Note (3)
Ref. (3)

NICKEL (Compounds)

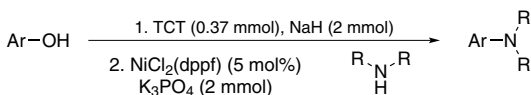
28-0500 Dichloro[1,1'-bis(diphenylphosphino)ferrocene]nickel(II), 98% (67292-34-6)
(continued)



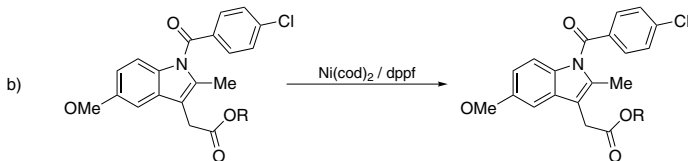
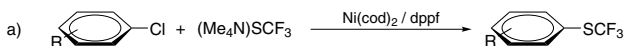
Tech. Note (4)
Ref. (4)



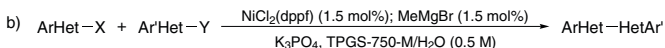
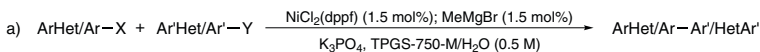
Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (6)



Tech. Note (7)
Ref. (7)



Tech. Note (8)
Ref. (8)

References:

1. *Macromolecules*, **2010**, 43, 4438.
2. *J. Org. Chem.*, **2010**, 75, 5438.
3. *J. Org. Chem.*, **2013**, 78, 5078.
4. *J. Am. Chem. Soc.*, **2014**, 136, 1062.
5. *J. Org. Chem.*, **2014**, 79, 8118.
6. *Adv. Synth. Catal.*, **2014**, 356, 3067.
7. *J. Am. Chem. Soc.*, **2015**, 137, 4164.
8. *Angew. Chem. Int. Ed.*, **2015**, 54, 11994.

28-1130 Nickel(II) acetylacetonate, anhydrous, min. 95% (3264-82-2) 25g
Ni(CH₃COCHCOCH₃)₂; FW: 256.93; light green powdr.; m.p. 238° dec. 100g
hygroscopic

Technical Note:

1. Versatile catalyst for polymerization, dimerization, hydrogenation, oxidation and addition reactions.

References:

1. *Chemistry of Metal Enolates*, **2009**, 551

28-1110 Nickel(II) acetylacetonate hydrate (120156-44-7) 100g
Ni(CH₃COCHCOCH₃)₂·XH₂O; FW: 256.93; light green powdr. 500g

Technical Note:

1. Versatile catalyst for polymerization, dimerization, hydrogenation, oxidation and addition reactions.

References:

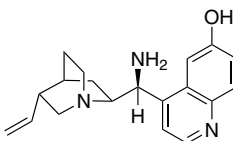
1. *Chemistry of Metal Enolates*, **2009**, 551

96-3660 Solvias Josiphos Nickel Catalyst Kit
See page 348

NITROGEN (Compounds)

07-1712 (8 α , 9S)-(+)-9-Amino-cinchonan-6'-ol, min. 90%
(960050-59-3)
C₁₉H₂₃N₃O; FW: 309.41; off-white to pale brown powdr.
(store cold)

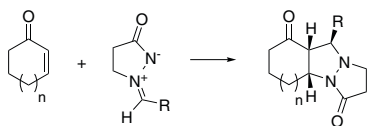
50mg
250mg



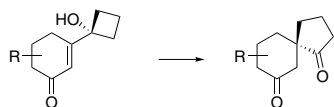
These amino-cinchonnane compounds behave as pseudoenantiomers, generally granting access to both enantiomers of a given transformation.

Technical Notes:

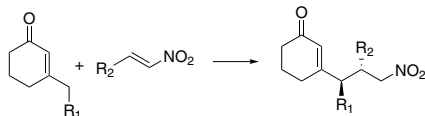
- [2+3]-dipolar cycloaddition of cyclic enones.
- Activation of α,β -unsaturated carbonyl compounds:
 - vinylous α -ketol rearrangement.
 - vinylous Michael addition of β -substituted α,β -unsaturated cyclohexanones.
- Michael addition
 - α -nitroacetate to α,β -unsaturated ketones.
 - Diastereodivergent Michael addition to α -substituted, α,β -unsaturated ketones.
- α -benzyloxylation of α -branched aldehydes.
- [4+2]-cycloadditions of β -substituted α,β -unsaturated cyclohexanones with polyconjugated malonitriles.
- Vinylous organocascade catalysis with control of remote stereochemistry in the synthesis of spirocyclic oxindoles.



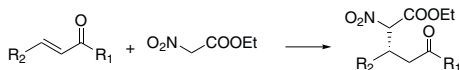
Tech. Note (1)
Ref. (1)



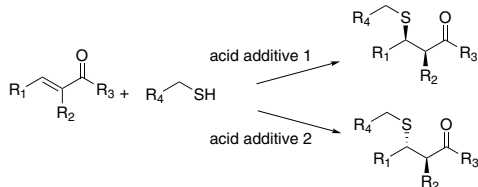
Tech. Note (2a)
Ref. (2)



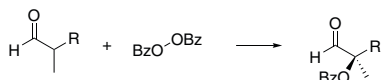
Tech. Note (2b)
Ref. (3)



Tech. Note (3a)
Ref. (4,5)



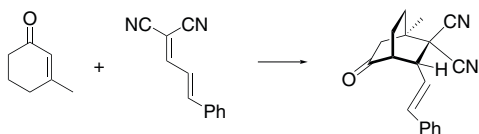
Tech. Note (3b)
Ref. (6)



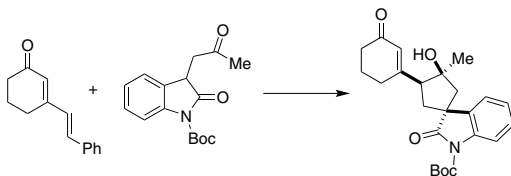
Tech. Note (4)
Ref. (7)

NITROGEN (Compounds)

07-1712 (8 α , 9S)-(+)-9-Amino-cinchonan-6'-ol, min. 90% (960050-59-3)
(continued)



Tech. Note (5)
Ref. (8)



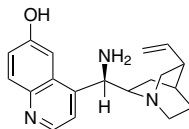
Tech. Note (6)
Ref. (9)

References:

1. *Angew. Chem. Int. Ed.*, **2007**, 46, 7667
2. *J. Am. Chem. Soc.*, **2009**, 131, 14626
3. *Proc. Nat. Acad. Sci. USA*, **2010**, 107, 20642
4. *Org. Lett.*, **2010**, 12, 2278
5. *Bull. Korean Chem. Soc.*, **2011**, 32, 291
6. *J. Am. Chem. Soc.*, **2011**, 133, 17934
7. *Tetrahedron*, **2012**, 68, 7568
8. *J. Am. Chem. Soc.*, **2012**, 134, 19942
9. *Angew. Chem. Int. Ed.*, **2013**, 52, 5360

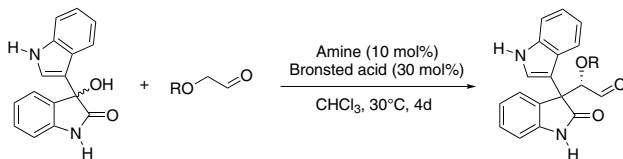
07-1717 (9R)-(+)-9-Amino-cinchonan-6'-ol, min. 90%
(960050-60-6)
C₁₉H₂₃N₃O; FW: 309.41;
off-white to pale brown powdr.
(store cold)

50mg
250mg

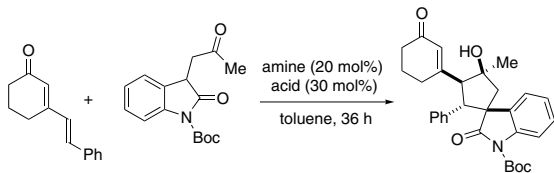


Technical Notes:

1. Organocatalyst for enantioselective alkylation of 3-hydroxyoxindoles with aldehydes co-promoted by the (BINOL)-derived phosphoric acids.
2. Aminocatalyst for vinylogous cascade reactions.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

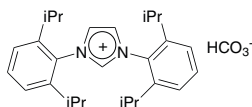
1. *Chem. Eur. J.*, **2013**, 19, 3319.
2. *Angew. Chem. Int. Ed.*, **2013**, 52, 5360

NITROGEN (Compounds)

07-0484

NEW

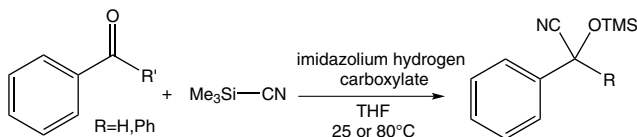
1,3-Bis(2,6-di-*i*-propylphenyl)imidazolium bicarbonate, min. 97%
IPrH.HCO₃ (1663476-15-0)
 [C₂₇H₃₇N₂]⁺HCO₃⁻; FW: 450.61;
 white to off-white powdr.
hygroscopic



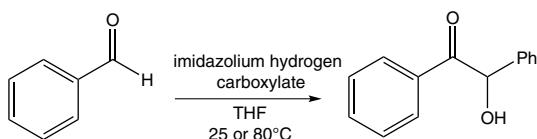
500mg
2g

Technical Notes:

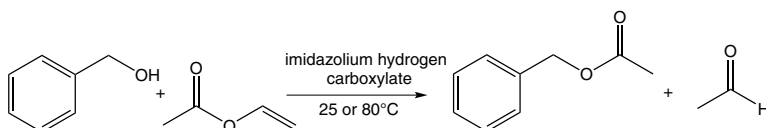
1. Catalyst used for the cyanosilylation of benzaldehyde or benzophenone.
2. Catalyst used in the benzoin condensation reaction.
3. Catalyst used to effect the transesterification between benzyl alcohol and vinyl acetate.



Tech. Note (1)
Ref. (1)



Tech. Note (2)



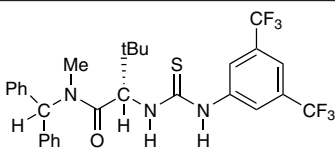
Tech. Note (3)

References:

1. *J. Org. Chem.*, **2012**, *77*, 10135
2. *Catal. Sci. Technol.*, **2014**, *4*, 2466

07-0215

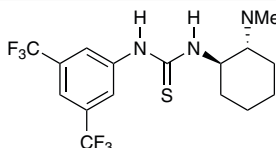
(2S)-(-)-2-([[(3,5-Bis(trifluoromethyl)phenyl]amino]thioxomethyl]amino)-N-(diphenylmethyl)-N,3,3-trimethylbutanamide, 95% (1186602-28-7)
 C₂₉H₂₉F₆N₃OS; FW: 581.62;
 white to gray solid; m.p. 193-198°
 Note: US Patent Application 61/240,558.



50mg
250mg
1g

07-0283

1-[3,5-Bis(trifluoromethyl)phenyl]-3-[(1R,2R)-(-)-2-(dimethylamino)cyclohexyl]thiourea (R,R-TUC) (620960-26-1)
 C₁₇H₂₁F₆N₃S; FW: 413.42; white powdr.; m.p. 87-88°
 Note: Sold for research purposes only.
 Patents PCT Application No.: JP2004009350 (publication WO2005000803) US Application 10/562,579, EPC Application 04746819.4



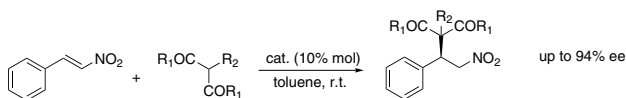
250mg
1g

Technical Notes:

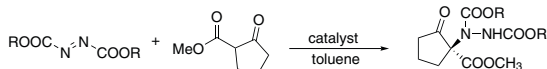
1. Thiourea catalyst used in the enantio and diastereoselective Michael addition of malonates and ketoesters to nitroolefins.
2. Catalyst used in the enantioselective hydrazination of 1,3-dicarbonyl compounds.
3. Catalyst used for the dynamic resolution of azalactones.
4. Catalyst used in Michael-Aldol reaction of 2-mercaptobenzaldehyde with α,β -unsaturated oxazolidinone.
5. Catalyst for enantioselective synthesis of flavanones and chromanones.
6. Catalyst for the asymmetric Neber Reaction.
7. Catalyst for the three component synthesis of 2,6-diazabicyclo[2.2.2]octanones.

NITROGEN (Compounds)

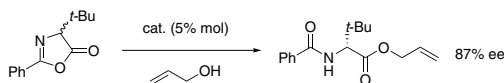
07-0283 1-[3,5-Bis(trifluoromethyl)phenyl]-3-[(1R,2R)-(-)-2-(dimethylamino)cyclohexyl]thiourea
(continued) (R,R-TUC) (620960-26-1)



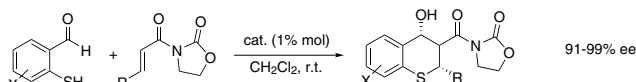
Tech. Note (1)
Ref. (1)



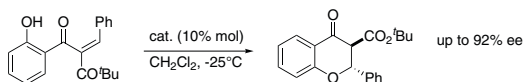
Tech. Note (2)
Ref. (2)



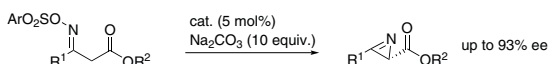
Tech. Note (3)
Ref. (3)



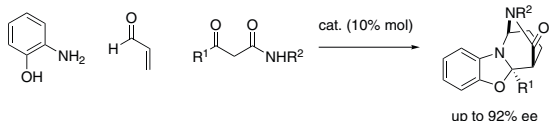
Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (6)



Tech. Note (7)
Ref. (7)

References:

1. *J. Am. Chem. Soc.*, **2005**, 127, 119
2. *Synlett*, **2006**, 1, 137
3. *Org. Biomol. Chem.* **2006**, 4, 4319
4. *J. Am. Chem. Soc.*, **2007**, 129, 1036
5. *J. Am. Chem. Soc.*, **2007**, 129, 3830
6. *Org. Lett.*, **2011**, 13, 6374
7. *Angew. Chem. Int. Ed.* **2013**, 52, 14143

07-0284 1-[3,5-Bis(trifluoromethyl)phenyl]-3-[(1S,2S)-(+)-2-(dimethylamino)cyclohexyl]thiourea (S,S-TUC) (851477-20-8)
C₁₇H₂₁F₆N₂S; FW: 413.42; white pwdr.; m.p. 87-88°
Note: Sold for research purposes only.
Patents PCT Application No.: JP2004009350 (publication WO2005000803)
US Application 10/562,579, EPC Application 04746819.4

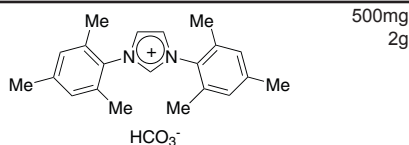
250mg
1g

Technical Note:

1. See 07-0283 (page 103)

07-4033 1,3-Bis(2,4,6-trimethylphenyl)imidazolium bicarbonate, min. 97% IMeS.HCO₃
(1372124-93-0)
[C₂₁H₂₅N₂]⁺HCO₃⁻; FW: 366.45;
white to yellow-orange pwdr.
moisture sensitive

NEW

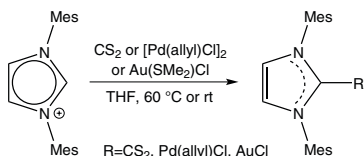


Technical Notes:

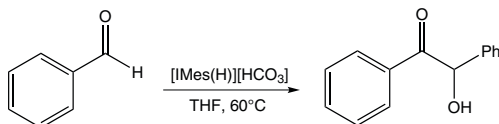
1. This compound is used as a source of NHC's and can be transferred to transition metals.
2. This catalyst is used in the benzoin condensation reaction.

NITROGEN (Compounds)

07-4033 1,3-Bis(2,4,6-trimethylphenyl)imidazolium bicarbonate, min. 97% IMesH.HCO₃
(continued) (1372124-93-0)



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (1, 2)

References:

1. *J. Am. Chem. Soc.*, **2012**, *134*, 6776
2. *J. Org. Chem.*, **2012**, *77*, 10135

07-0299 1,3-Bis(2,4,6-trimethylphenyl)imidazolium chloride, min. 97%

(141556-45-8)

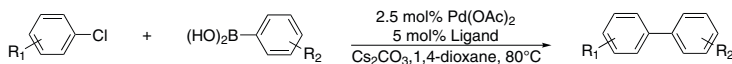
C₂₁H₂₅N₂⁺Cl⁻; FW: 340.90; off-white to yellow pwdr.

Note: NHC Ligand Kit 3: Variety of N-Heterocyclic Carbenes Kit component.

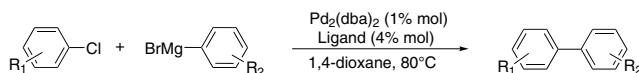
1g
5g

Technical Notes:

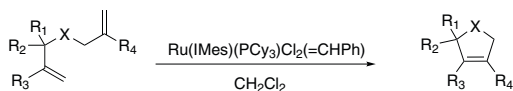
1. Precursor to the nucleophilic carbene that serves as a bulky, electron-rich "phosphine mimic" for metal-catalyzed reactions.
 - (a) Palladium-catalyzed Suzuki cross-coupling of aryl chlorides.
 - (b) Palladium-catalyzed Kumada cross-coupling of aryl chlorides.
 - (c) Ruthenium-carbene catalysts for ring-closing metathesis.
 - (d) Suzuki coupling of aryltrimethylammonium salts.
 - (e) Sonogashira coupling of aryl bromides.
2. Precursor to a nucleophilic carbene that serves as catalyst.
3. Ligand for arylation of aldehydes.
4. Ligand for carbene catalyzed intermolecular arylation of C-H bonds.
5. Catalyst for boron conjugate additions to cyclic and acyclic α,β -unsaturated carbonyls.
6. Ligand for dehydrogenative cyclocondensation of aldehydes, alkynes, and dialkylsilanes.
7. Precursor for carbene for conjugate silylation of alpha, beta-unsaturated carbonyls.



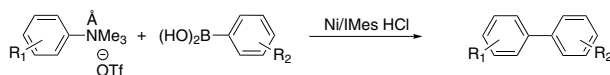
Tech. Note (1-a)
Ref. (1)



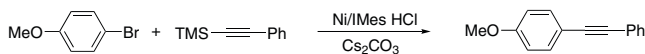
Tech. Note (1-b)
Ref. (2)



Tech. Note (1-c)
Ref. (3)



Tech. Note (1-d)
Ref. (4)



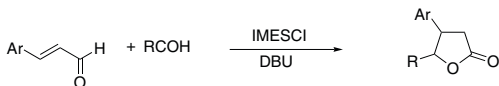
Tech. Note (1-e)
Ref. (5)

NITROGEN (Compounds)

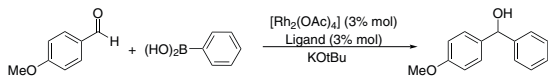
07-0299

1,3-Bis(2,4,6-trimethylphenyl)imidazolium chloride, min. 97% (141556-45-8)

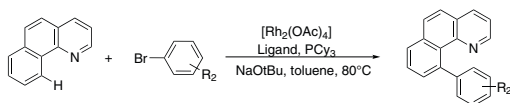
(continued)



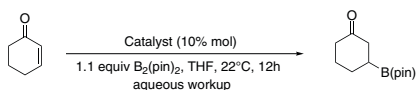
Tech. Note (2)
Ref. (6)



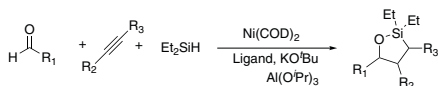
Tech. Note (3)
Ref. (7)



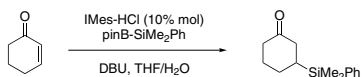
Tech. Note (4)
Ref. (8)



Tech. Note (5)
Ref. (9)



Tech. Note (6)
Ref. (10)



Tech. Note (7)
Ref. (11)

References:

1. *Organometallics*, **2002**, *21*, 2866.
2. *J. Am. Chem. Soc.*, **1999**, *121*, 9889.
3. *Org. Lett.*, **2000**, *2*, 1517.
4. *J. Am. Chem. Soc.*, **2003**, *125*, 6046.
5. *Organometallics*, **2002**, *21*, 1020.
6. *J. Am. Chem. Soc.*, **2004**, *126*, 14370.
7. *Angew. Chem. Int. Ed.*, **2007**, *46*, 5750.
8. *Angew. Chem. Int. Ed.*, **2009**, *48*, 8935.
9. *J. Am. Chem. Soc.*, **2009**, *131*, 7253.
10. *J. Am. Chem. Soc.*, **2008**, *130*, 9662.
11. *J. Am. Chem. Soc.*, **2011**, *133*, 7712.

07-0380

(11bR)-4,4-Dibutyl-2,6-bis(3,4,5-trifluorophenyl)-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]azepinium bromide (887938-70-7)

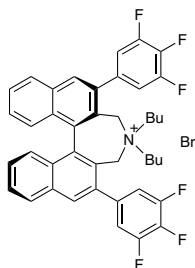
[C₄₂H₃₆F₆N]⁺Br⁻; FW: 748.64; brown powder.

Note: Sold in collaboration with Nagase for research purposes only. US Patent 6,340,753.

50mg
250mg

Technical Notes:

1. 2nd Generation Maruoka chiral phase transfer catalyst, for enantioselective alkylation of α -amino acid derivatives, that is easily recovered for recycle by extraction with fluoruous solvent.
2. Catalyst for asymmetric conjugate addition of α -substituted- α -cyanoacetates to α,β -unsaturated acetylenic esters.
3. Phase transfer catalyzed enantioselective α -alkylation.
4. Asymmetric amination of β -keto esters.
5. Diastereo- and enantioselective conjugate addition of α -substituted nitroacetates to maleimides.
6. Cyclization of β -alkynyl hydrazines.



NITROGEN (Compounds)

<p>07-0380 (continued)</p>	<p>(11bR)-4,4-Dibutyl-2,6-bis(3,4,5-trifluorophenyl)-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]azepinium bromide (887938-70-7)</p>		<p>Tech. Note (1) Ref. (1)</p>
	<p>Tech. Note (2) Ref. (2)</p>		
	<p>Tech. Note (3) Ref. (3)</p>		
	<p>Tech. Note (4) Ref. (4)</p>		
	<p>Tech. Note (5) Ref. (5)</p>		
	<p>Tech. Note (6) Ref. (6)</p>		

References:

1. *Tetrahedron Asymm.*, **2006**, 17, 603
2. *J. Am. Chem. Soc.*, **2007**, 129, 1038
3. *Angew. Chem. Int. Ed.*, **2009**, 48, 5014
4. *Tetrahedron Lett.*, **2009**, 50, 3280
5. *Chem. Commun.*, **2011**, 47, 10557
6. *Angew. Chem. Int. Ed.*, **2011**, 50, 8338

<p>07-0381</p>	<p>(11bS)-4,4-Dibutyl-2,6-bis(3,4,5-trifluorophenyl)-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]azepinium bromide (851942-89-7) [C₄₂H₃₆F₆N]⁺Br⁻; FW: 748.64; brown powdr. Note: Sold in collaboration with Nagase for research purposes only. US Patent 6,340,753.</p>	<p>50mg 250mg</p>
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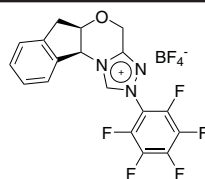
Technical Note:

1. See 07-0380 (page 106)

<p>07-0415</p>	<p>(5aR,10bS)-(+)-5a,10b-Dihydro-2-(pentafluorophenyl)-4H,6H-indeno[2,1-b][1,2,4]triazolo[4,3-d][1,4]oxazinium tetrafluoroborate, min. 98% (872143-57-2) [C₁₈H₁₁F₅N₃O]⁺BF₄⁻; FW: 467.10; light brown powdr.</p>	<p>250mg 1g</p>
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Technical Notes:

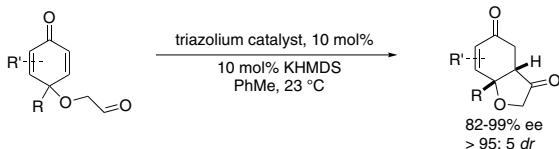
1. Reagent used in the highly enantio- and diastereoselective, catalytic intramolecular Stetter reaction.
2. Direct synthesis of α-protio and α-deuterio α-chloro and α-fluoro carboxylic acids via asymmetric hydration.
3. Chemoselective conversion of α-unbranched aldehydes to amides.



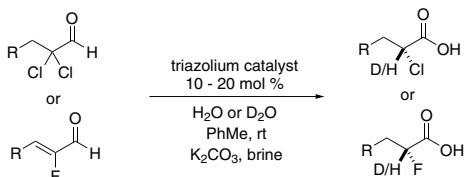
	<p>Tech. Note (1) Ref. (1,3)</p>
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NITROGEN (Compounds)

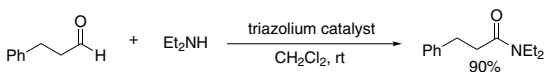
07-0415 (5aR,10bS)-(+)-5a,10b-Dihydro-2-(pentafluorophenyl)-4H,6H-indeno[2,1-b][1,2,4]triazolo[4,3-d][1,4]oxazinium tetrafluoroborate, min. 98% (872143-57-2)



Tech. Note (1)
Ref. (2)



Tech. Note (2)
Ref. (4)



Tech. Note (3)
Ref. (5)

References:

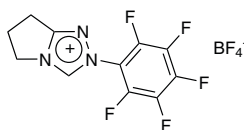
1. *J. Org. Chem.*, **2008**, *73*, 2033
2. *J. Am. Chem. Soc.*, **2006**, *128*, 2552
3. *Org. Lett.*, **2008**, *10*, 3141
4. *J. Am. Chem. Soc.*, **2010**, *132*, 2860
5. *Chem. Commun.*, **2012**, *48*, 145
6. For a review, see *Acc. Chem. Res.*, **2011**, *44*, 1182

07-0414 (5aS, 10bR)-(-)-5a,10b-Dihydro-2-(pentafluorophenyl)-4H,6H-indeno[2,1-b][1,2,4]triazolo[4,3-d][1,4]oxazinium tetrafluoroborate, min. 98% (740816-14-2) 100mg
[C₁₈H₁₁F₅N₃O]⁺BF₄⁻; FW: 467.10; light brown powdr. 500mg

Technical Note:

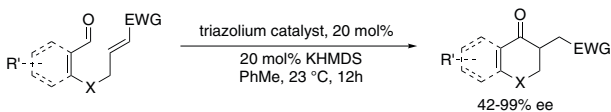
1. See 07-0415 (page 107)

07-0417 6,7-Dihydro-2-pentafluorophenyl-5H-pyrrolo[2,1-c]-1,2,4-triazolium tetrafluoroborate, min. 98% (862095-91-8) 250mg
[C₁₁H₇F₅N₃]⁺BF₄⁻; FW: 362.99; tan powdr. 1g

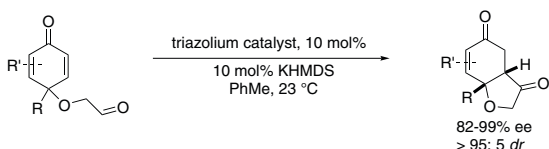


Technical Notes:

1. Reagent used in the highly enantio- and diastereoselective, catalytic intramolecular Stetter reaction.
2. Enantioselective synthesis of β-hydroxy and β-amino esters.
3. Organocatalytic iminium ion/carbene reaction cascade for the formation of 2,4-disubstituted cyclopentenones.
4. Synthesis of allo- and epi-Inositol via the NHC-catalyzed carbocyclization of carbohydrate-derived dialdehydes.



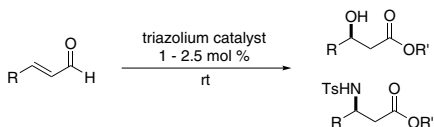
Tech. Note (1)
Ref. (1,3)



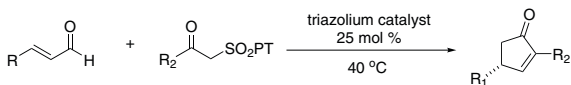
Tech. Note (2)
Ref. (4)

NITROGEN (Compounds)

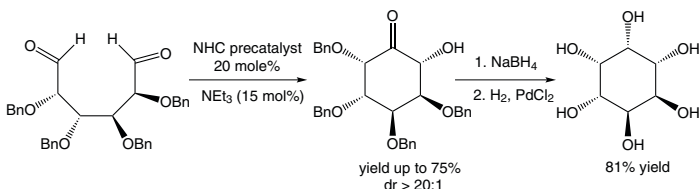
07-0417 **6,7-Dihydro-2-pentafluorophenyl-5H-pyrrolo[2,1-c]-1,2,4-triazolium tetrafluoroborate, min. 98% (862095-91-8)**



Tech. Note (2)
Ref. (4)



Tech. Note (3)
Ref. (5)



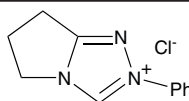
Tech. Note (4)
Ref. (6)

References:

1. *J. Org. Chem.*, **2008**, *73*, 2033
2. *J. Am. Chem. Soc.*, **2006**, *128*, 2552
3. *Org. Lett.*, **2008**, *10*, 3141
4. *Org. Lett.*, **2010**, *12*, 5052
5. *Org. Lett.*, **2011**, *13*, 4790
6. *J. Org. Chem.*, **2014**, *79*, 5088

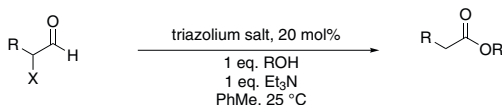
07-0421 **6,7-Dihydro-2-phenyl-5H-pyrrolo[2,1-c]-1,2,4-triazolium chloride, min. 98% (828914-68-7)**

250mg
1g

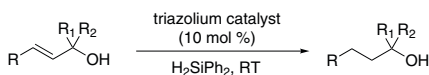


Technical Notes:

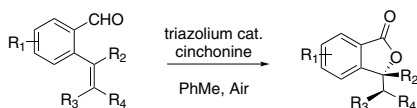
1. Reagent used for the conversion of α -haloaldehydes into acylating agents via a catalyzed internal redox reaction.
2. Reagent used for reduction of styryl and propargylic alcohols.
3. Catalyst for the synthesis of 3-substituted phthalides.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



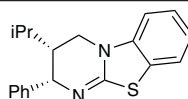
Tech. Note (3)
Ref. (3)

References:

1. *J. Am. Chem. Soc.*, **2004**, *126*, 9518.
2. *Chem. Eur. J.*, **2011**, *17*, 9911.
3. *Org. Lett.*, **2014**, *16*, 1028.

07-0496 **(2R,3S)-(-)-3,4-Dihydro-3-(i-propyl)-2-phenyl-2H-pyrimido[2,1-b]benzothiazole, min. 98% HyperBTM (1203507-02-1)**
C₁₉H₂₀N₂S; FW: 308.44; white pwdr.

NEW

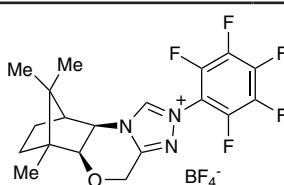


100mg
500mg

NITROGEN (Compounds)

96-1575 Cinchona Alkaloid-Derived Organocatalyst Kit - (enantiopure primary amines) for Iminium-Enamine Activation
See page 334

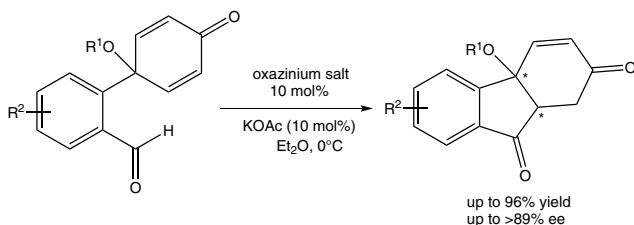
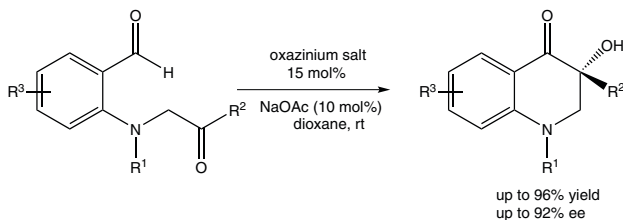
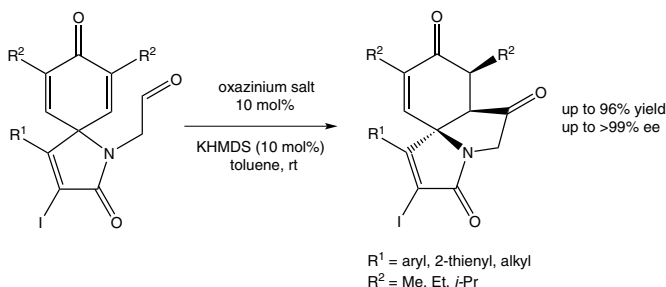
07-0970 (5a*S*,6*R*,9*S*,9a*R*)-5a,6,7,8,9,9a-Hexahydro-6,11,11-trimethyl-2-(2,3,4,5,6-pentafluorophenyl)-6,9-methano-4*H*-[1,2,4]triazolo[3,4-*c*][1,4]benzoxazinium tetrafluoroborate (1037287-81-2)
C₁₉H₁₉F₅N₃OBF₄; FW: 487.17; white powd. *hygroscopic*
Note: Sold in collaboration with SIOC for research purposes only.
Patent ZL200810033107.0.



250mg
1g

Technical Notes:

1. Chiral ligand used in the diastereoselective and enantioselective desymmetrization of α -substituted cyclohexadienones via an intramolecular Stetter reaction.
2. N-Heterocyclic, carbene-catalyzed, enantioselective intramolecular N-tethered aldehyde-ketone reactions.
3. Desymmetrization of cyclohexadienones via intramolecular Stetter reaction to construct tricyclic carbocycles.



References:

1. *J. Org. Chem.*, **2012**, *77*, 10996
2. *ACS Catalysis*, **2013**, *3*, 4, 622
3. *Synlett*, **2013**, *24(10)*, 622.

NITROGEN (Compounds)

07-0975

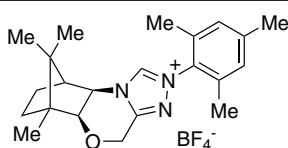
(5a*S*,6*R*,9*S*,9a*R*)-5a,6,7,8,9,9a-Hexahydro-6,11,11-trimethyl-2-(2,4,6-trimethylphenyl)-6,9-methano-4H-[1,2,4]triazolo[3,4-c][1,4]benzoxazinium tetrafluoroborate (1037287-79-8)

C₂₂H₃₀N₃OBF₄; FW: 439.29;
white to off-white pwdr.

hygroscopic

Note: Sold in collaboration with SIOC for research purposes only.

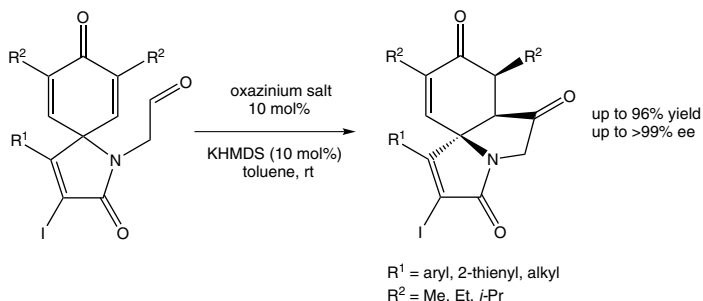
Patent ZL200810033107.0.



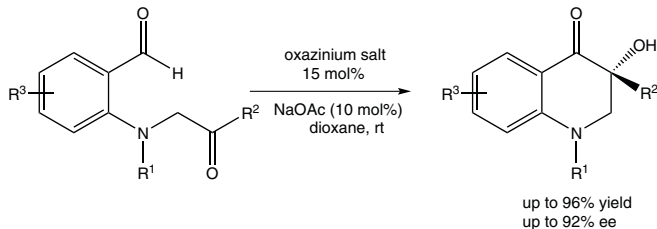
250mg
1g

Technical Notes:

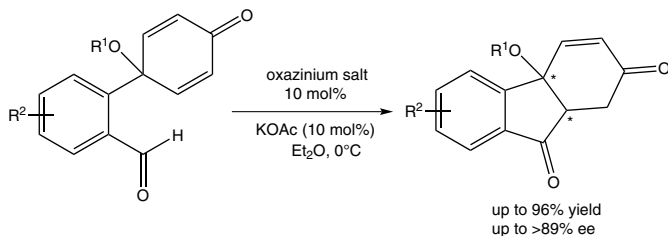
1. Chiral ligand used in the diastereoselective and enantioselective desymmetrization of α -substituted cyclohexadienones via an intramolecular Stetter reaction.
2. N-Heterocyclic, carbene-catalyzed, enantioselective intramolecular N-tethered aldehyde-ketone reactions.
3. Desymmetrization of cyclohexadienones via intramolecular Stetter reaction to construct tricyclic carbocycles.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



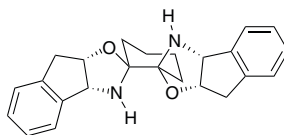
Tech. Note (3)
Ref. (3)

References:

1. *J. Org. Chem.*, **2012**, *77*, 10996
2. *ACS Catalysis*, **2013**, *3*, 4, 622
3. *Synlett*, **2013**, *24(10)*, 622.

NITROGEN (Compounds)

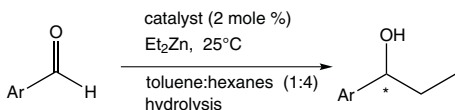
07-0488 (1'R,2'R,3aS,3''aS,8aR,8''aR)-(+)-3,3'',3a,3''a,8,8'',8a,8''a-Octahydrodispiro{2H-indeno[1,2-d]oxazole-2,1'-cyclohexane-2',2''-[2H]indeno[1,2-d]oxazole} **WOLF BISOXAZOLIDINE** (947515-50-6)
 $C_{24}H_{26}N_2O_2$; FW: 374.48; white powdr.
 Note: Sold under license from Georgetown University for research purposes only.
 Patent pending.



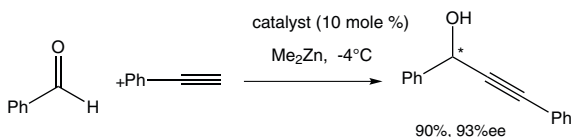
250mg
1g

Technical Notes:

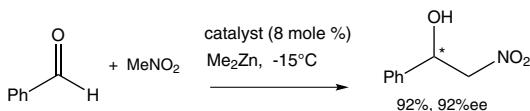
1. Catalyst used in the asymmetric addition of diethylzinc to aldehydes – synthesis of chiral alcohols.
2. Catalysts used in the asymmetric addition of acetylenes and silylacetylenes to aldehydes.
3. Catalyst used in the asymmetric addition of nitromethane to aldehydes – synthesis of β -hydroxynitromethanes.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

References:

1. *Org. Lett.*, **2007**, *9*, 2965
2. *J. Am. Chem. Soc.*, **2006**, *128*, 10996
3. *Org. Lett.*, **2008**, *10*, 1831

07-1885 **Pyridinium trifluoromethanesulfonate, min. 97%** (52193-54-1)
 $[C_5H_5NH]^+CF_3SO_3^-$; FW: 229.18; white powdr.; m.p. 221-223°

5g
25g

Technical Note:

1. Catalytic amounts of pyridinium triflate in conjunction with silylbenzamide is a versatile reagent for the silylation of alcohols.

References:

1. *J. Chem. Soc., Chem. Comm.*, **2001**, 2478

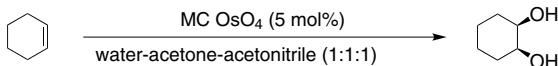
OSMIUM (Elemental Forms)

76-2956 **Osmium(VIII) oxide, Microencapsulated in a Styrene Polymer**
 HAZ (~10%OsO₄)
 OsO₄; black solid

1g

Technical Note:

1. Microencapsulated Osmium (VIII) oxide, in combination with a suitable co-oxidant, is a useful catalyst for the asymmetric dihydroxylation of olefins to yield chiral diols. The encapsulated OsO₄ is easily separated from the reaction mixture and is reusable. Furthermore, encapsulation suppresses the volatilization of hazardous osmium tetroxide.



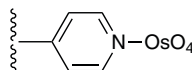
N-methylmorpholine N-oxide, rt, 12 hours

References:

1. *J. Org. Chem.*, **1998**, *63*, 6094

OSMIUM (Compounds)

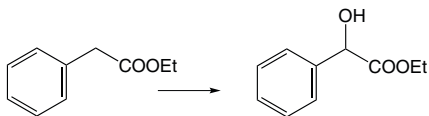
76-2970 Tetraoxopyridineosmium(VIII) (~7.5% Os) polymer-bound FibreCat™
yellow, fibrous solid
Note: Limited quantities available.



5g

Technical Note:

1. A stable polymer-bound osmium tetroxide useful for the hydroxylation of olefins. Use of this catalyst effectively eliminates the hazard of working with osmium tetroxide in the free state, while still maintaining its activity as a catalyst.



PALLADIUM (Elemental Forms)

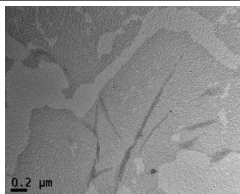
96-6715 BASF Blocking Group Removal Catalyst Kit
See page 322

96-6717 BASF Heterogeneous Catalyst Kit
See page 323

96-6719 BASF Palladium Catalyst Kit
See page 323

28-0015 Nickel/palladium alloy nanoparticle on graphene (G-Ni₃₃Pd₆₇)
black powdr.
Note: U.S. Patent Application 14/667,859.

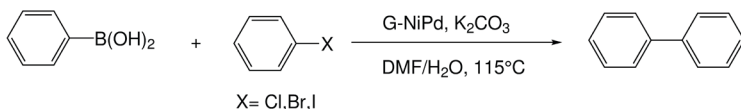
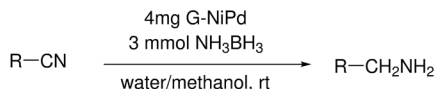
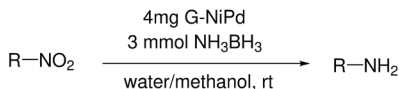
NEW



25mg
100mg

Technical Note:

1. NiPd NPs are useful catalysts for the tandem dehydrogenation of ammoniaborane and hydrogenation of R-NO₂ or R-CN to R-NH₂. NiPd nanoparticles also catalyze Suzuki-Miyaura and Heck cross-coupling reactions. The product is synthesized via the borane reduction of nickel and palladium salts in oleylamine, followed by dispersing the resulting mixture of Ni/Pd nanoparticles on graphene. The catalyst is 100% recyclable and shows no drop in catalytic activity after one month, when stored in air or argon at ambient temperatures.

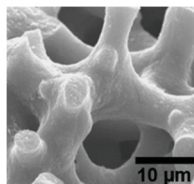


References:

1. *Nano Research*, **2013**, 6, 10.
2. *ACS Catal.*, **2014**, 4, 1777.

PALLADIUM (Elemental Forms)

46-1660 Palladium on carbon - 1 wt % loading, activated synthetic carbon pellet (7440-05-3)
NEW Pd; FW: 106.42; black pellet; SA: Pd 130 m²/g; P.Vol. 1.2 cm³/g



10g
50g

Technical Notes:

1. The enhanced dispersion of these Pd particles on the high purity carbon support (in both powder and pellet forms) enables the catalysts' operation under mild conditions (from RT to 60 °C) with higher selectivity and minimum unwanted side reactions.

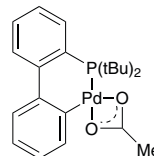
One of the key differences of the Pd/C catalyst in pellet form (46-1660) is its more accessible surface area. This product has macroporosity (10 micron) and mesoporosity (6 nm) which makes carbon considerably lower in density (0.27 g/mL versus 0.5 - 0.8 g/mL) and lighter than other carbon supports. This macroporosity allows palladium to be distributed throughout the carbon support instead of just on the outside. As a result, the metal surface area is much greater (130 m²/g vs 20 m²/g) and has a much smaller particle size (3.5 nm vs 40 nm).

46-1610 Palladium on carbon - 1 wt % loading, activated synthetic carbon powder (7440-05-3)
NEW Pd; FW: 106.42; black powder; SA: Pd 150 m²/g; P.Vol. 0.35 cm³/g

46-1630 Palladium on carbon - 5 wt % loading, activated synthetic carbon powder (7440-05-3)
NEW Pd; black powder; SA: Pd 70 m²/g; P.Vol. 0.35 cm³/g

PALLADIUM (Compounds)

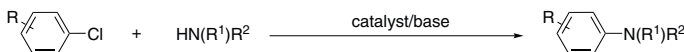
46-0025 Acetato(2'-di-*t*-butylphosphino-1,1'-biphenyl-2-yl) palladium(II), min. 98% (577971-19-8)
 C₂₂H₂₉O₂PPd; FW: 462.86; off-white powder



250mg
1g

Technical Note:

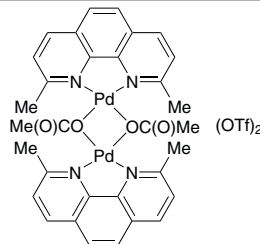
- Air and thermally stable, one-component precatalyst for the amination of aryl halides.



References:

- Org. Lett.*, **2003**, *5*, 2413

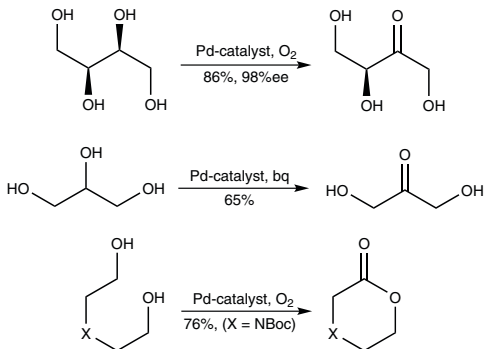
46-0970 Acetato(2,9-dimethyl-1,10-phenanthroline) palladium(II) dimer bis(trifluoromethanesulfonate), 99% (959698-19-2)
NEW C₃₄H₃₀F₆N₄O₁₀Pd₂S₂; FW: 1045.59; dark orange powder



100mg
500mg

Technical Note:

- This dimeric palladium complex is used in the chemoselective oxidation of polyols.



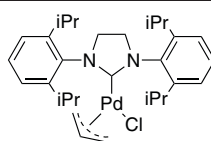
X = O, NBoc
 [O] = air, O₂, benzoquinone

References:

- J. Am. Chem. Soc.*, **2013**, *135*, 7593

PALLADIUM (Compounds)

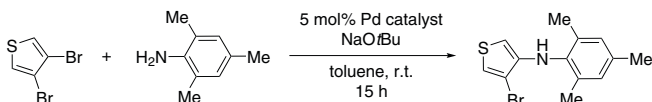
46-0039 Allylchloro[1,3-bis(2,6-di-*i*-propylphenyl)-4,5-dihydroimidazol-2-ylidene]palladium(II), 97%
(478980-01-7)
C₃₀H₄₃ClN₂Pd; FW: 573.55; white powdr.
Note: Sold in collaboration with Umicore for research purposes only. Patent WO 2004014550, US 6,316,380 and EP 721 953 A1.



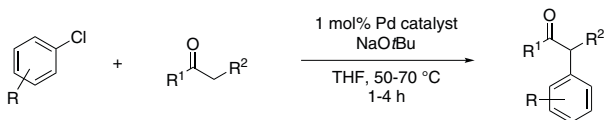
250mg
1g

Technical Notes:

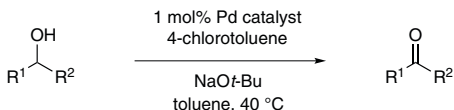
1. Catalyst for the cross-coupling of aryl chlorides or bromides with aromatic amines.
2. Catalyst for the α -arylation of ketones.
3. Catalyst for anaerobic alcohol oxidation.



Tech. Note (1)
Ref. (1,2)



Tech. Note (2)
Ref. (3)

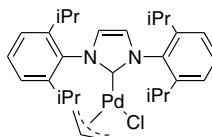


Tech. Note (3)
Ref. (4)

References:

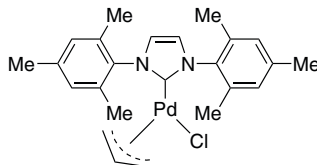
1. *Organometallics*, **2009**, 28, 5253
2. *Organometallics*, **2002**, 21, 5470
3. *Org. Lett.*, **2002**, 4, 4053
4. *J. Org. Chem.*, **2011**, 76, 1390

46-0040 Allylchloro[1,3-bis(2,6-di-*i*-propylphenyl)imidazol-2-ylidene]palladium(II), 98%
(478980-03-9)
C₃₀H₄₁ClN₂Pd; FW: 571.53; white powdr.; m.p. 190° dec.
Note: Sold in collaboration with Umicore for research purposes only. Patent WO 2004014550, US 6,316,380 and EP 721 953 A1.



250mg
1g

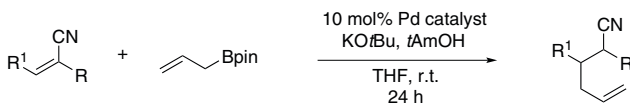
46-0045 Allylchloro[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]palladium(II), 98%
(478980-04-0)
C₂₈H₂₉ClN₂Pd; FW: 487.37; white powdr.
Note: Sold in collaboration with Umicore for research purposes only. Patent WO 2004014550, US 6,316,380 and EP 721 953 A1.



250mg
1g

Technical Notes:

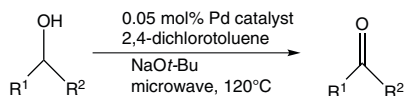
1. See 46-0039.
2. Catalyst for conjugate allylation reactions.
3. Catalyst for microwave assisted anaerobic alcohol oxidation.



Tech. Note (2)
Ref. (1)

PALLADIUM (Compounds)

46-0045 Allylchloro[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene]palladium(II), 98%
(continued) (478980-04-0)



Tech. Note (3)
Ref. (2)

References:

1. *Tetrahedron*, **2009**, 65, 3197.
2. *J. Org. Chem.*, **2011**, 76, 1390.

46-0065 Allyl(cyclopentadienyl)palladium(II), 98% (1271-03-0)

NEW

C₈H₁₀Pd; FW: 212.58; red solid
air sensitive, (store cold)



100mg
500mg
2g

Technical Notes:

1. Volatile palladium catalyst with numerous uses in CVD and MOCVD applications.

References:

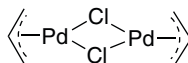
1. *Chem.Eur.J.*, **2012**, 19, 13652
2. *Catalysis Letters*, **2012**, 142, 313
3. *Chemistry of Materials*, **2009**, 21, 2360
2. Starting material for the in situ generation of active palladium catalysts.

References:

1. *Syn. Lett.*, **2014**, 25, 2488
2. *Org. Lett.*, **2013**, 15, 5932
3. *Angew.Chem.Int.Ed.*, **2013**, 52, 4466

46-0100 Allylpalladium chloride dimer, min. 98%

(12012-95-2)
[C₃H₅PdCl]₂; FW: 365.86; yellow xtl.; m.p. 120° dec.
air sensitive, (store cold)

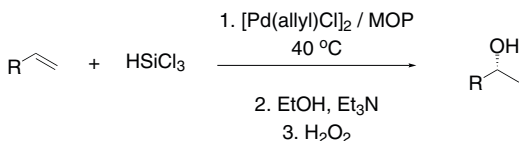


500mg
2g
10g

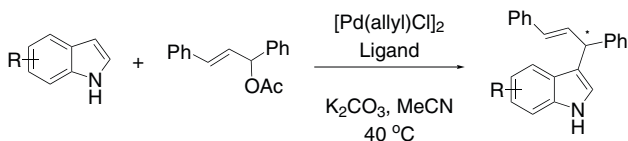
Note: Palladium Kit component.

Technical Notes:

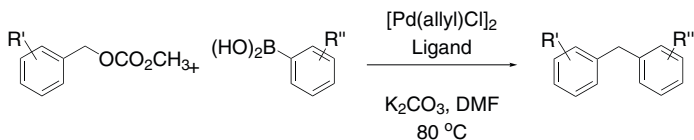
1. Precatalyst for the enantioselective hydrosilylation of olefins.
2. Precatalyst for asymmetric allylic alkylation and amination.
3. Used as a palladium source for cross-coupling reactions.
4. Can be used with Trost ligands.
5. Catalyst for the carbostannylation of alkynes.
6. Used as a precatalyst for "arylation" of aldehydes.



Tech. Note (1)
Ref. (1,2)



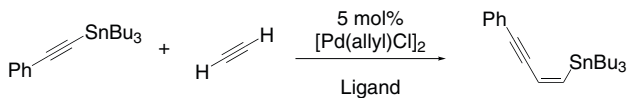
Tech. Note (2)
Ref. (3,4,5)



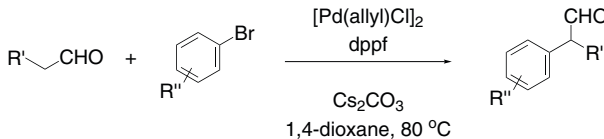
Tech. Note (3)
Ref. (6,7,8)

PALLADIUM (Compounds)

46-0100 Allylpalladium chloride dimer, min. 98% (12012-95-2)
(continued)



Tech. Note (5)
Ref. (12)



Tech. Note (6)
Ref. (13)

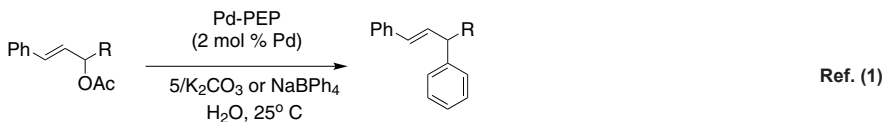
References:

1. *J. Am. Chem. Soc.*, **1991**, 113, 9887.
2. *Tetrahedron*, **1994**, 50, 335.
3. *J. Am. Chem. Soc.*, **2007**, 129, 7718.
4. *Org. Lett.*, **2007**, 9, 4295.
5. *Org. Lett.*, **2008**, 10, 501.
6. *Org. Lett.*, **2005**, 7, 945.
7. *Synlett*, **2005**, 2057.
8. *Tetrahedron*, **2007**, 63, 9393.
9. *J. Am. Chem. Soc.*, **2006**, 128, 2540.
10. *Org. Lett.*, **2006**, 8, 2027.
11. *Angew. Chem. Int. Ed.*, **2007**, 46, 6123.
12. *J. Am. Chem. Soc.*, **1998**, 120, 2975.
13. *Angew. Chem. Int. Ed.*, **2008**, 47, 2127.
14. *Chem. Rev.*, **1996**, 96, 395. (review)
15. *Science of Synthesis*, **2002**, 1, 113.

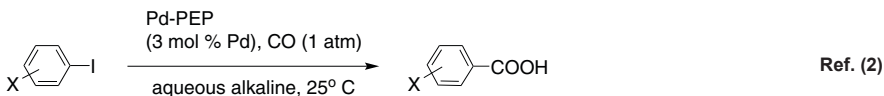
46-0101 Allylpalladium chloride dimer, supported on poly(ethylene glycol) polystyrene graft copolymer beads [~6% (C₃H₅PdCl)₂] 250mg
[C₃H₅PdCl]₂; yellow solid
air sensitive, (store cold)

Technical Notes:

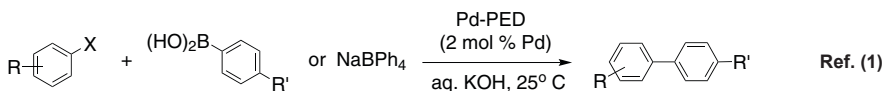
1. Resin supported Allylpalladium chloride dimer is a highly active catalyst useful in allylic substitution reactions, hydrocarbonylation of aryl halides, and cross-coupling of aryl halides and allylacetates with aryl boron reagents. The supported complex can easily be separated from the reaction mixture, and is reusable.
2. See 46-0100.



Ref. (1)



Ref. (2)



Ref. (1)

References:

1. *J. Org. Chem.*, **1999**, 64, 3384
2. *J. Org. Chem.*, **1999**, 64, 6921

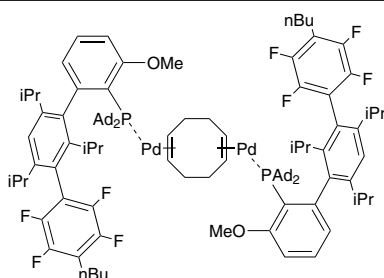
PALLADIUM (Compounds)

46-0241

NEW

Bis{[2-(Diadamantylphosphino)-3-methoxy-2',4',6'-tri-*i*-propyl-3'-(2,3,5,6-tetrafluoro-4-butylphenyl)-1,1'-biphenyl] palladium(0)}₂1,5-cyclooctadiene, [AIPhos Palladium complex] (1805783-51-0)

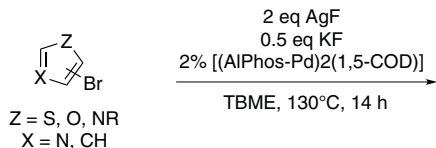
C₁₁₂H₁₄₆F₈O₂P₂Pd₂; FW: 1951.13; yellow-green solid
 Note: Patents: US 6,395,916, US 6,307,087



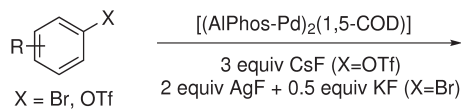
50mg
250mg

Technical Notes:

- Ligand for the Palladium-Catalyzed Fluorination of Five-Membered Heteroaryl Bromides.
- Ligand for the Palladium-Catalyzed Fluorination of Aryl Triflates and Bromides.



Tech. Note (1)
Ref. (1)



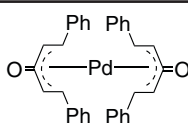
Tech. Note (2)
Ref. (2)

References:

- Organometallics*, **2015**, *34*, 4775
- J. Am. Chem. Soc.*, **2015**, *137*, 13433

46-0210

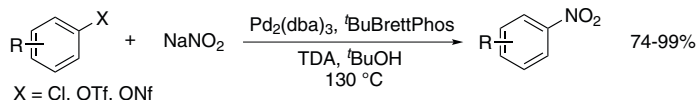
Bis(dibenzylideneacetone)palladium(0) (32005-36-0)
 (C₈H₈CH=CHCOCH=CHC₆H₅)₂Pd;
 FW: 575.00; purple powdr.
air sensitive, moisture sensitive



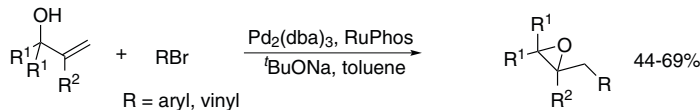
250mg
1g
5g
25g

Technical Notes:

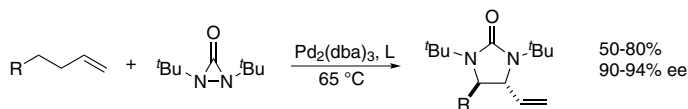
- Palladium-catalyzed acylation of unsaturated halides by anions of enol ethers.
- Asymmetric Allylation reactions.
- Intramolecular reactions with alkenes.
- Carbonylation reactions.
- Cross Coupling reactions.



Tech. Note (1)
Ref. (2)



Tech. Note (2)
Ref. (3)



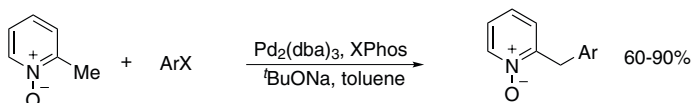
Tech. Note (2)
Ref. (4)

PALLADIUM (Compounds)

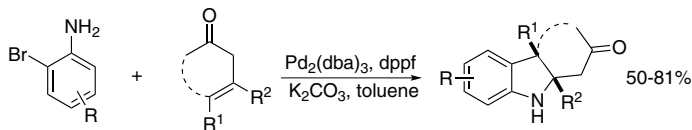
46-0210

Bis(dibenzylideneacetone)palladium(0) (32005-36-0)

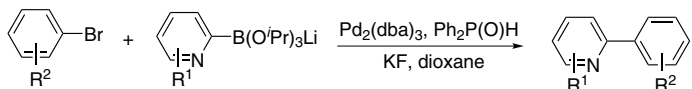
(continued)



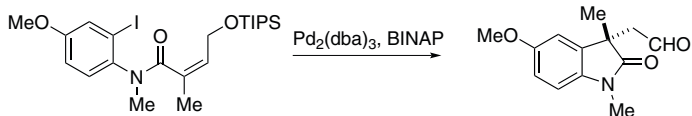
Tech. Note (3)
Ref. (5)



Tech. Note (4)
Ref. (6)



Tech. Note (4)
Ref. (7)



Tech. Note (5)
Ref. (8)

References:

1. *Handbook of Organopalladium Chemistry for Organic Synthesis*, 1st Ed., John Wiley & Sons, 2002. (review)
2. *J. Am. Chem. Soc.*, **1983**, 105, 943.
3. *Tet. Lett.*, **1988**, 29, 4543.
4. *Tet. Lett.*, **1986**, 27, 4573.
5. *J. Chem. Soc., Chem. Commun.*, **1988**, 948.
6. *J. Org. Chem.*, **1991**, 56, 5357.
7. *J. Am. Chem. Soc.*, **1985**, 107, 8289.
8. *Tet. Lett.*, **1988**, 29, 6043.

46-0228

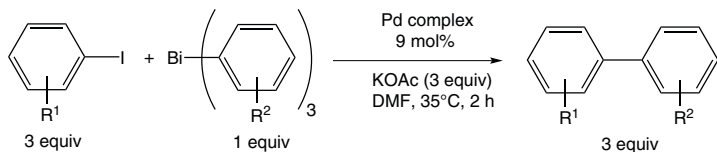
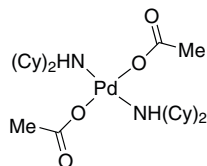
trans-Bis(dicyclohexylamine)bis(acetato) palladium(II) DAPCy (628339-96-8)

Pd[(C₆H₁₁)₂NH]₂(CH₃COO)₂; FW: 587.14; yellow xtl.

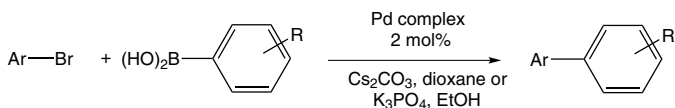
250mg
1g

Technical Notes:

1. Pd-catalyzed coupling of aryl iodides with triarylboranes.
2. Pd-catalyzed Suzuki Coupling Reactions of aryl bromides under mild aerobic conditions.



Tech. Note (1)
Ref. (1)



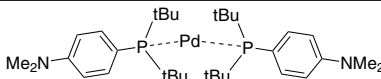
Tech. Note (2)
Ref. (2)

References:

1. *Tetrahedron Lett.*, **2010**, 51, 6101
2. *J. Org. Chem.*, **2004**, 69, 4330

PALLADIUM (Compounds)

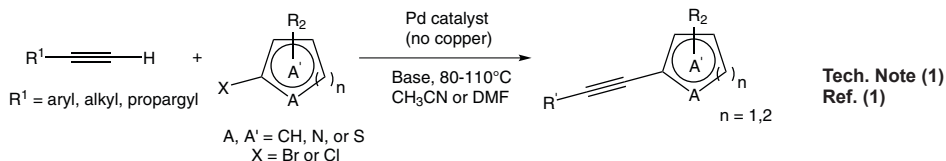
46-0828 Bis{[4-(*N,N*-dimethylamino)phenyl]-di-*t*-butylphosphino}palladium(0), min. 98% Pdamphos (1233717-68-4)
 $C_{32}H_{56}N_2P_2Pd$; FW: 637.17; yellow-brown pwr.
air sensitive
 Note: Sold in collaboration with Johnson Matthey for research purposes only.



250mg
1g

Technical Note:

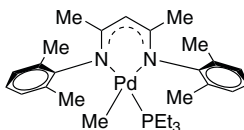
- Catalyst used for the Heck alkylation of aryl and heteroaryl chlorides.



References:

- J. Org. Chem.*, **2013**, *78*, 568

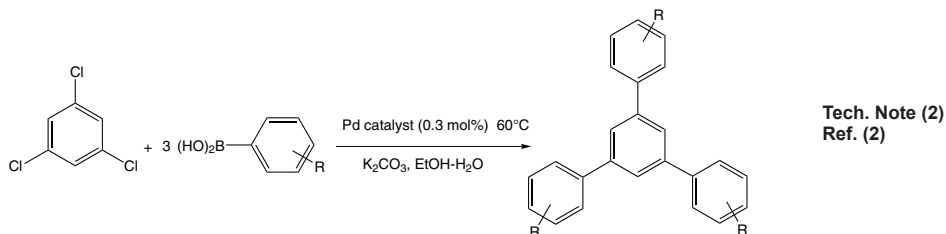
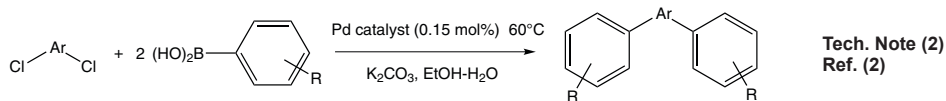
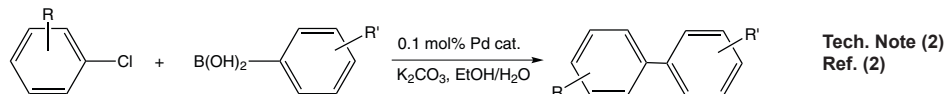
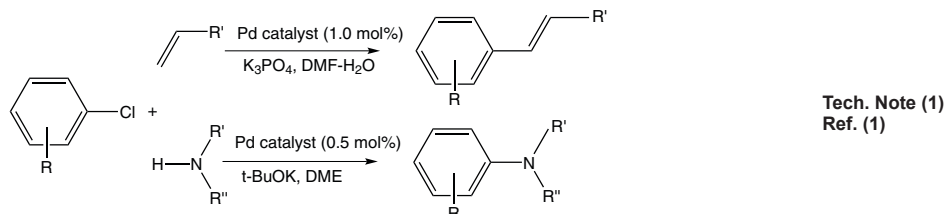
46-0230 *N,N'*-[Bis(2,6-dimethylphenyl)-1,3-dimethyl-1,3-propanediylidene](methyl)(triethylphosphine)palladium(II), min. 97% (1224879-40-6)
 $C_{28}H_{43}N_2PPd$; FW: 545.05; light brown pwr.
air sensitive



50mg
250mg

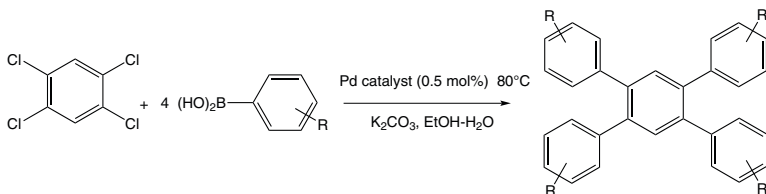
Technical Notes:

- Catalyst used in the general method for the Heck and Buchwald-Hartwig coupling reactions of aryl chlorides.
- Extremely active and general catalyst for the Suzuki coupling reaction of unreactive aryl chlorides.



PALLADIUM (Compounds)

46-0230 N,N'-[Bis(2,6-dimethylphenyl)-1,3-dimethyl-1,3-propanediylidene](methyl) (continued) (triethylphosphine)palladium(II), min. 97% (1224879-40-6)

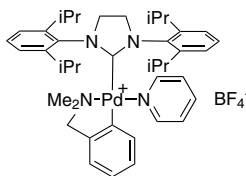


Tech. Note (2)
Ref. (2)

References:

1. *Org. Lett.*, **2011**, *13*, 5540.
2. *Org. Lett.*, **2011**, *13*, 252.

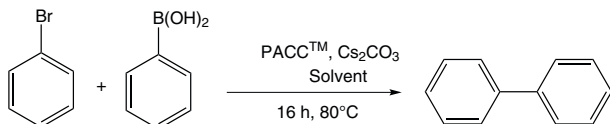
46-0226 [1,3-Bis(2,6-di-i-propylphenyl)-4,5-dihydroimidazol-2-ylidene][2-[(dimethylamino-kN)methyl]phenyl-kC}(pyridine)palladium(II) tetrafluoroborate, min. 97% PACC™
[C₄₁H₅₅N₄Pd]BF₄; FW: 797.13; pale yellow solid
air sensitive
Note: Sold under license from Kanata for research purposes only. US App. No. 61/324,022.



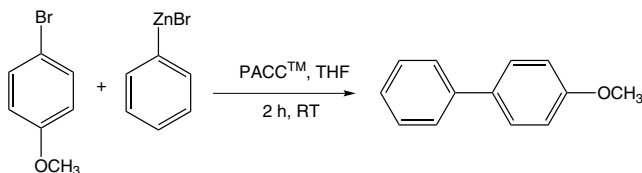
100mg
500mg

Technical Notes:

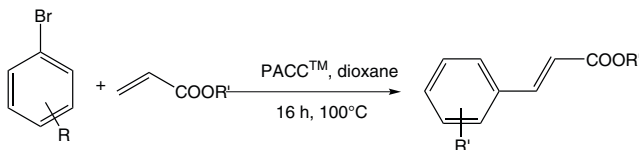
1. Catalyst used for Suzuki-Miyaura Coupling.
2. Catalyst used for Negishi Coupling.
3. Catalyst used for Heck-Mizoroki Coupling.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (1)

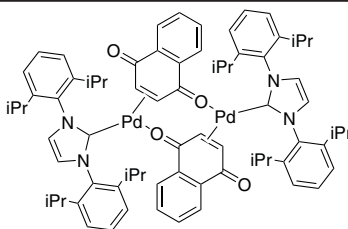


Tech. Note (3)
Ref. (1)

References:

1. US Patent Application No. 61/324,022.

46-0220 1,3-Bis(2,6-di-i-propylphenyl)imidazol-2-ylidene(1,4-naphthoquinone)palladium(0) dimer, 96% (649736-75-4)
[(C₂₇H₃₆N₂)(C₁₀H₆O₂)Pd]₂; FW: 1306.3; violet solid
air sensitive
Note: Sold in collaboration with Umicore for research purposes only. Patent WO 2004014550, US 6,316,380 and EP 721 953 A1.



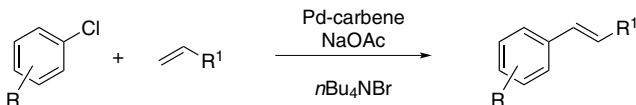
250mg
1g

PALLADIUM (Compounds)

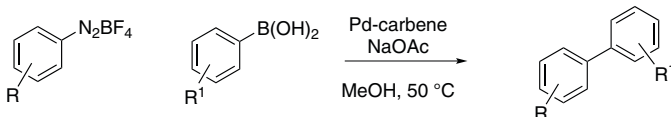
46-0220 1,3-Bis(2,6-di-*i*-propylphenyl)imidazol-2-ylidene(1,4-naphthoquinone)palladium(0) dimer, (continued) 96% (649736-75-4)

Technical Notes:

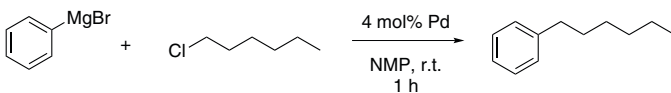
1. Catalyst for Heck reactions in ionic liquids.
2. Catalyst for the cross-coupling of aryl diazonium salts.
3. Catalyst for the Kumada cross-coupling of alkyl chlorides.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

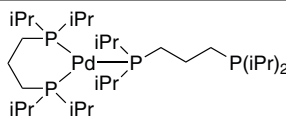


Tech. Note (3)
Ref. (3)

References:

1. *Org. Lett.*, **2002**, 4, 3031
2. *Chem. Eur. J.*, **2002**, 8, 3901
3. *J. Organomet. Chem.*, **2003**, 687, 403

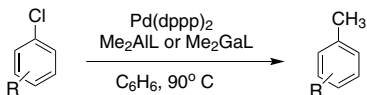
46-0205 [P,P'-1,3-Bis(di-*i*-propylphosphino)propane][P-1,3-bis(di-*i*-propylphosphino)propane]palladium(0), 98% (123333-45-9)
 $[\text{CH}_2\{\text{CH}_2(\text{P}(\text{C}_3\text{H}_7)_2)_2\}_2]\text{Pd}[(\text{C}_3\text{H}_7)_2\text{PCH}_2\text{CH}_2\text{CH}_2\text{P}(\text{C}_3\text{H}_7)_2]$; FW: 659.18;
 yellow oil to solid
air sensitive, (store cold)



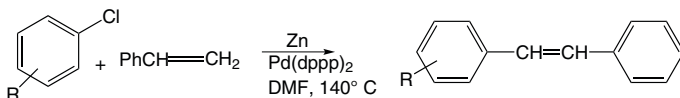
250mg
1g

Technical Notes:

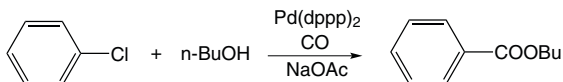
1. Catalyst for the cross-methylation of aryl chlorides using stabilized dimethylaluminum or dimethylgallium reagents.
2. Catalyst used in base-free olefin arylation.
3. Catalyst for the efficient carbonylation of aryl chlorides.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



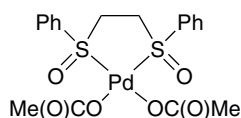
Tech. Note (3)
Ref. (3,4)

References:

1. *Synthesis*, **2000**, 4, 571
2. *Organometallics*, **1993**, 12, 4734
3. *J. Am. Chem. Soc.*, **1989**, 111, 8742
4. *J. Chem. Soc. Chem. Comm.*, **1989**, 1816

PALLADIUM (Compounds)

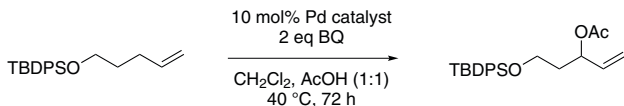
46-0245 1,2-Bis(phenylsulfinyl)ethane palladium(II) acetate, min. 98% Christina White Catalyst (858971-43-4)
 $C_{18}H_{20}O_6PdS_2$; FW: 502.90; orange to brown powdr. (store cold)



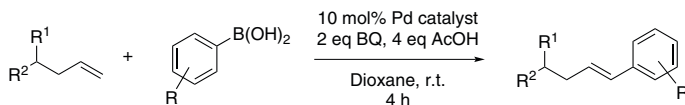
250mg
1g

Technical Notes:

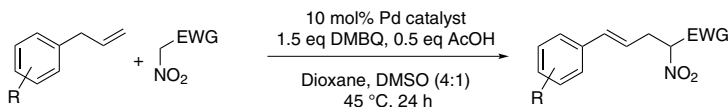
1. Catalyst for allylic oxidation.
2. Catalyst for oxidative Heck reactions.
3. Catalyst for allylic alkylation.
4. Catalyst for allylic amination.



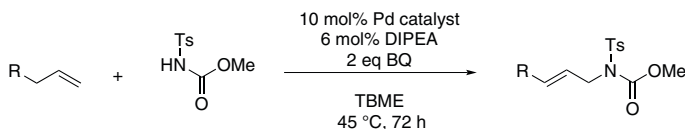
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)

References:

1. *J. Am. Chem. Soc.*, **2004**, 126, 1346
2. *J. Am. Chem. Soc.*, **2008**, 130, 11270
3. *J. Am. Chem. Soc.*, **2008**, 130, 14090
4. *J. Am. Chem. Soc.*, **2009**, 131, 11701

46-0252 Bis(tri-*t*-butylphosphine)palladium(0), 98% (53199-31-8)
 $Pd[P(C_4H_9)_3]_2$; FW: 511.06; off-white xtl.
air sensitive

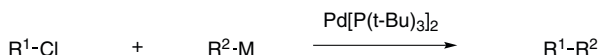
250mg
1g
5g
25g

Technical Notes:

1. Introduced as an easier to handle Pd/P(*t*-Bu)₃-based catalyst for the Negishi cross-coupling of aryl/vinyl chlorides.
2. A versatile catalyst for the cross-coupling of aryl and vinyl chlorides.
3. Catalyst for the amination of aryl chlorides and bromides using aqueous hydroxide bases.
4. Useful catalyst for the cross-coupling of heteroaromatic carboxylic acids.
5. Pd-catalyzed Newman-Kwart rearrangement of O-aryl thiocarbamates.
6. Cross-coupling of silanolates and halides.
7. Elimination/isomerization of enol triflates derived from β-ketoesters



Tech. Note (1)
Ref. (1-3)

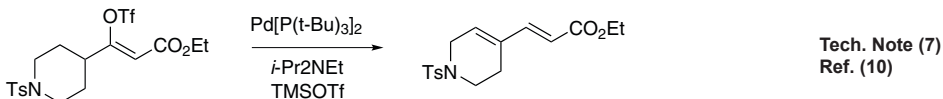
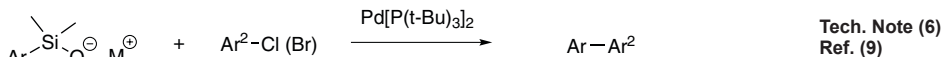
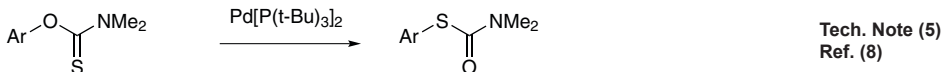
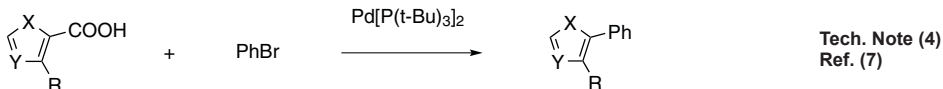
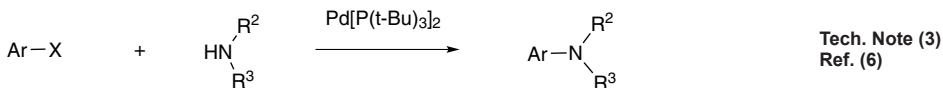


Tech. Note (2)
Ref. (4,5)

PALLADIUM (Compounds)

46-0252 Bis(tri-*t*-butylphosphine)palladium(0), 98% (53199-31-8)

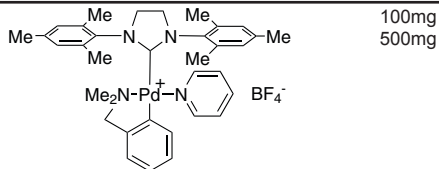
(continued)



References:

1. *J. Am. Chem. Soc.*, **2001**, 123, 2719
2. *Handbook of Palladium Catalyzed Organic Reactions*, **1997**
3. *Palladium Reagents and Catalysis*, **1995**, Tsuji
4. *J. Am. Chem. Soc.*, **2002**, 124, 6343
5. *J. Am. Chem. Soc.*, **2001**, 123, 2719
6. *J. Org. Chem.*, **2002**, 67, 6479
7. *J. Am. Chem. Soc.*, **2006**, 128, 11350
8. *Angew. Chem. Int. Ed.*, **2009**, 48, 7612
9. *J. Am. Chem. Soc.*, **2009**, 131, 3104
10. *Angew. Chem. Int. Ed.*, **2011**, 50, 6128

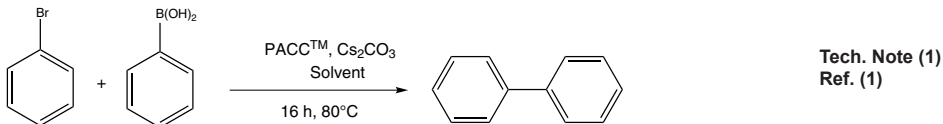
46-0224 [1,3-Bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene] {2-[(dimethylamino-*k*N)methyl]phenyl-*k*C}(pyridine)palladium (II) tetrafluoroborate, min. 97% PACC™
[C₃₅H₄₃N₄Pd]BF₄; FW: 712.97; pale yellow solid
air sensitive



Note: Sold under license from Kanata for research purposes only. US App. No. 61/324,022.

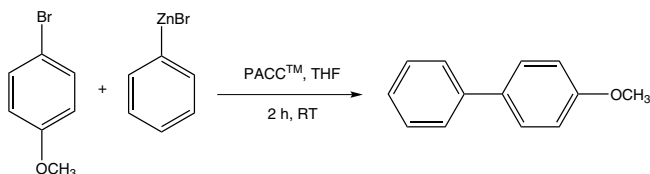
Technical Notes:

1. Catalyst used for Suzuki-Miyaura Coupling.
2. Catalyst used for Negishi Coupling.
3. Catalyst used for Heck-Mizoroki Coupling.

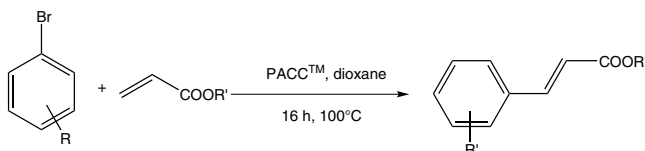


PALLADIUM (Compounds)

46-0224 [1,3-Bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene]{2-[(dimethylamino-kN)methyl]phenyl-kC}(pyridine)palladium (II) tetrafluoroborate, min. 97% PACC™
(continued)



Tech. Note (2)
Ref. (1)



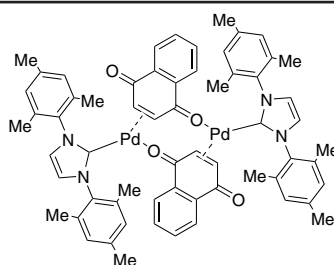
Tech. Note (3)
Ref. (1)

References:

1. US Patent Application No. 61/324,022.

46-0265 **1,3-Bis(2,4,6-trimethylphenyl)imidazol-2-ylidene(1,4-naphthoquinone)palladium(0) dimer, 96%** (467220-49-1)
[(C₂₁H₂₄N₂)(C₁₀H₆O₂)Pd]₂; FW: 1138.00; orange-red powdr.
air sensitive

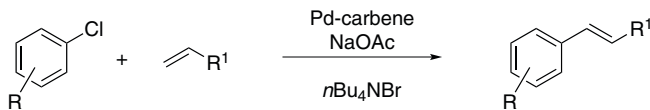
Note: Sold in collaboration with Umicore for research purposes only.
Patent WO 2004014550, US 6,316,380 & EP 721 953 A1.



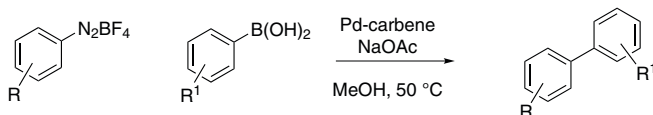
250mg
1g

Technical Notes:

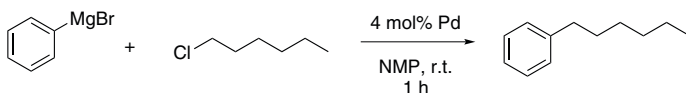
1. Catalyst for Heck reactions in ionic liquids.
2. Catalyst for the cross-coupling of aryl diazonium salts.
3. Catalyst for the Kumada cross-coupling of alkyl chlorides.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



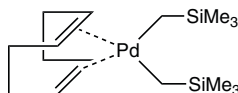
Tech. Note (3)
Ref. (3)

References:

1. *Org. Lett.*, **2002**, *4*, 3031
2. *Chem. Eur. J.*, **2002**, *8*, 3901
3. *J. Organomet. Chem.*, **2003**, *687*, 403

46-0308 **Bis[(trimethylsilyl)methyl](1,5-cyclooctadiene)palladium(II), 98%**
(225931-80-6)
C₁₆H₃₄PdSi₂; FW: 389.03; gray powdr.
air sensitive, (store cold)

NEW



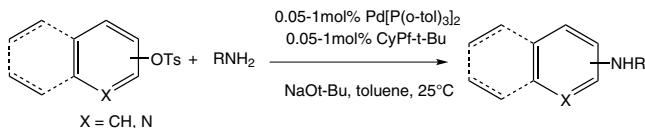
250mg
1g

PALLADIUM (Compounds)

46-0262 **Bis(tri-*o*-tolylphosphine)palladium(0)**, min. 98% (69861-71-8) 250mg
 $C_{42}H_{42}P_2Pd$; FW: 715.15; yellow xtl. 1g
air sensitive, (store cold) 5g

Technical Note:

- Catalyst used in the palladium-catalyzed amination of aryl and heteroaryl tosylates at room temperature.



References:

- J. Am. Chem. Soc.*, **2008**, *130*, 13848

96-5503 **Buchwald Palladacycle Precatalyst Kit 1**
(Chloro-2-aminoethylphenyl- Palladacycles Gen. 1)
 See page 325

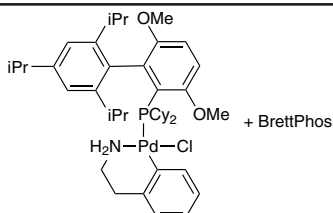
96-5508 **Buchwald Palladacycle Precatalyst Kit 3**
(Chloro- 2'-amino-1,1'-biphenyl-2-yl - Palladacycles Gen. 2)
 See page 326

96-5505 **Buchwald Palladacycle Precatalyst Kit 2a**
(Methanesulfonato-2'-amino-1,1'-biphenyl-2-yl- Palladacycles Gen. 3)
 See page 327

96-5506 **Buchwald Palladacycle Precatalyst Kit 2b (Methanesulfonato-2'-amino-1,1'-biphenyl-2-yl- Palladacycles Gen. 3)**
 See page 329

96-5512 **Buchwald Palladacycle Precatalyst Kit 4 (Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4)**
 See page 331

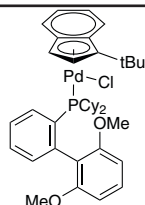
46-0367 **Chloro{[BrettPhos][2-(2-aminoethylphenyl)]palladium(II)}** 100mg
[BrettPhos] admixture 500mg
(molar PdP/P = 1:1)
 white powdr.
 Note: Patents: US 6,395,916, US 6,307,087.



Technical Note:

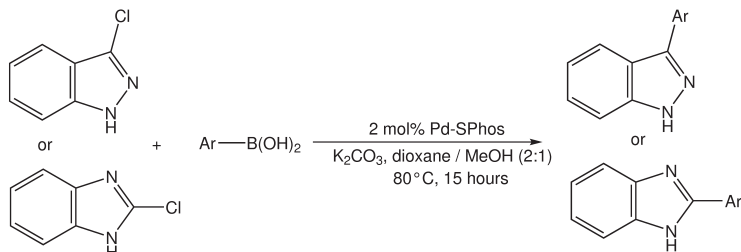
- See 46-0267.

46-0435 **Chloro(1-*t*-butylindenyl)[2-(dicyclohexylphosphino)-2',6'-dimethoxy-1,1'-biphenyl]palladium(II)** 100mg
(1779569-07-1) 500mg
 $C_{39}H_{52}ClO_2PPd$; FW: 723.06; orange powdr.
 Note: For research and development only. Not for use in humans. Patents 62/061,319. US 6,395,916, US 6,307,087.



Technical Note:

- Catalyst used in the Suzuki cross-coupling of 3-chloroindazole or 3-chlorobenzimidazole with arylboronic acids.



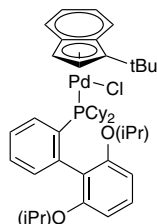
Tech. Note (1)

References:

- ACS Catal.*, **2015**, *5*, 3680.

PALLADIUM (Compounds)

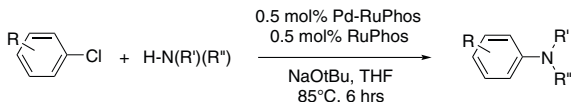
46-0440 **Chloro(1-t-butylindenyl)[2-(dicyclohexylphosphino)-2',6'-di-i-propoxy-1,1'-biphenyl]palladium(II)**
 (1779569-08-2)
 $C_{43}H_{58}ClO_2PPd$; FW: 779.77; orange pwdr.
 Note: For research and development only. Not for use in humans. Patents 62/061,319. US 6,395,916, US 6,307,087.



100mg
500mg

Technical Note:

1. Catalyst used in the Buchwald-Hartwig cross-coupling of substituted aryl chlorides with secondary amines.

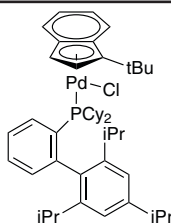


Tech. Note (1)

References:

1. *ACS Catal.*, **2015**, *5*, 3680.

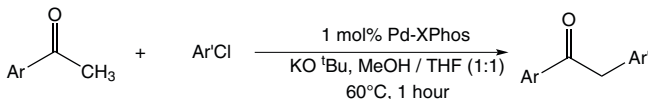
46-0437 **Chloro(1-t-butylindenyl)[2-(dicyclohexylphosphino)-2',4',6'-tri-i-propyl-1,1'-biphenyl]palladium(II)**
 (1779569-06-0)
 $C_{46}H_{64}ClPPd$; FW: 789.85; orange pwdr.
 Note: For research and development only. Not for use in humans. Patents 62/061,319. US 6,395,916, US 6,307,087.



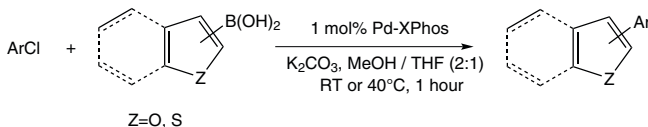
100mg
500mg

Technical Notes:

1. Catalyst used in the α -arylation of ketones.
2. Catalyst used in the Suzuki cross-coupling of aryl chlorides with boronic acid-substituted benzofurans.



Tech. Note (1)
Ref. (1)

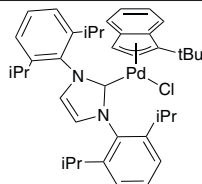


Tech. Note (2)
Ref. (1)

References:

1. *ACS Catal.*, **2015**, *5*, 3680.

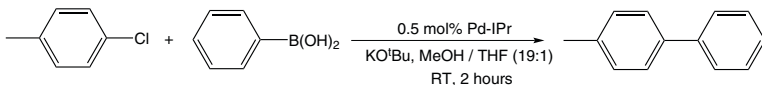
46-0815 **Chloro(1-t-butylindenyl)[1,3-bis(2,6-di-i-propylphenyl)imidazol-2-yl]palladium(II), 98%**
 $C_{40}H_{41}ClN_2Pd$; FW: 691.61; orange pwdr.



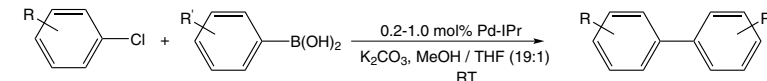
100mg
500mg

Technical Note:

1. Catalyst used in the Suzuki cross-coupling of aryl halides and aryl boronic acids.



Tech. Note (1)



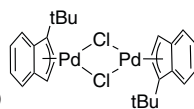
References:

1. *ACS Catal.*, **2015**, *5*, 3680.

PALLADIUM (Compounds)

46-0868 **Chloro(1-t-butylindenyl)palladium(II) dimer, 98%**
 (1779569-01-5)
 $C_{26}H_{30}Cl_2Pd_2$; FW: 626.26; brown powdr.

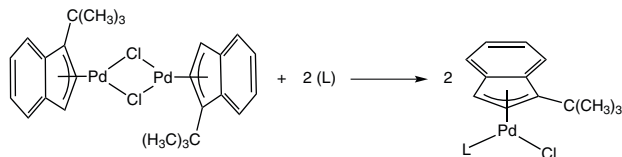
NEW



100mg
500mg

Technical Note:

- Starting material used to prepare monomeric chloro(t-butylindenyl) (ligand)palladium complexes.

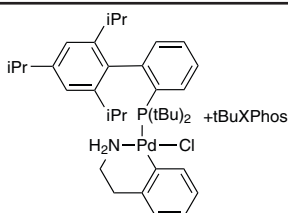


Tech. Note (1)
Ref. (1)

References:

- ACS Catal., 2015, 5, 3680

46-0364 **Chloro[[t-BuXPhos][2-(2-aminoethyl)phenyl] palladium(II)]/[t-BuXPhos] admixture (molar Pd/P = 1:1)**
 white powdr.
 Note: Patents: US 6,395,916, US 6,307,087

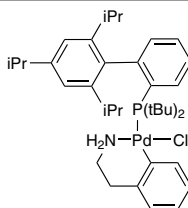


100mg
500mg

Technical Note:

- See 46-0264.

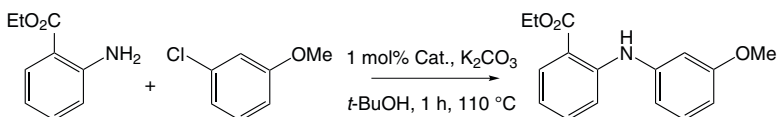
46-0264 **Chloro(2-di-t-butylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II), min. 98%**
[t-BuXPhos Palladacycle Gen. 1] (1142811-12-8)
 $C_{37}H_{55}ClNPPd$; FW: 686.69; white powdr.
 Note: Patents: US 6,395,916, US 6,307,087.
 Buchwald Palladacycle Precatalyst Kit 1 component.



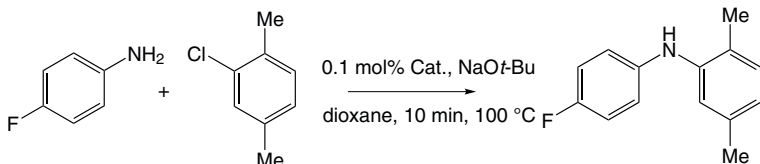
100mg
500mg
2g
10g

Technical Notes:

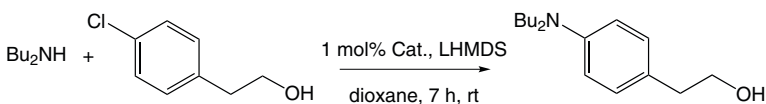
- Catalyst for cross-coupling reactions of electron-deficient anilines with aryl chlorides.
- Catalyst for rapid C-N bond-forming process at low catalyst loading.
- Catalyst for C-N cross-coupling reactions, at or below room temperature.
- Efficient Pd-catalyzed amination reactions for heterocycle functionalization.



Tech. Note (1)
Ref. (1)



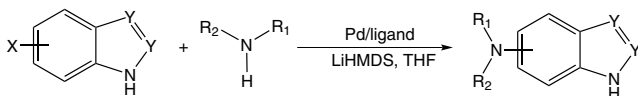
Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (1)

PALLADIUM (Compounds)

46-0264 Chloro(2-di-*t*-butylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II), min. 98% [t-BuXPhos Palladacycle Gen. 1] (1142811-12-8)



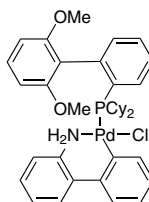
Tech. Note (4)
Ref. (2)

References:

1. *J. Am. Chem. Soc.*, **2008**, *130*, 6686
2. *Org. Lett.*, **2010**, *12*, 4442

46-0283 Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II) min. 98% [SPhos Palladacycle Gen. 2] (1375325-64-6)

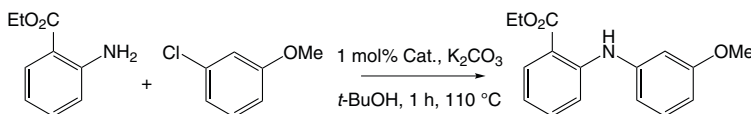
C₃₀H₄₅ClNO₂PPd; FW: 720.62; white pwdr.
Note: Patents: US 6,395,916, US 6,307,087.
Buchwald Palladacycle Precatalyst Kit 3 component.



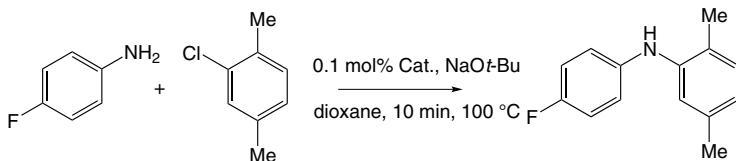
250mg
1g
5g
25g

Technical Note:

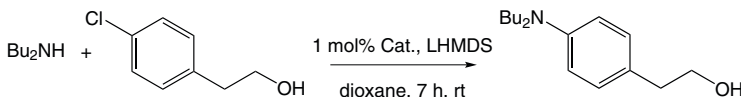
1. Palladium precatalyst for Suzuki-Miyaura coupling reactions.



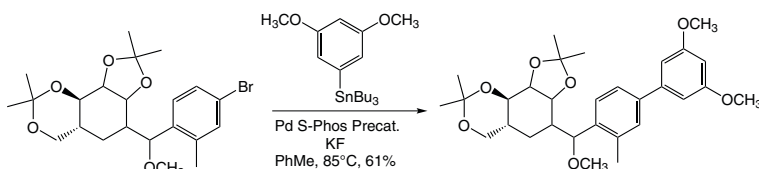
Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



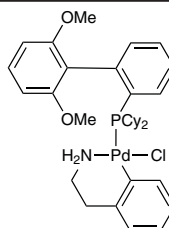
Tech. Note (1)
Ref. (2)

References:

1. *J. Am. Chem. Soc.*, **2010**, *132*, 14073
2. *Org. Lett.*, **2013**, *15*, 5818

46-0269 Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)[2-(2-aminoethylphenyl)] palladium(II) methyl-*t*-butylether adduct, min. 98% [SPhos Palladacycle Gen. 1] (1028206-58-7)

C₃₄H₄₅ClNO₂PPd; FW: 672.57; white pwdr.
Note: Patents: US 6,395,916, US 6,307,087.
Buchwald Palladacycle Precatalyst Kit 1 component.



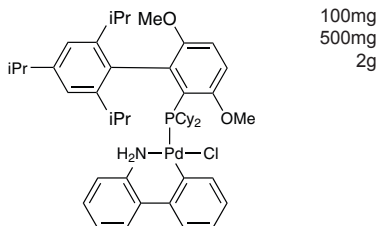
250mg
1g
5g

Technical Note:

1. See 46-0268.

PALLADIUM (Compounds)

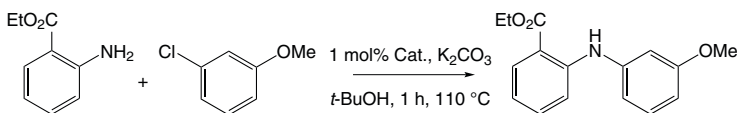
46-0292 Chloro[2-(dicyclohexylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl] [2-(2-amino-1,1'-biphenyl-2-yl)palladium(II)], min. 98% [BrettPhos Palladacycle Gen. 2] (1451002-39-3)
 $C_{47}H_{63}ClNO_2PPd$; FW: 846.86; white powdr.
 Note: Patents: US 6,395,916, US 6,307,087.
 Buchwald Palladacycle Precatalyst Kit 3 component.



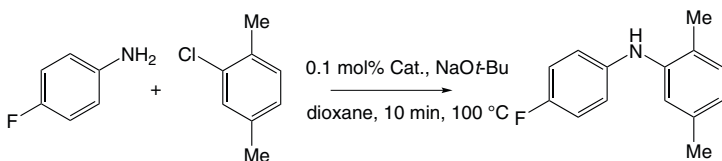
100mg
500mg
2g

Technical Notes:

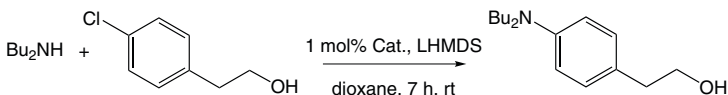
1. Palladium precatalyst for fast Buchwald-Hartwig coupling reactions.
2. Suzuki-Miyaura coupling of chloropyrazoles with boronic acids.



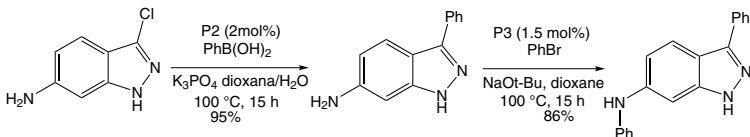
Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)

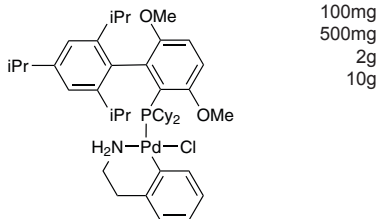


Tech. Note (1)
Ref. (2)

References:

1. *J. Am. Chem. Soc.*, **2010**, *132*, 14073
2. *J. Am. Chem. Soc.*, **2013**, *135*, 12879

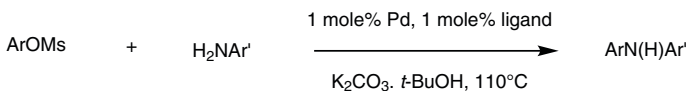
46-0267 Chloro[2-(dicyclohexylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl] [2-(2-aminoethyl)phenyl]palladium(II), min. 98% [BrettPhos Palladacycle Gen. 1] (1148148-01-9)
 $C_{43}H_{63}ClNO_2PPd$; FW: 798.81; white powdr.
 Note: Patents US 6,395,916, US 6,307,087.
 Buchwald Palladacycle Precatalyst Kit 1 component.



100mg
500mg
2g
10g

Technical Notes:

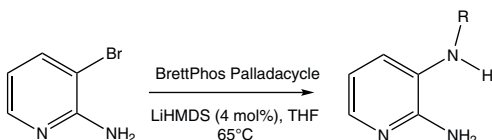
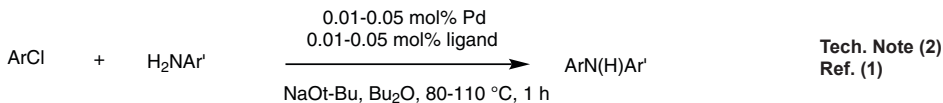
1. Catalyst for cross-coupling reactions using aryl mesylates with electron-deficient anilines.
2. Catalyst for rapid C-N bond-forming processes at low catalyst loading.
3. Cross-coupling of 3-Bromo-2-aminopyridine with primary amines.



Tech. Note (1)
Ref. (1)

PALLADIUM (Compounds)

46-0267 Chloro[2-(dicyclohexylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl][2-(2-aminoethyl)phenyl]palladium(II), min. 98% [BrettPhos Palladacycle Gen. 1] (1148148-01-9)



Tech. Note (3)
Ref. (2)

References:

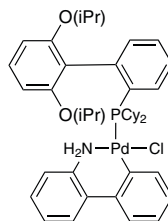
1. *J. Am. Chem. Soc.*, **2008**, *130*, 13552
2. *Org. Lett.*, **2011**, *13*, 1984

46-0232 Chloro[2-(dicyclohexylphosphino)-2'-(*N*,*N*-dimethylamino)-1,1'-biphenyl][2'-(2-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [DavePhos Palladacycle Gen. 2]
C₃₈H₄₆ClN₂PPd; FW: 703.63; white powder.
Note: Patents: US 6,395,916, US 6,307,087.



250mg
1g

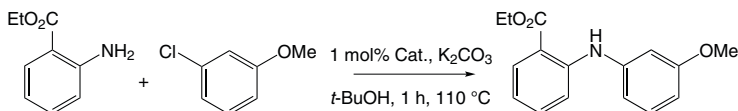
46-0286 Chloro(2-dicyclohexylphosphino-2',6'-di-*i*-propoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 2] (1375325-68-0)
C₄₂H₅₃ClNO₂PPd; FW: 776.72; white powder.
Note: Patents: US 6,395,916, US 6,307,087. Buchwald Palladacycle Precatalyst Kit 3 component.



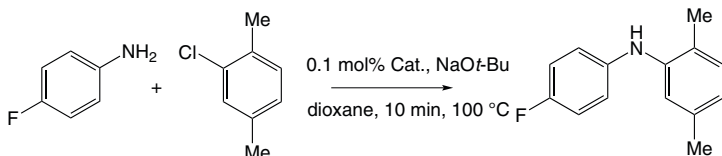
250mg
1g
5g

Technical Note:

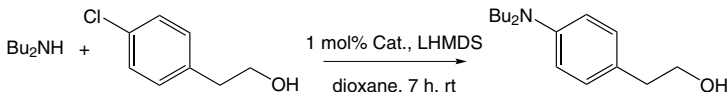
1. Palladium precatalyst for Suzuki-Miyaura coupling reactions.



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



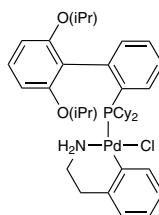
Tech. Note (1)
Ref. (1)

References:

1. *J. Am. Chem. Soc.*, **2010**, *132*, 14073

PALLADIUM (Compounds)

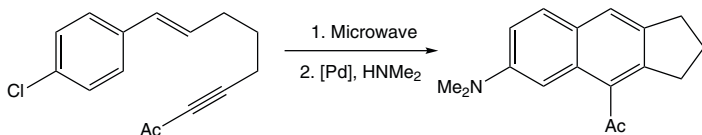
46-0266 Chloro(2-dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-biphenyl)[2-(2-aminoethylphenyl)]palladium(II), methyl-t-butylether adduct, min. 98% [RuPhos Palladacycle Gen. 1] (1028206-60-1)
 $C_{38}H_{53}ClNO_2PPd$; FW: 728.68; off-white to beige powdr.
 Note: Patents: US 6,395,916, US 6,307,087.
 Buchwald Palladacycle Precatalyst Kit 1 component.



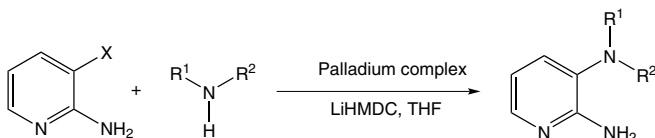
100mg
 500mg
 2g
 10g

Technical Notes:

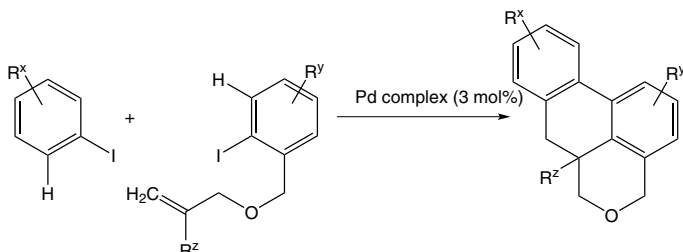
1. Catalyst used in the thermal dehydrogenative Diels-Alder reaction of styrenes.
2. Catalyst used for the CN-cross coupling reactions of 3-halo-2-aminopyridines.
3. Catalyst used for the domino reaction of two aryl iodides, involving two C-H functionalizations.



Tech. Note (1)
 Ref. (1)



Tech. Note (2)

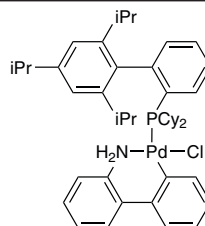


Tech. Note (3)
 Ref. (3)

References:

1. *Org. Lett.*, **2012**, *14*, 4430
2. *Org. Lett.*, **2011**, *13*, 1984
3. *Angew. Chem. Int. Ed.*, **2014**, *53*, 5147

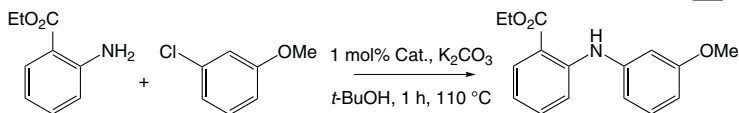
46-0281 Chloro(2-dicyclohexylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [XPhos Palladacycle Gen. 2] (1310584-14-5)
 $C_{45}H_{59}ClNPPd$; FW: 786.80; white powdr.
 Note: Patents: US 6,395,916, US 6,307,087.
 Buchwald Palladacycle Precatalyst Kit 3 component.



250mg
 1g
 5g
 25g

Technical Note:

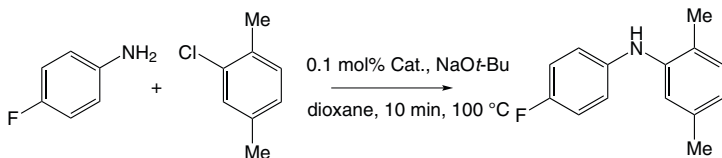
1. Palladium precatalyst for Buchwald/Hartwig coupling reactions.



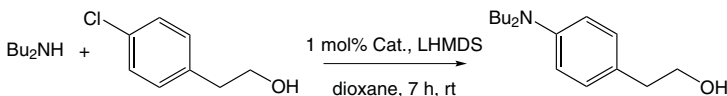
Tech. Note (1)
 Ref. (1)

PALLADIUM (Compounds)

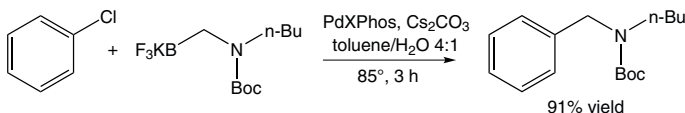
46-0281 Chloro(2-dicyclohexylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [XPhos Palladacycle Gen. 2] (1310584-14-5)



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)

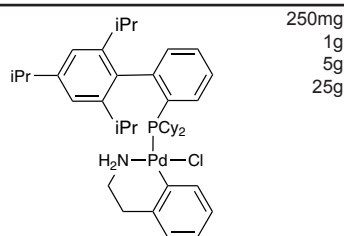


Tech. Note (1)
Ref. (2)

References:

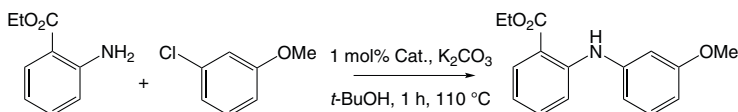
1. *J. Am. Chem. Soc.*, **2010**, *132*, 14073
2. *Org. Lett.*, **2013**, *15*, 5818

46-0268 Chloro(2-dicyclohexylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II) methyl-*t*-butylether adduct, min. 98% [XPhos Palladacycle Gen. 1] (1028206-56-5)
C₄₁H₅₉ClNPPd; FW: 738.76; white powdr.
Note: Patents: US 6,395,916, US 6,307,087.
Buchwald Palladacycle Precatalyst Kit 1 component.

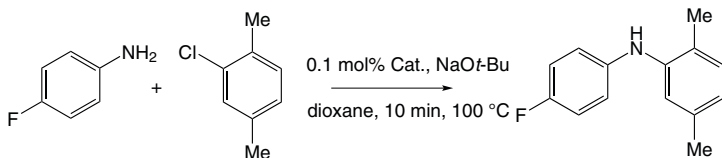


Technical Notes:

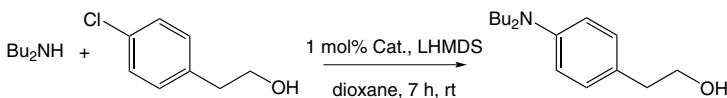
1. Catalyst for cross-coupling reactions of electron-deficient anilines with aryl chlorides.
2. Catalyst for rapid C-N bond-forming process at low catalyst loading.
3. Catalyst for C-N cross-coupling reactions, at or below room temperature.
4. Catalyst for the synthesis of tetracyclic indoles via intermolecular α -arylation of ketones.
5. Catalyst for the cross-coupling of benzyl chlorides with cyclopropanol-derived ketone homoenolates



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (1)

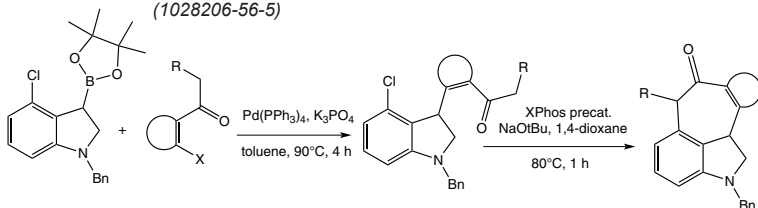


Tech. Note (3)
Ref. (1)

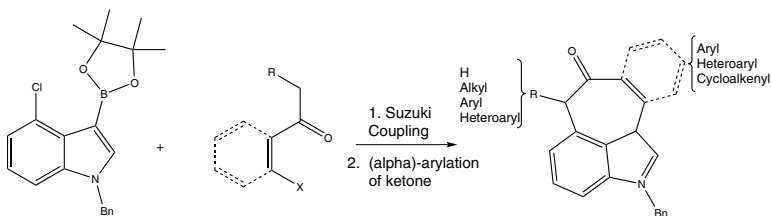
PALLADIUM (Compounds)

46-0268
(continued)

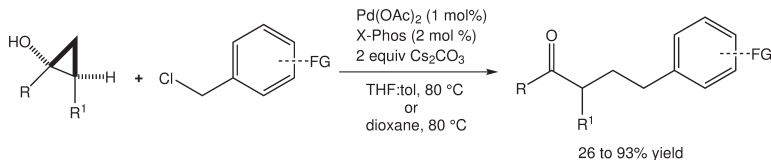
Chloro(2-dicyclohexylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II) methyl-*t*-butylether adduct, min. 98% [XPhos Palladacycle Gen. 1] (1028206-56-5)



Tech. Note (4)
Ref. (2)



Tech. Note (4)
Ref. (2)



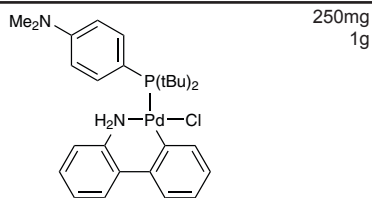
Tech. Note (5)
Ref. (3)

26 to 93% yield

References:

1. *J. Am. Chem. Soc.*, **2008**, *130*, 6686.
2. *J. Org. Chem.*, **2012**, *77*, 4123.
3. *Org. Lett.*, **2014**, *16*, 5854.

46-0342 Chloro[[4-(*N,N*-dimethylamino)phenyl]di-*t*-butylphosphino}(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [Amphos Palladacycle Gen. 2] C₂₈H₃₈ClN₂PPd; FW: 575.46; beige to tan pwr. Note: Patents: US 6,395,916, US 6,307,087

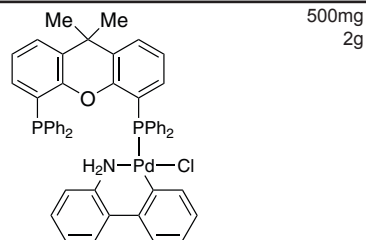


250mg
1g

Technical Note:

1. See 15-1242.

46-0955 Chloro[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene][2'-amino-1,1'-biphenyl]palladium(II) dichloromethane adduct, min. 98% [Xantphos Palladacycle Gen. 2] (1375325-77-1) C₅₁H₄₂ClN₂OP₂Pd; FW: 888.71; pale yellow pwr. Note: Patents: US 6,395,916, US 6,307,087.



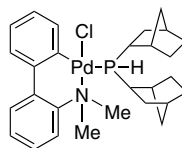
500mg
2g

Technical Note:

1. See 15-1242.

PALLADIUM (Compounds)

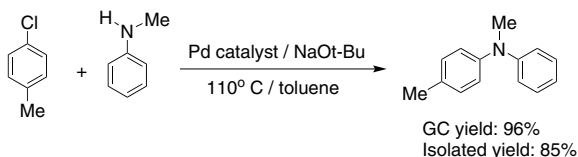
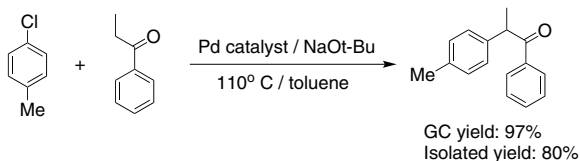
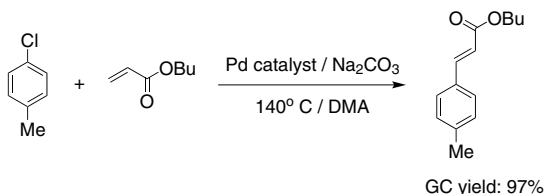
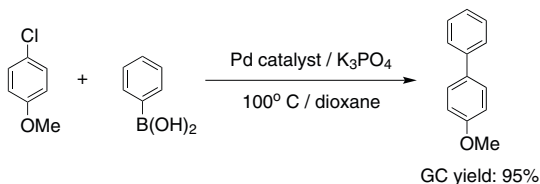
46-0270 Chloro(di-2-norbornylphosphino)(2'-dimethylamino-1,1'-biphenyl-2-yl)palladium(II), min. 97% (359803-53-5)
 $[C_{12}H_{18}N(CH_3)_2]PdCl[HP(C_7H_{11})_2]$; FW: 560.45; beige powder; m.p. ~165° dec.
 Note: Sold in collaboration with Solvias for research purposes only.



250mg
1g
5g

Technical Note:

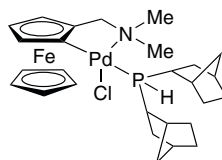
1. A new, air and moisture-stable, palladium catalyst useful in a broad scope of C-C and C-N coupling reactions. The highly-active catalyst can tolerate substrates containing a wide variety of functional groups such as alkyls, alkoxides, ketones, aldehydes, esters, amines, trifluoromethyl and nitro groups.



References:

1. Solvias A.-G., EP1132361
2. Angew. Chem. Int. Ed., 2002, 41, 3668

46-0272 Chloro(di-2-norbornylphosphino)(2-dimethylaminomethylferrocen-1-yl)palladium(II), min. 97% (614753-51-4)
 $C_{27}H_{39}ClFeNPPd$; FW: 606.31; beige powder.
 Note: Sold in collaboration with Solvias for research purposes only. EP 1132361 (B1), 2001.



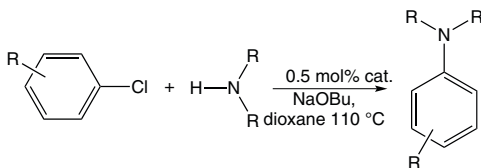
250mg
1g
5g

Technical Notes:

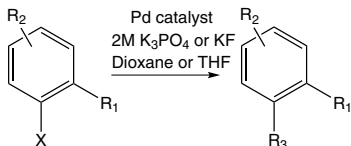
1. Efficient catalyst for the amination of aryl chlorides
2. Catalyst used for the efficient synthesis of substituted biaryl anilines and biaryl phenols.
3. Catalyst used for the direct vinylation, and difluorovinylation, of arylboronic acids.
4. Catalyst used in the Heck coupling of vinyl phosphates.

PALLADIUM (Compounds)

46-0272 Chloro(di-2-norbornylphosphino)(2-dimethylaminomethylferrocen-1-yl)palladium(II), min. 97%
(continued) (614753-51-4)

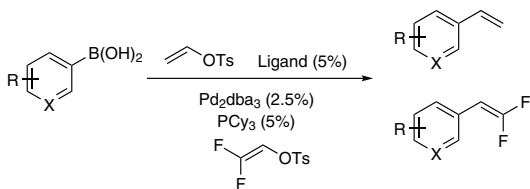


Tech. Note (1)
Ref. (1)

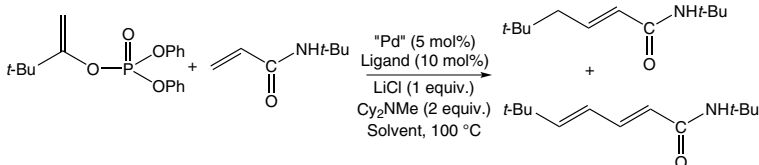


X = Cl or Br
R₁ = NH₂ or OH
R₂ = COOMe, CONH₂, CN or Alkyl group
R₃ = Aryl, Heteroaryl

Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



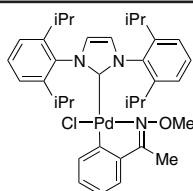
Tech. Note (4)
Ref. (4)

References:

1. *Synlett.*, **2004**, 14, 2549
2. *Tetrahedron Lett.*, **2005**, 46, 1779
3. *J. Org. Chem.*, **2008**, 73, 3404
4. *J. Am. Chem. Soc.*, **2007**, 129, 6931

46-1050 Chloro{2-[1-(N-methoxyiminoethyl)phenyl]{{1,3-bis(2,6-di-i-propylphenyl)imidzole-2-ylidene}palladium(II) (1511859-41-8)
C₃₆H₄₆ClN₃OPd; FW: 678.64; pale yellow powdr.

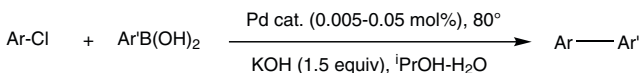
NEW



50mg
250mg

Technical Note:

1. Extremely active palladium catalyst for Suzuki-Miyaura coupling of aryl chlorides.



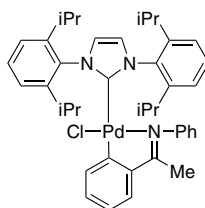
Tech. Note (1)
Ref. (1)

References:

1. *Tetrahedron Lett.*, **2014**, 55, 3278

PALLADIUM (Compounds)

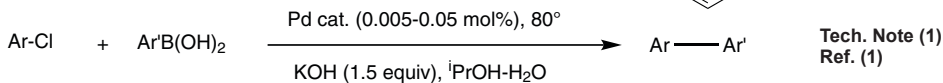
46-1058 **NEW** Chloro[2-[[1-(N-phenyl)iminoethyl]phenyl] [[1,3-bis(2,6-di-i-propylphenyl)imidazole-2-ylidene]palladium(II) (1905460-13-0)
C₄₁H₄₈ClN₃Pd; FW: 724.71; pale yellow pwdr.



50mg
250mg

Technical Note:

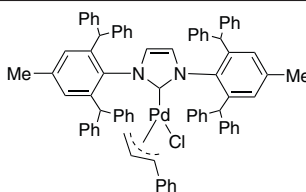
- Extremely active palladium catalyst for Suzuki-Miyaura coupling of aryl chlorides.



References:

- Tetrahedron Lett.*, **2014**, *55*, 3278

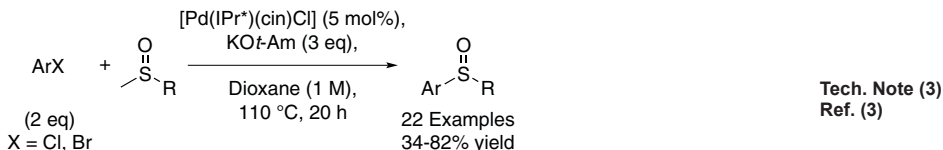
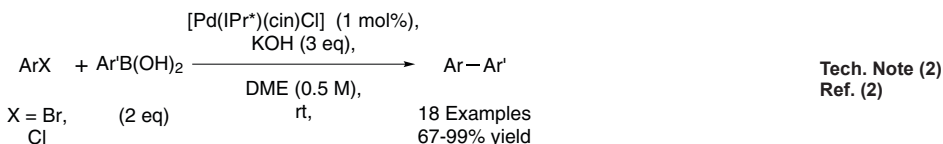
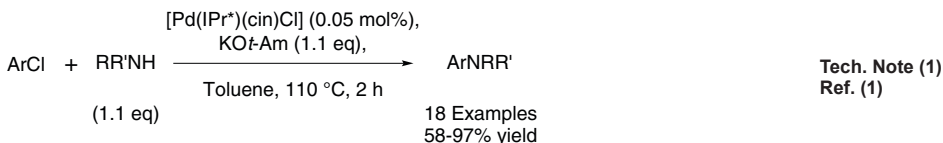
46-0298 **NEW** Chloro[[1,2,3-η)-1-phenyl-2-propen-1-yl]-[[1,3-bis[2,6-bis(diphenylmethyl)-4-methylphenyl]-2H-imidazol-2-ylidene]palladium(II), min. 97% (1380314-24-8)
C₇₈H₆₅ClN₂Pd; FW: 1172.24; yellow pwdr.



100mg
500mg

Technical Notes:

- Buchwald-Hartwig cross-coupling of aryl compounds.
- Preparation of tetra-ortho-substituted biaryls by Suzuki-Miyaura cross-coupling.
- Direct S-arylation of unactivated arylsulfonides.



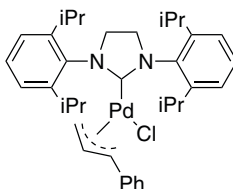
R = phenyl, tolyl, naphthyl, anisyl.

References:

- (a) For tertiary amines: *Adv. Synth. Catal.*, **2012**, *354*, 1897, (b) For, secondary amines, *RSC Advances*, **2013**, *3*, 3840
- Chem. Eur. J.*, **2012**, *18*, 4517
- ACS Catal.*, **2013**, *3*, 2190

PALLADIUM (Compounds)

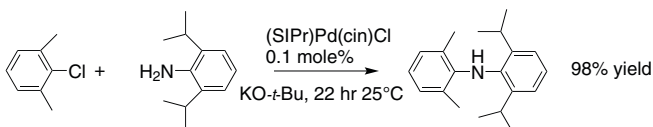
46-0274 Chloro[(1,2,3-η)-3-phenyl-2-propenyl] [1,3-bis(2,6-di-*i*-propylphenyl)-4,5-dihydroimidazol-2-ylidene]palladium(II), min. 97% (884879-24-7)
 $C_{36}H_{47}ClN_2Pd$; yellow microxtls.
 Note: Sold in collaboration with Umicore.
 WO 2004014550, US 6,316,380, EP 721 953 A1.



250mg
1g

Technical Note:

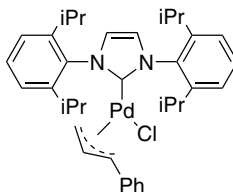
- Catalyst used for the room temperature Buchwald-Hartwig amination of hindered aryl chlorides.



References:

- J. Am. Chem. Soc.*, **2006**, *128*, 4101
- Chem. Eur. J.*, **2006**, *12*, 5142

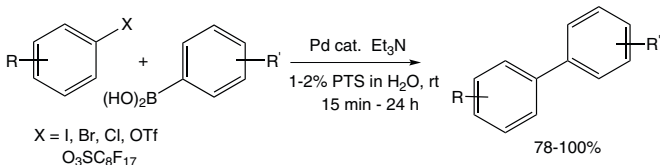
46-0276 Chloro[(1,2,3-η)-3-phenyl-2-propenyl] [1,3-bis(2,6-di-*i*-propylphenyl)imidazol-2-ylidene]palladium(II), min. 97% (884879-23-6)
 $C_{36}H_{45}ClN_2Pd$; FW: 647.65; yellow microxtls.
 Note: Sold in collaboration with Umicore for research purposes only. WO 2004014550
 US 6,316,380, EP 721 953 A1.



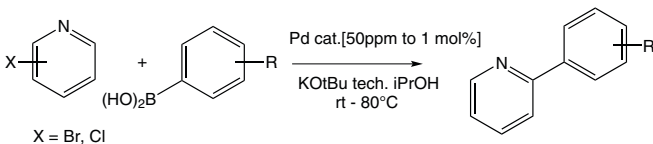
250mg
1g

Technical Notes:

- Catalyst used for room temperature Suzuki-Miyaura couplings.
- Catalyst used for rapid, room temperature Buchwald-Hartwig and Suzuki-Miyaura coupling reactions. Tech Note (1) Ref. (1,2) Tech Note (2) Ref. (3)



Tech. Note (1)
Ref. (1,2)

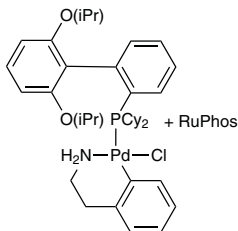


Tech. Note (2)
Ref. (3)

References:

- Org. Lett.*, **2008**, *10*, 1333
- J. Am. Chem. Soc.*, **2006**, *128*, 4101
- Chem. Eur. J.*, **2006**, *12*, 5142

46-0366 Chloro{[RuPhos][2-(2-aminoethyl)phenyl] palladium(II)}/[RuPhos] admixture (molar Pd/P = 1:1)
 white pwdr.
 Note: Patents: US 6,395,916, US 6,307,087

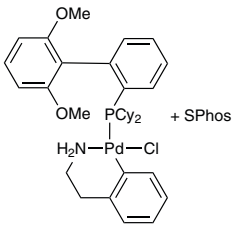
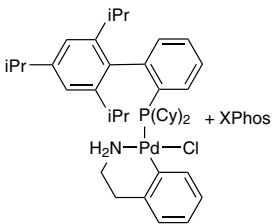
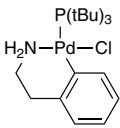
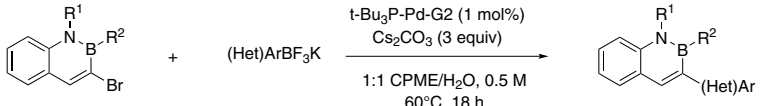
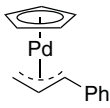
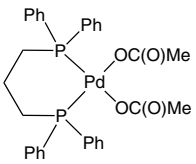


100mg
500mg

Technical Note:

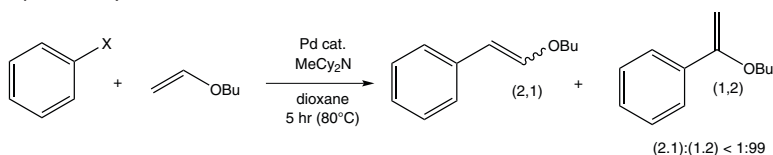
- See 46-0266.

PALLADIUM (Compounds)

<p>46-0369</p> <p>Chloro{[S-Phos][2-(2-aminoethylphenyl)]palladium(II)} [S-Phos] admixture (molar PdP/P = 1:1) white powdr. Note: Patents: US 6,395,916, US 6,307,087.</p>		<p>250mg 1g</p>
<p>Technical Note: 1. See 46-0269.</p>		
<p>46-0368</p> <p>Chloro{[X-Phos][2-(2-aminoethylphenyl)]palladium(II)}/[X-Phos] admixture (molar PdP/P = 1:1) white powdr. Note: Patents: US 6,395,916 US 6,307,087.</p>		<p>250mg 1g</p>
<p>Technical Note: 1. See 46-0268.</p>		
<p>46-0028</p> <p>Chloro(tri-t-butylphosphine)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% (1375325-71-5) C₂₄H₃₇ClNPPd; FW: 512.40; yellow powdr.; m.p. 158-160°</p>		<p>250mg 1g 5g</p>
<p>Technical Note: 1. Catalyst for the Suzuki Coupling of brominated 2,1-borazonaphthalenes and potassium organotrifluoroborates</p>		
<p>NEW</p> 	<p>Tech. Note (1) Ref. (1)</p>	
<p>>20 Brominated Azaborines R¹ = H, alkyl R² = alkyl, aryl, heteroaryl</p>		
<p>References: 1. <i>J. Org. Chem.</i> 2014, 79, 6663</p>		
<p>46-0285</p> <p>Cyclopentadienyl[(1,2,3-n)-1-phenyl-2-propenyl]palladium(II), 98% (105333-10-6) C₁₄H₁₄Pd; FW: 288.68; purple-red xtl. <i>air sensitive, (store cold)</i></p>		<p>100mg 500mg</p>
<p>Technical Note: 1. A superior precursor for the preparation of palladium(0)-based cross-coupling and other catalytic reactions.</p>		
<p>References: 1. <i>J. Org. Chem.</i>, 2009, 74, 6674</p>		
<p>46-0257</p> <p>Diacetato[1,3-bis(diphenylphosphino)propane]palladium(II), 99% (149796-59-8) C₃₁H₃₂O₄P₂Pd; FW: 636.95; yellow-brown solid <i>moisture sensitive</i></p>		<p>250mg 1g</p>
<p>Technical Notes: 1. Catalyst used for the copolymerization of ethene with carbon monoxide. 2. Catalyst used in the Heck reactions of vinyl ethers.</p>		
<p>nCO + nCH₂=CH₂ → [C(O)CH₂CH₂]_n</p>		
<p>Tech. Note (1) Ref. (1)</p>		

PALLADIUM (Compounds)

46-0257 Diacetato[1,3-bis(diphenylphosphino)propane]palladium(II), 99% (149796-59-8)
(continued)

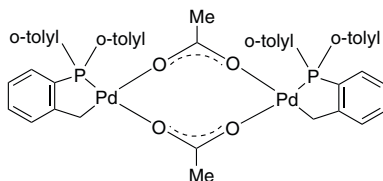


Tech. Note (2)
Ref. (2)

References:

1. *Mod. Res. in Catal.*, **2013**, 2, 93.
2. *J. Am. Chem. Soc.*, **2010**, 132, 79.

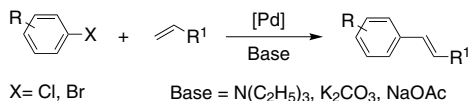
46-0290 **trans-Di(μ-acetato) bis[o-(di-o-tolylphosphino) benzyl]dipalladium(II), 97+%**
[cataCXium® C] (172418-32-5)
C₂₇H₂₀PPd(C₂H₃O₂)₂PdPC₂₁H₂₀;
FW: 937.65; yellow xtl.
Note: Sold in collaboration with Solvias for research purposes. German Patent No. 4421753 granted to Solvias. Solvias cataCXium® Ligand Kit component.



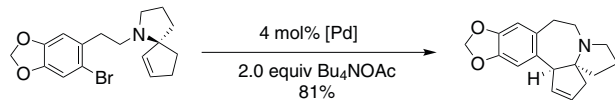
250mg
1g
5g

Technical Note:

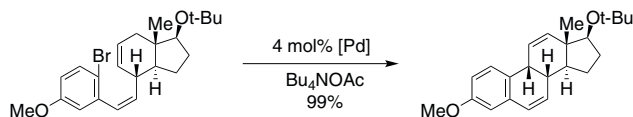
1. Heck olefination of haloarenes.



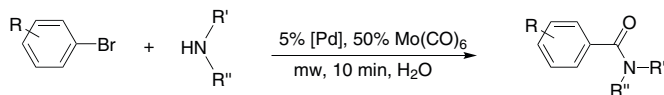
Ref. (1)



Ref. (2)



Ref. (3)

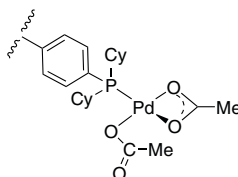


Ref. (4)

References:

1. *Angew. Chem. Int. Ed.*, **1995**, 34, 1844
2. *J. Am. Chem. Soc.*, **1999**, 121, 10264
3. *J. Am. Chem. Soc.*, **1998**, 120, 8971
4. *Org. Lett.*, **2005**, 7, 3327

46-1500 **Di(acetato)dicyclohexylphenylphosphinepalladium (II) (~5% Pd) polymer-bound FibreCat™**
orange-brown, fibrous solid
Note: Limited quantities available.



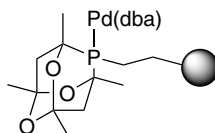
1g
5g

Technical Note:

1. Useful in the coupling of less active aryl chlorides with boronic acids.

PALLADIUM (Compounds)

46-0180 **Dibenzylideneacetonepalladium(0)**
1,3,5,7-tetramethyl-2,4,6-trioxa-8-
phosphaadamantane-8- ethyl Silica
(PhosphonicS PAPP2r)
 pale green solid
 Note: Sold in collaboration with PhosphonicS Ltd.
 for research purposes only.



500mg
2g

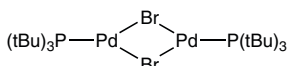
Particle size range: 60-200 microns

Palladium loading: 0.01 to 0.03 mmol/g

Technical Note:

1. Immobilized palladium heterogeneous catalyst successfully utilized in typical Suzuki and Heck reactions. The catalyst is effective for a wide range of substrates yielding coupled products in high yield. The catalyst can be simply filtered off and reused over several cycles, with no apparent loss in activity. Typical reactions using the homogeneous version of dibenzylideneacetonepalladium(0) phosphaadamantane can be found in *Org. Lett.* **2003**, 5, 6, *Tetrahedron Lett.*, **2004**, 45, 8319 and *J.Org.Chem.*, **2004**, 69, 5082.

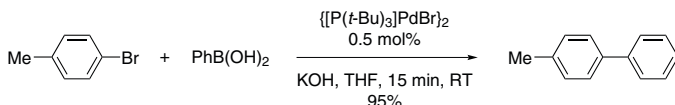
46-0355 **Di-μ-bromobis(tri-*t*-butylphosphino)**
dipalladium(I) (185812-86-6)
 $\text{Pd}_2\text{Br}_2[\text{P}(\text{C}_4\text{H}_9)_3]_2$; FW: 777.28; dark-green xtl.
air sensitive, moisture sensitive, (store cold)



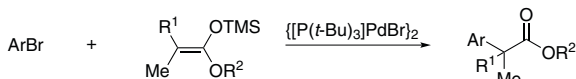
100mg
500mg
2g

Technical Notes:

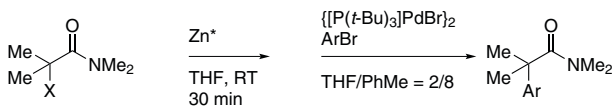
1. Palladium catalyst for rapid room temperature coupling of unactivated hindered aryl bromides with arylboronic acids.
2. Aryl bromide - silyl ketene acetal coupling.
3. Catalyst for intermolecular α-arylation of zinc amide enolates.
4. Catalyst for α-vinylation of carbonyl compounds.
5. Catalyst for thiol coupling of heteroaromatic aryl bromides.



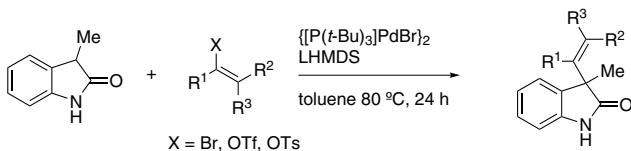
Tech. Note (1)
Ref. (1,2)



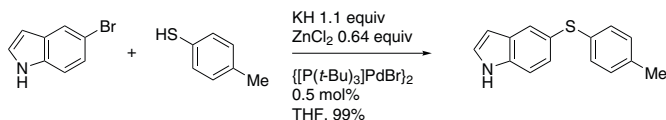
Tech. Note (2)
Ref. (3)



Tech. Note (3)
Ref. (4)



Tech. Note (4)
Ref. (5)



Tech. Note (5)
Ref. (6)

References:

1. *J. Org. Chem.*, **2003**, 68, 1163
2. *J. Org. Chem.*, **2003**, 68, 2861
3. *J. Am. Chem. Soc.*, **2003**, 125, 11176
4. *J. Am. Chem. Soc.*, **2006**, 128, 4976
5. *Org. Lett.*, **2007**, 9, 4343
6. *J. Org. Chem.*, **2009**, 74, 4005

PALLADIUM (Compounds)

46-0370 Dichlorobis(acetonitrile)palladium(II), 99% (14592-56-4)
 $\text{PdCl}_2(\text{CH}_3\text{CN})_2$; FW: 259.41; orange powdr.

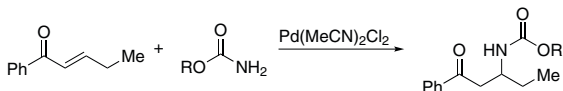
1g
5g

Technical Notes:

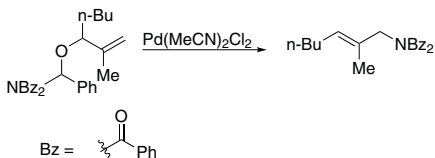
1. Catalyst for the cyclization of δ -acetylenic carboxylic acids to butenolides.
2. Catalyst for the aza-Michael reaction of carbamates with enones.
3. Catalyst for the rearrangement of allylic imidates to allylic amides.
4. Catalyst for the Nazarov cyclization of α -alkoxy dienones.
5. Catalyst for the diamination of conjugated dienes.
6. Three component Michael addition, cyclization, cross-coupling reaction.
7. C-H activation of indoles.
8. Catalyst used for the direct C-H arylation of isoxazoles at the 5 position.



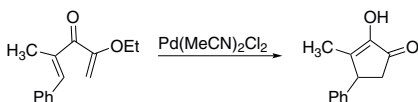
Tech. Note (1)
Ref. (1)



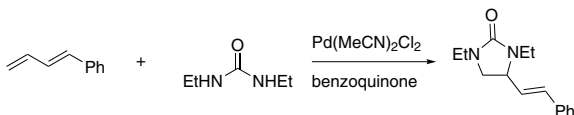
Tech. Note (2)
Ref. (2)



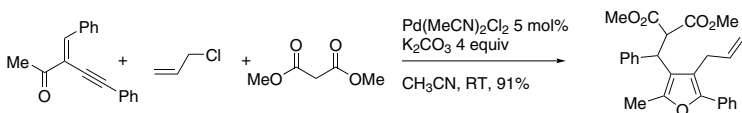
Tech. Note (3)
Ref. (3)



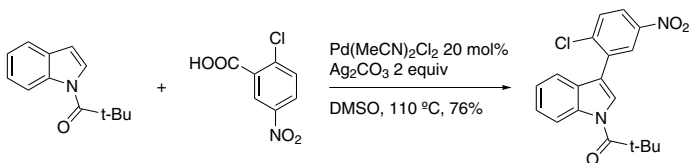
Tech. Note (4)
Ref. (4)



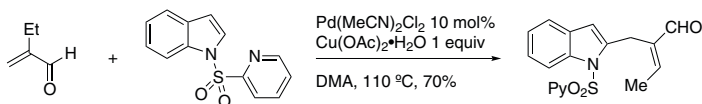
Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (6)



Tech. Note (7)
Ref. (7)

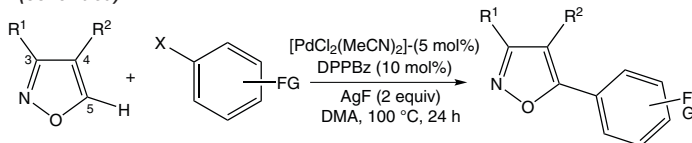


Tech. Note (7)
Ref. (8)

PALLADIUM (Compounds)

46-0370
(continued)

Dichlorobis(acetonitrile)palladium(II), 99% (14592-56-4)



Tech. Note (8)
Ref. (9)

References:

1. *J. Am. Chem. Soc.*, **1986**, *108*, 2753.
2. *Org. Lett.*, **2001**, *3*, 25.
3. *J. Org. Chem.*, **1997**, *62*, 2288.
4. *Org. Lett.*, **2003**, *5*, 4927.
5. *J. Am. Chem. Soc.*, **2005**, *127*, 7308.
6. *Angew. Chem. Int. Ed.*, **2008**, *47*, 1903.
7. *Org. Lett.*, **2009**, *11*, 5506.
8. *Angew. Chem. Int. Ed.*, **2009**, *48*, 6511.
9. *Angew. Chem. Int. Ed.*, **2015**, *54*, 9572.

46-0400 **Dichlorobis(benzonitrile)palladium(II), 99% (14220-64-5)**

$\text{PdCl}_2(\text{C}_6\text{H}_5\text{CN})_2$; FW: 383.55; yellow to orange powdr.; m.p. 129-130°

1g

Note: Palladium Kit component.

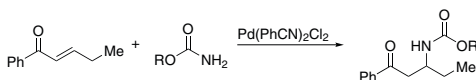
5g

Technical Notes:

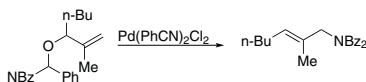
1. Catalyst for the cyclization of δ -acetylenic carboxylic acids to butenolides.
2. Catalyst for the aza-Michael reaction of carbamates with enones.
3. Catalyst for the rearrangement of allylic imidates to allylic amides.
4. Catalyst for the Nazarov cyclization of α -alkoxy dienones.
5. Catalyst for the diamination of conjugated dienes.
6. Three component Michael addition, cyclization, cross-coupling reaction.
7. C-H activation of indoles.



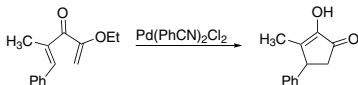
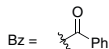
Tech. Note (1)
Ref. (1)



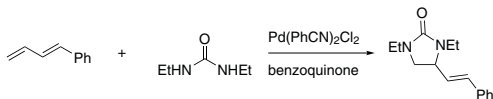
Tech. Note (2)
Ref. (2)



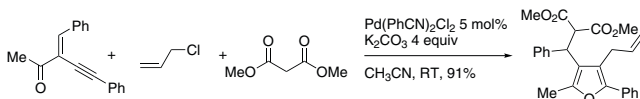
Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)

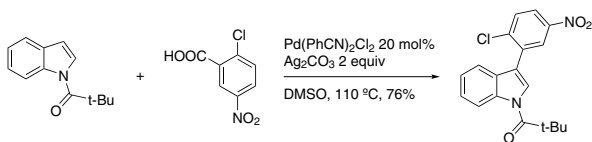


Tech. Note (6)
Ref. (6)

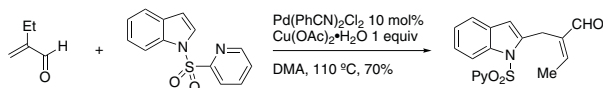
PALLADIUM (Compounds)

46-0400 Dichlorobis(benzonitrile)palladium(II), 99% (14220-64-5)

(continued)



Tech. Note (7)
Ref. (7)



Tech. Note (7)
Ref. (8)

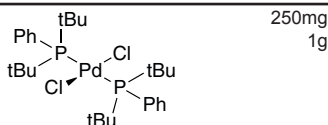
References:

1. *J. Am. Chem. Soc.*, **1986**, *108*, 2753
2. *Org. Lett.*, **2001**, *3*, 25
3. *J. Org. Chem.*, **1997**, *62*, 2288
4. *Org. Lett.*, **2003**, *5*, 4927
5. *J. Am. Chem. Soc.*, **2005**, *127*, 7308
6. *Angew. Chem. Int. Ed.*, **2008**, *47*, 1903
7. *Org. Lett.*, **2009**, *11*, 5506
8. *Angew. Chem. Int. Ed.*, **2009**, *48*, 6511

46-0420 Dichlorobis(di-*t*-butylphenylphosphino)palladium(II), 99% (34409-44-4)

NEW

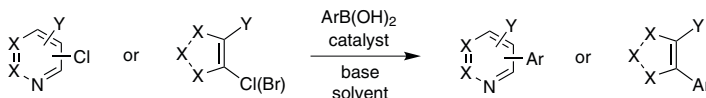
C₂₆H₄₆Cl₂P₂Pd; FW: 621.94;
colorless to pale-yellow solid



250mg
1g

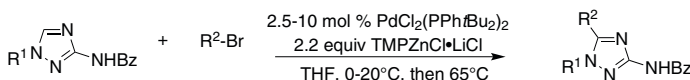
Technical Notes:

1. Catalyst for Suzuki-Miyaura Couplings of Heteroatom-Substituted Heteroaryl Chlorides
2. Catalyst for the Negishi Approach to 1,5-Disubstituted 3-Amino-1H-1,2,4-triazoles



Tech. Note (1)
Ref. (1)

X = O, S, CR, N, NR
Y = R, OR, SR, COOR, NH₂



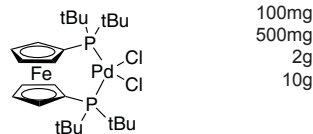
Tech. Note (2)
Ref. (2)

References:

1. *J. Org. Chem.*, **2007**, *72*, 5104
2. *Org. Lett.*, **2015**, *17*, 4678

46-0445 Dichloro[1,1'-bis(di-*t*-butylphosphino)ferrocene]palladium(II), 99% (95408-45-0)

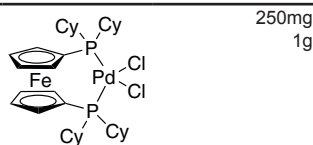
[(C₅H₅)P(C₄H₉)₂Fe]₂PdCl₂; FW: 651.75; brown to purple xtl
Note: Dichloro[1,1'-bis(dialkyl/diarylphosphino)ferrocene]palladium(II) Catalyst Kit component.



100mg
500mg
2g
10g

46-0455 Dichloro[1,1'-bis(dicyclohexylphosphino)ferrocene]palladium(II), dichloromethane adduct, 99% (917511-90-1)

[(C₅H₅)P(C₆H₁₁)₂Fe]₂PdCl₂; FW: 755.89;
red-orange microxtl.
Note: Dichloro[1,1'-bis(dialkyl/diarylphosphino)ferrocene]palladium(II) Catalyst Kit component.



250mg
1g

Technical Note:

1. Air-stable catalyst useful in the arylation of various ketones with aryl chlorides and aryl bromides.

References:

1. *Org. Proc. Res. Dev.*, **2008**, *12*, 522

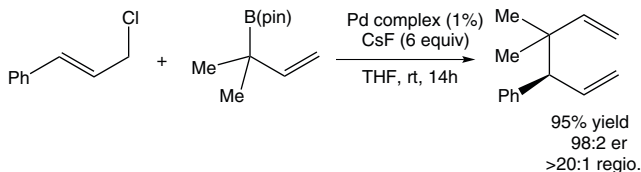
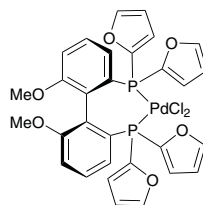
PALLADIUM (Compounds)

46-0188 Dichloro[(R)-(+)-2,2'-bis(di-furanylphosphino)-6,6'-dimethoxy-1,1'-biphenyl]palladium(II) (1338245-54-7)
 $C_{30}H_{24}Cl_2O_6P_2Pd$; FW: 719.78; pale yellow powder.

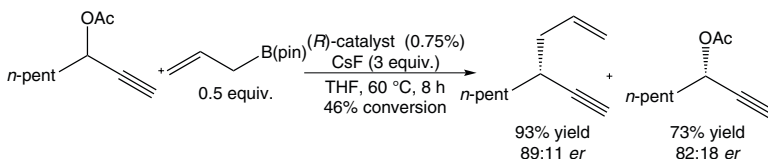
50mg
250mg

Technical Notes:

1. This Palladium-complex is used for the asymmetric cross-coupling of allylboron reagents with allylic electrophiles.
2. The catalyst is used for the kinetic resolution of propargylic acetates to give enantioenriched 1,5-enynes.



Tech. Note (1)
Ref. (1)



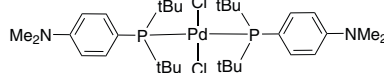
Tech. Note (2)
Ref. (2)

References:

1. *J. Am. Chem. Soc.*, **2014**, *136*, 7092.
2. *Adv. Synth. Catal.*, **2013**, *355*, 3413.

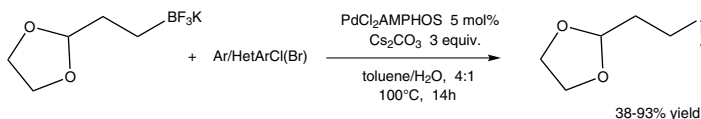
46-0825 Dichlorobis[[4-(N,N-dimethylamino)phenyl]di-*t*-butylphosphino]palladium(II), min. 98% PdAmphos (887919-35-9)
 $(C_{16}H_{28}NP)_2PdCl_2$; FW: 708.07; yellow powder.

250mg
1g
5g
25g

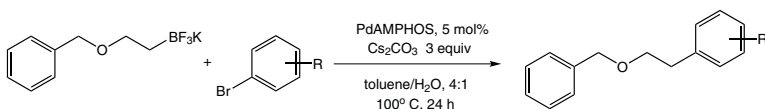


Technical Notes:

1. Useful catalyst for the Suzuki Cross-Coupling of dioxolanylethyltrifluoroborate and aryl/heteroaryl chlorides.
2. Useful catalyst for the Suzuki Cross-Coupling of benzyloxyethyltrifluoroborate.



Tech. Note (1)
Ref. (1)



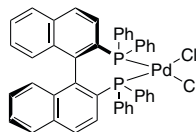
Tech. Note (2)
Ref. (2)

References:

1. *Org. Lett.*, **2013**, *15*, 1536
2. *J. Org. Chem.*, **2012**, *77*, 10399

46-0870 Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]palladium(II), min. 98% (115826-95-4)
 $PdCl_2(C_{44}H_{32}P_2)$; FW: 800.00; orange microxtls.

250mg
1g

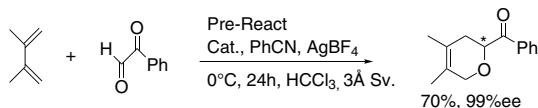
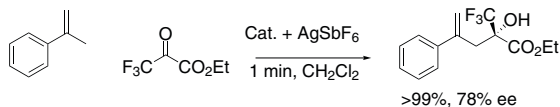
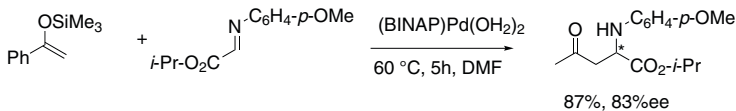


Technical Notes:

1. Catalyst precursor, with $AgBF_4$, for the enantioselective addition of silyl ethers, to imines to produce β -amino ketones, and to aldehydes to produce 3-hydroxy-1-propanone aldol addition products.
2. Catalyst precursor, with $AgSbF_6$, for the asymmetric carbonylene reaction.
3. Catalyst precursor for hetero Diels-Alder reaction of simple dienes with aldehydes and aryl glyoxals.

PALLADIUM (Compounds)

46-0870 Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]palladium(II), min. 98%
(continued) (115826-95-4)



References:

1. *J. Am. Chem. Soc.*, **1999**, *12*, 15450
2. *Tetrahedron Lett.*, **2006**, *47*, 3956
3. *Organometallics*, **2007**, *26*, 5961
4. *Tetrahedron, Asymm.*, **2004**, *15*, 3885
5. *Tetrahedron Lett.*, **1998**, *39*, 6253
6. *J. Org. Chem.*, **1999**, *64*, 8660

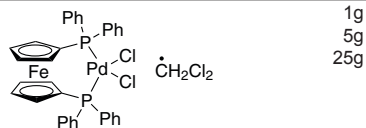
46-0871 Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]palladium(II), min. 98% (127593-28-6)
PdCl₂(C₄₄H₃₂P₂); FW: 800.00; orange microxtls.

250mg
1g

Technical Note:

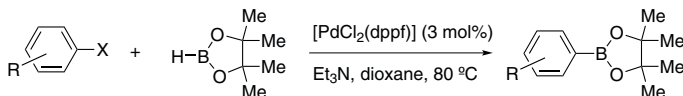
1. See 46-0870 (page 145)

46-0450 Dichloro 1,1'-bis(diphenylphosphino)ferrocene palladium (II) dichloromethane, 99%
(95464-05-4)
[(C₅H₄P(C₆H₅)₂)₂Fe]PdCl₂·CH₂Cl₂;
FW: 731.77 (816.65); orange-red powder.
Note: Dichloro[1,1'-bis(dialkyl/diarylphosphino)ferrocene]palladium(II) Catalyst Kit component.

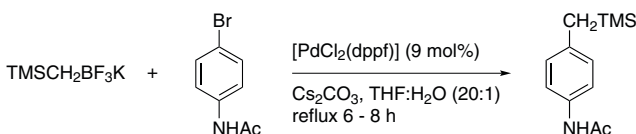


Technical Notes:

1. See 26-0270.
2. Catalyst for the borylation of aryl halides.
3. β-Alkyl Suzuki-Miyaura cross-coupling reactions with potassium alkyltrifluoroborates.
4. Catalyst for modified Negishi coupling.
5. Synthesis of polyheterocycles by a Pd-catalyzed intramolecular N-arylation/C-H bond activation/aryl-aryl bond-forming domino process.
6. Catalyst for Stille allylation.
7. Catalyst for the amination of aryl bromides.



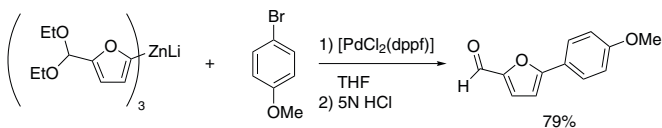
X=Br, I, OTf, ONF



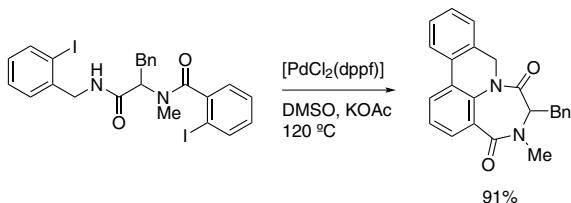
53%

PALLADIUM (Compounds)

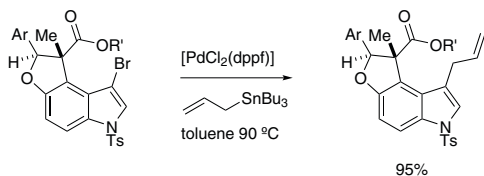
46-0450 Dichloro 1,1'-bis(diphenylphosphino)ferrocene palladium (II) dichloromethane, 99%
(continued) (95464-05-4)



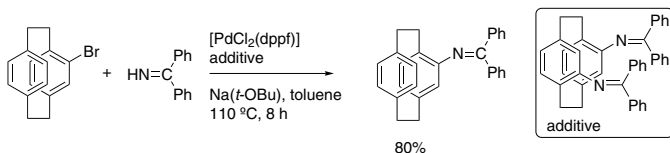
Tech. Note (4)
Ref. (3)



Tech. Note (5)
Ref. (4)



Tech. Note (6)
Ref. (5)



Tech. Note (7)
Ref. (6)

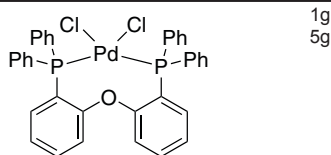
References:

1. *J. Org. Chem.*, **2000**, 65, 164
2. *J. Org. Chem.*, **2003**, 74, 5534
3. *Org. Lett.*, **2002**, 4, 375
4. *Angew. Chem. Int. Ed.*, **2003**, 42, 4774
5. *J. Am. Chem. Soc.*, **2008**, 130, 16854
6. *J. Org. Chem.*, **2009**, 74, 6867

46-0463 Dichloro[bis[2-(diphenylphosphino)phenyl]ether] palladium(II), 98% (205319-06-8)

NEW

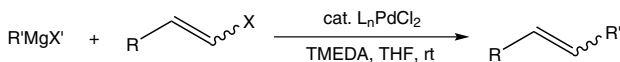
C₃₆H₂₈Cl₂OP₂Pd; FW: 715.88; yellow pwdr.



1g
5g

Technical Notes:

1. Stereoretentive palladium-catalyzed Kumada-Corriu couplings of alkenyl halides at room temperature.
2. Highly selective reactions of unbiased alkenyl halides: Negishi-Plus couplings.



R' = alkyl, alkenyl, alkenyl, aryl
R = alkyl, aryl
X = I, Br

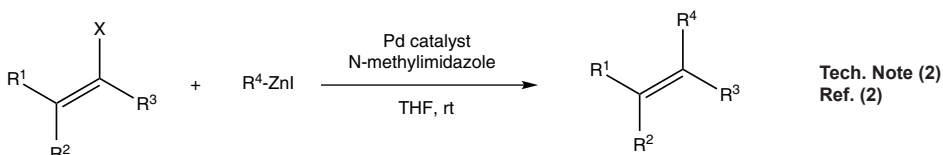
63-96% yield

Tech. Note (1)
Ref. (1)

X' = Cl, Br

PALLADIUM (Compounds)

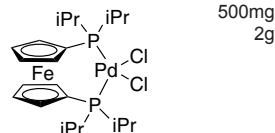
46-0463 Dichloro{bis[2-(diphenylphosphino)phenyl]ether}palladium(II), 98% (205319-06-8)
(continued)



References:

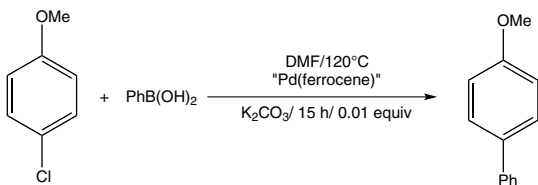
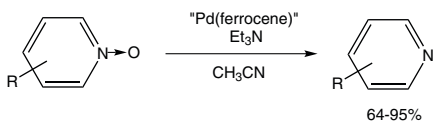
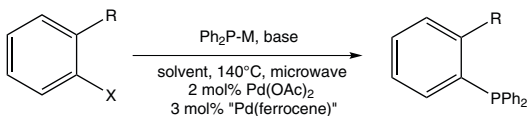
1. *Org. Lett.*, **2014**, *16*, 4066
2. *Org. Lett.*, **2011**, *13*, 3822

46-0460 Dichloro[1,1'-bis(di-*i*-propylphosphino)ferrocene]palladium(II), 99% (215788-65-1)
[(C₅H₄P(C₃H₇)₂)₂Fe]PdCl₂; FW: 595.64; yellow-orange solid
Note: [1,1'-Bis(dialkyl/diarylphosphino)ferrocene]palladium(II) dichloro Catalyst Kit component.



Technical Notes:

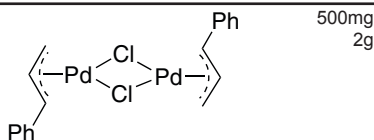
1. Palladium-catalyzed P-C bond formation between diphenylphosphine and ortho-substituted aryl bromides.
2. Deoxygenation of pyridine N-oxides by palladium-catalyzed oxidation of trialkylamines
3. Air-stable catalyst useful in challenging Suzuki coupling reactions.



References:

1. *Appl. Organomet. Chem.*, **2009**, *23*, 272.
2. *Synlett.*, **2008**, 2579.
3. *Org. Lett.*, **2004**, *6*, 3731.

46-0295 Di- μ -chlorobis[(1,2,3- η)-1-phenyl-2-propenyl]dipalladium(II), 98% (12131-44-1)
[(C₉H₉)ClPd]₂; FW: 518.08; yellow xtl.
air sensitive

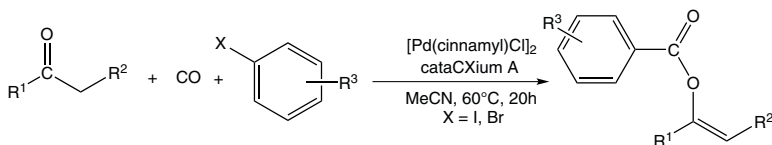


Technical Notes:

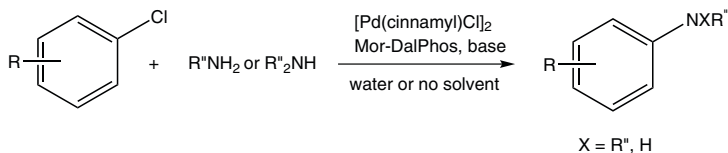
1. Precursor for the preparation of a palladium catalyst used in the carbonylative arylation of ketones, yielding vinylbenzoate compounds.
2. Precursor for the preparation of a palladium catalyst used in the Buchwald-Hartwig amination of (hetero)aryl chlorides.
3. Precursor for the preparation of a palladium catalyst used in the arylation of phenols.
4. Versatile palladium precursor for the preparation of palladium catalysts used in the cross-coupling of aryl chlorides and amines⁴, conversion of aryl triflates to aryl fluorides⁵, and the α -arylation of aldehydes⁶.

PALLADIUM (Compounds)

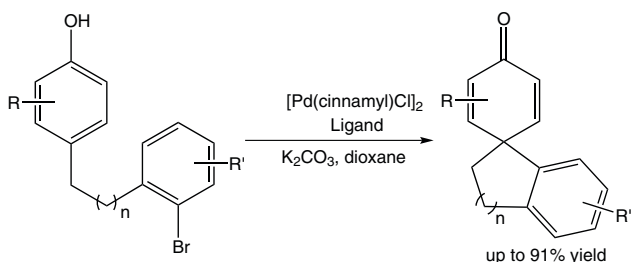
46-0295 Di- μ -chlorobis[(1,2,3- η)-1-phenyl-2-propenyl]dipalladium(II), 98% (12131-44-1)
(continued)



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



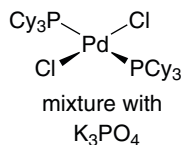
Tech. Note (3)
Ref. (3)

References:

1. *Chem. Eur. J.*, **2012**, *18*, 15592
2. *Eur. J. Org. Chem.*, **2012**, 3972
3. *J. Am. Chem. Soc.*, **2011**, *133*, 9282
4. *Chem. Eur. J.*, **2010**, *16*, 1983
5. *Science*, **2009**, *325*, 1661
6. *Org. Lett.*, **2008**, *10*, 4561

46-2040 **trans-Dichlorobis(tricyclohexylphosphine) palladium(II)/potassium phosphate admixture [CatKit single-use vials - 6.62 wt% Pd complex] (29934-17-6)**

$\text{PdCl}_2[(\text{C}_6\text{H}_{11})_3\text{P}]_2/\text{K}_3\text{PO}_4$; off-white powder.
Note: Each vial contains 453mg of admixture.
Weight-percent of components:
6.62 wt% palladium complex
Kit of CatKits - Single-Use Vials for low catalyst loading experiments Kit component..



5 x 1vial
25 x 1vial

Weight-percent of components:

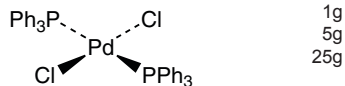
- 6.62 wt% palladium complex
- 93.38 wt% potassium phosphate

Technical Note:

1. Convenient, pre-weighed vial of palladium catalyst/base admixture useful for screening reactions. The vial contains 453mg of admixture, which will deliver 4 mole% of palladium catalyst and 2 equivalents of base, to a reaction using 1 mmole of substrate.

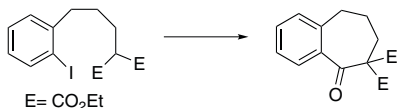
PALLADIUM (Compounds)

46-0530 **trans-Dichlorobis(triphenylphosphine) palladium(II), 99% (99.9+%-Pd)** (13965-03-2)
PdCl₂(P(C₆H₅)₃)₂; FW: 701.89; yellow powder.

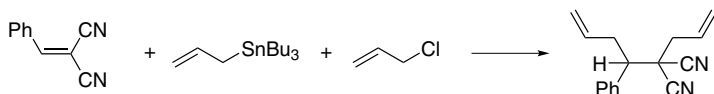


Technical Notes:

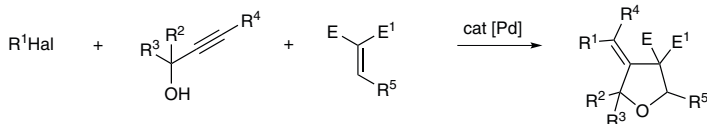
1. Precatalyst for the carbonylative cyclization of malonate derivatives.
2. Catalyst used in the double allylation of activated olefins.
3. Precatalyst for the three-component preparation of 3-arylidene- (or 3-alkenyldene) tetrahydrofurans.
4. Precatalyst for the homocoupling of terminal alkynes.
5. Precatalyst in the cross-coupling of alkynylsilanols and aryl halides.
6. Catalyst for direct Pd-catalyzed alkylation of N-fused heterocycles.
7. Catalyst for direct arylation of tautomerizable heterocycles.
8. Catalyst for a tandem Heck reaction/C-H functionalization.



Tech. Note (1)
Ref. (1,2)

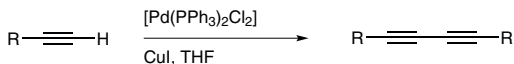


Tech. Note (2)
Ref. (3)



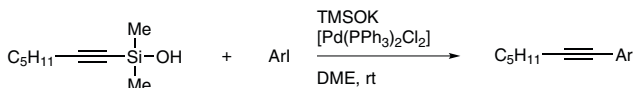
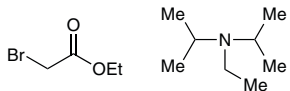
Tech. Note (3)
Ref. (4)

50-89%



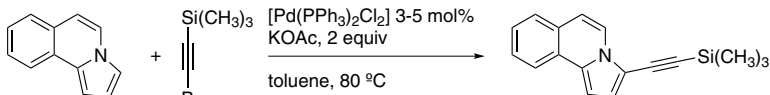
47-99%

Tech. Note (4)
Ref. (5)



Tech. Note (5)
Ref. (6)

75-95%

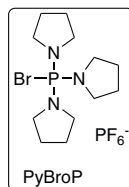
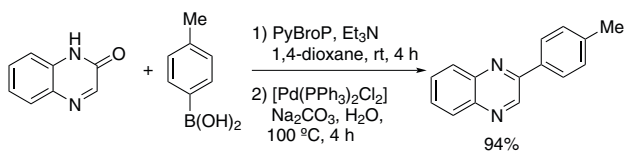


Tech. Note (6)
Ref. (7)

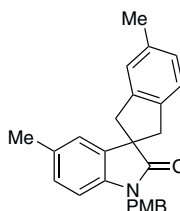
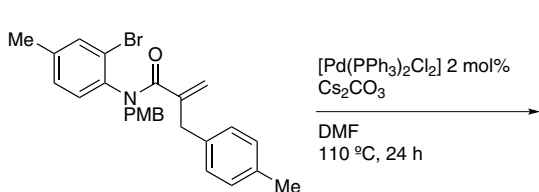
87%

PALLADIUM (Compounds)

46-0530 trans-Dichlorobis(triphenylphosphine)palladium(II), 99% (99.9+-Pd) (13965-03-2)
(continued)



Tech. Note (8)
Ref. (9)



82%

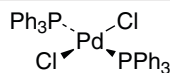
Tech. Note (7)
Ref. (8)

References:

1. *J. Am. Chem. Soc.*, **1989**, *111*, 8018
2. *Tetrahedron Lett.*, **1990**, *31*, 2841
3. *J. Am. Chem. Soc.*, **1997**, *119*, 8113
4. *J. Org. Chem.*, **2001**, *66*, 175
5. *J. Org. Chem.*, **2002**, *67*, 1969
6. *J. Org. Chem.*, **2003**, *68*, 9151
7. *J. Am. Chem. Soc.*, **2007**, *129*, 7742
8. *Angew. Chem. Int. Ed.*, **2008**, *47*, 4711
9. *J. Am. Chem. Soc.*, **2008**, *130*, 11300

46-2038 trans-Dichlorobis(triphenylphosphine) palladium(II)/potassium phosphate admixture [CatKit single-use vials - 6.32 wt% Pd complex] (13965-03-2)

PdCl₂[P(C₆H₅)₃]₂/K₃PO₄; FW: 701.89; off-white powder.
Note: Each vial contains 453mg of admixture. Weight-percent of components: 6.32 wt% palladium complex
Kit of CatKits - Single-Use Vials for low catalyst loading experiments Kit component.



5 x 1vial
25 x 1vial

mixture with
K₃PO₄

Weight-percent of components:

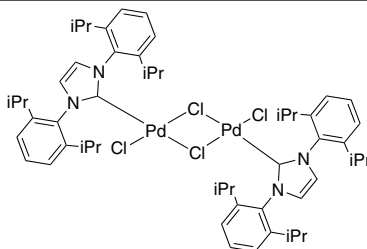
6.32 wt% palladium complex
93.68 wt% potassium phosphate

Technical Note:

1. Convenient, pre-weighed vial of palladium catalyst/base admixture useful for screening reactions. The vial contains 453mg of admixture, which will deliver 4 mole% of palladium catalyst and 2 equivalents of base, to a reaction using 1 mmole of substrate.

46-0860 Dichloro(di-μ-chloro)bis[1,3-bis(2,6-di-*i*-propylphenyl)imidazol-2-ylidene]dipalladium(II), 97% (444910-17-2)

C₅₄H₇₂Cl₄N₄Pd₂; FW: 1131.83; orange to tan powder.
Note: Sold in collaboration with Umicore for research purposes only. Patent WO 2004014550, US 6,316,380 and EP 721 953 A1.



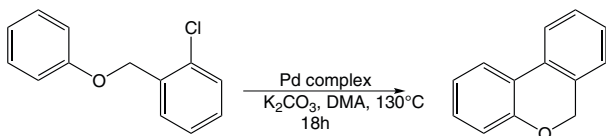
250mg
1g

PALLADIUM (Compounds)

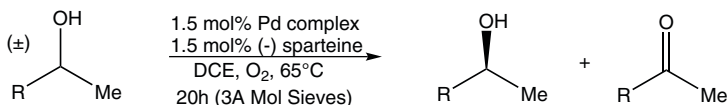
46-0860 Dichloro(di- μ -chloro)bis[1,3-bis(2,6-di-*i*-propylphenyl)imidazol-2-ylidene]dipalladium(II), 97%
(continued) (444910-17-2)

Technical Notes:

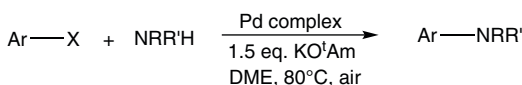
1. Catalyst used for the intramolecular, direct arylation reaction with aryl chlorides.
2. Catalyst used for aerobic oxidative kinetic resolution of secondary alcohols.
3. Catalyst used for aryl amination.
4. Highly active catalyst for the Mizoroki-Heck reaction.
5. Highly efficient catalytic hydrodehalogenation of polychlorinated biphenyls.



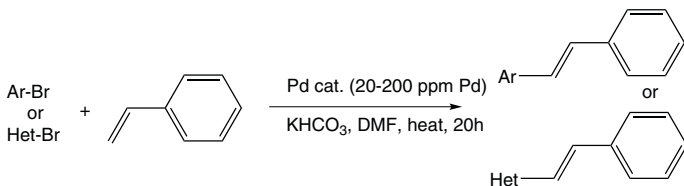
Tech. Note (1)
Ref. (1)



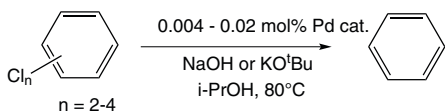
Tech. Note (2)
Ref. (2)



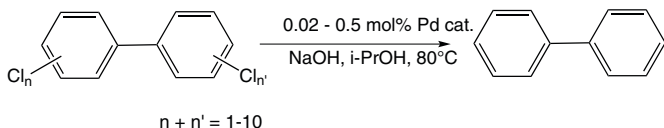
Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



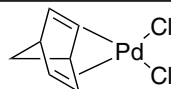
Tech. Note (5)
Ref. (5)



References:

1. *Org. Lett.*, **2005**, 7, 1857
2. *Org. Lett.*, **2003**, 5, 63
3. *Org. Lett.*, **2002**, 4, 2229
4. *Eur. J. Inorg. Chem.*, **2013**, 2013, 2007
5. *Chemical Comm.*, **2009**, 38, 5752

46-0900 Dichloro(norbornadiene)palladium(II), 99%
(12317-46-3)
 $C_7H_8PdCl_2$; FW: 269.46; yellow to orange pwr.



250mg
1g

Technical Note:

1. Useful starting material for the in situ preparation of a variety of chiral and achiral palladium catalysts.

References:

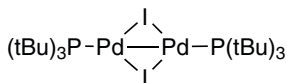
1. *J. Am. Chem. Soc.*, **2001**, 123, 7725.
2. *J. Org. Chem.*, **2009**, 74, 1407.
3. *Angew. Chem. Int. Ed.*, **2008**, 47, 6367.

PALLADIUM (Compounds)

46-0310

NEW

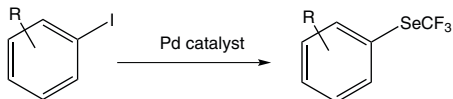
Di- μ -iodobis(tri-*t*-butylphosphino)
dipalladium(I), 98% (166445-62-1)
C₂₄H₅₄I₂P₂Pd₂; FW: 871.28; black solid



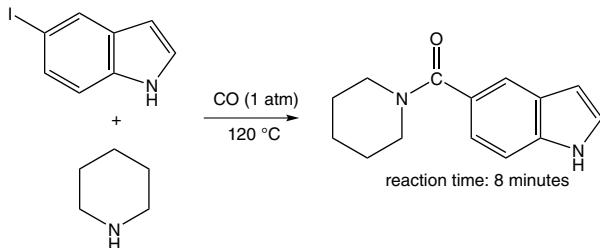
250mg
1g

Technical Notes:

1. Catalyst used for the highly efficient C-SeCF₃ coupling of aryl iodides.
2. Catalyst used for rapid carbonylative coupling reactions. .



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

1. *Angew. Chem. Int. Ed.*, **2015**, *54*, 10322
2. *Org. Biomol. Chem.*, **2011**, *9*, 3499

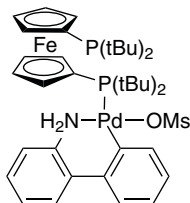
96-6670 Evonik Heterogeneous Catalyst Kit
See page 340

96-6674 Evonik Heterogeneous Catalyst Kit for Selective Hydrogenation
See page 340

96-6672 Evonik Heterogeneous Palladium Catalyst Kit
See page 340

96-3790 Kit of CatKits - Single-Use Vials for Low Catalyst Loading Experiments
See page 344

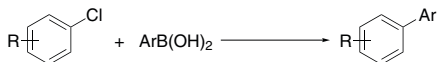
46-2158 Methanesulfonato(1,1'-bis(di-*t*-butylphosphino)
ferrocene)(2'-amino-1,1'-biphenyl-2-yl)palladium(II),
min. 98% [DTBPF Palladacycle Gen. 3]
C₃₉H₅₇FeNO₃P₂PdS; FW: 844.16; orange powdr.
Note: Patents: PCT/US2013/030779,
US Serial No. 13/799620



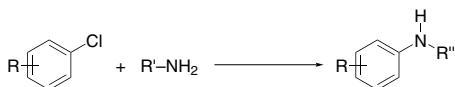
250mg
1g
5g

Technical Note:

1. Palladium precatalyst for general C-C and C-N cross-coupling reactions:
 - a. Suzuki-Miyaura coupling reactions
 - b. Arylation reactions of primary amines, secondary amines, primary amides, phenols, alcohols, tert-butyl acetate
 - c. Fluorination reactions



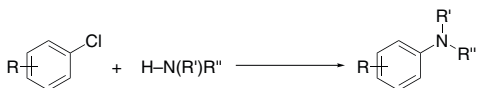
Tech. Note (1a)
Ref. (1)



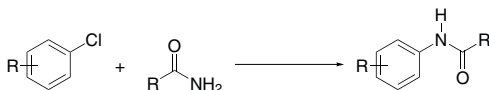
Tech. Note (1b)
Ref. (1)

PALLADIUM (Compounds)

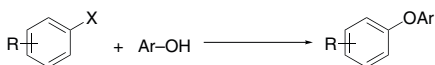
46-2158 Methanesulfonato(1,1'-bis(di-*t*-butylphosphino)ferrocene)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [DTBPF Palladacycle Gen. 3]



Tech. Note (1b)
Ref. (1)



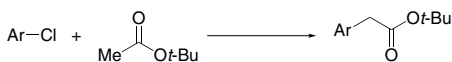
Tech. Note (1b)
Ref. (1)



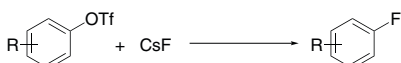
Tech. Note (1b)
Ref. (1)



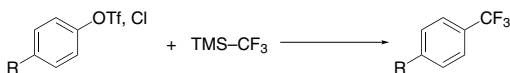
Tech. Note (1b)
Ref. (1)



Tech. Note (1b)
Ref. (1)



Tech. Note (1c)
Ref. (1)

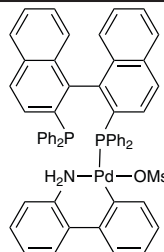


Tech. Note (1c)
Ref. (1)

References:

1. *Chem. Sci.*, **2013**, 4, 916.

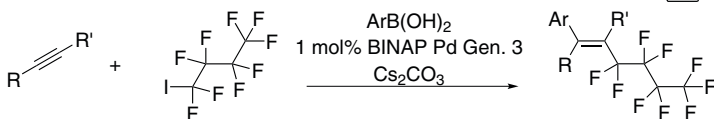
46-2153 Methanesulfonato[2,2'-bis(diphenylphosphino)-1,1'-binaphthyl](2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [BINAP Palladacycle Gen. 3]
C₅₇H₄₅NO₃P₂PdS; FW: 992.41; off-white powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.



250mg
1g
5g

Technical Note:

1. Palladium catalyst for carboperfluoro-alkylation of terminal and internal alkynes to tri- and tetrasubstituted olefins.

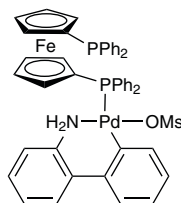


Tech. Note (1)
Ref. (1)

References:

1. *ACS Catal.*, **2016**, 6, 3452.

46-2128 Methanesulfonato[1,1'-bis(diphenylphosphino)ferrocene](2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [DPPF Palladacycle Gen. 3] (1445086-28-1)
C₄₇H₄₁FeNO₃P₂PdS; FW: 924.11; yellow powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620



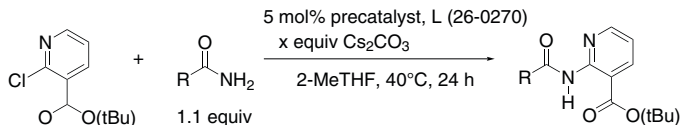
250mg
1g
5g

PALLADIUM (Compounds)

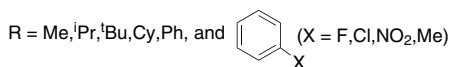
46-2128 Methanesulfonato[1,1'-bis(diphenylphosphino)ferrocene][(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [DPPF Palladacycle Gen. 3] (1445086-28-1)

Technical Note:

- Design and preparation of new palladium precatalysts for C-C and C-N cross-coupling reactions.



Tech. Note (1)
Ref. (1)



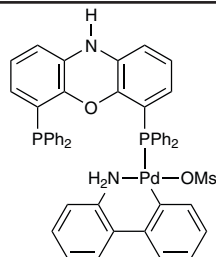
References:

- ACS Catal., 2018, 8, 203.

46-0959

NEW

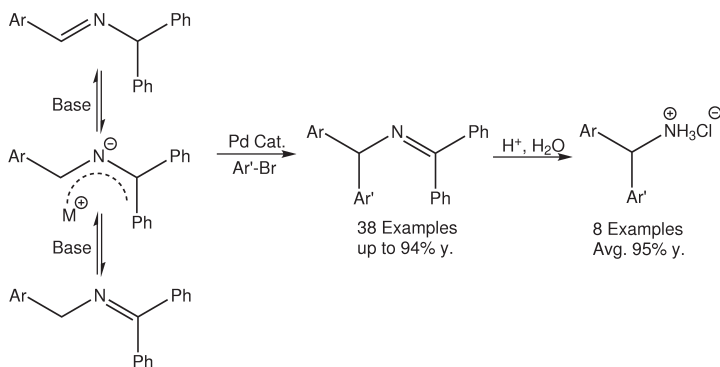
Methanesulfonato[4,6-bis(diphenylphosphino) phenoxazine][(2'-amino-1,1'-biphenyl-2-yl) palladium(II), 98% [NiXantphos Palladacycle Gen. 3] (1602922-03-1)
C₄₀H₄₀N₂O₄P₂PdS; FW: 921.29;
light green yellow solid
Note: Patents: PCT/US2013/030779,
US Serial No. 13/799620



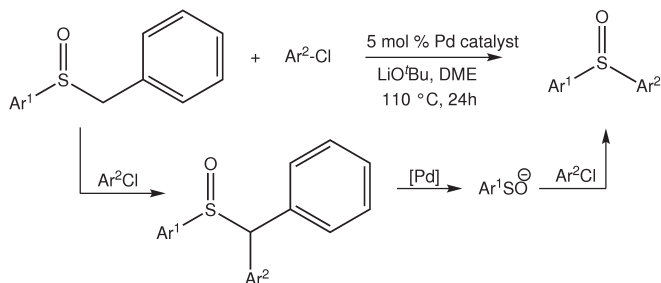
100mg
500mg
2g

Technical Notes:

- Synthesis of diarylmethylamines via palladium-catalyzed arylation of 1,1,3-triaryl-2-azaallyl anions.
- Catalyst used in the generation of diaryl sulfoxides from aryl benzyl sulfoxides and aryl chlorides.



Tech. Note (1)
Ref. (1)



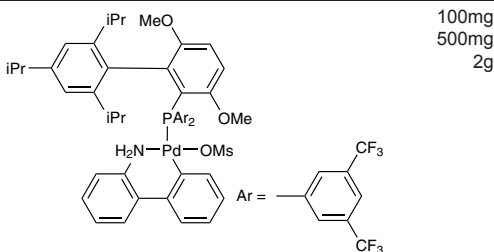
Tech. Note (2)
Ref. (2)

References:

- Chem Sci. 2014, 5, 2383
- Org. Lett., 2015, 17, 1168

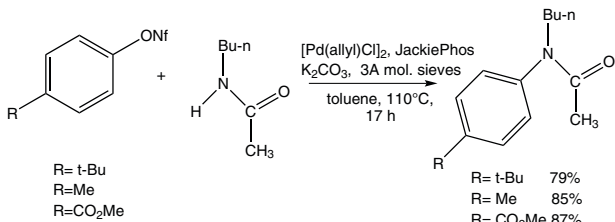
PALLADIUM (Compounds)

46-0340 **Methanesulfonato[2-bis(3,5-di(trifluoromethyl)phenyl)phosphino]-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl] (2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [JackiePhos Palladacycle Gen. 3]**
 $C_{52}H_{50}F_{12}NO_5PPdS$; FW: 1166.39; white powdr.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.

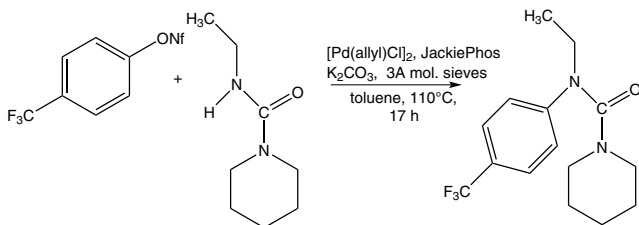


Technical Notes:

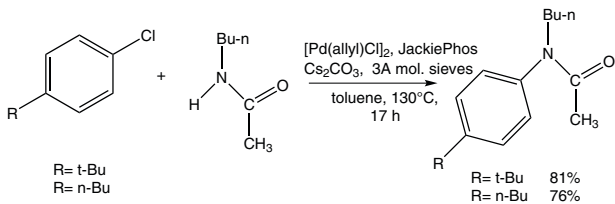
- Ligand used in the Pd-catalyzed coupling of aryl nonaflates and triflates with secondary amides.
- Ligand used in the Pd-catalyzed coupling of aryl nonaflates and triflates with secondary ureas, carbamates, and sulfonamides.
- Ligand used in the Pd-catalyzed coupling of aryl chlorides with secondary amides, carbamates, and sulfonamides.
- Ligand used in the Pd-catalyzed coupling of secondary alkyl stannanes with aryl halides.



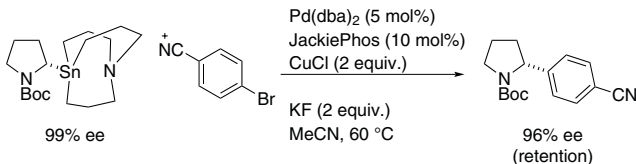
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (1)



Tech. Note (4)
Ref. (3)

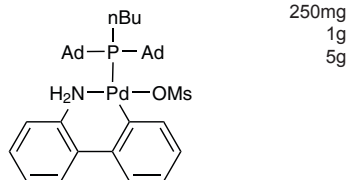
References:

- J. Am. Chem. Soc.*, **2009**, *131*, 16720.
- Chem. Sci.*, **2011**, *2*, 27-50.
- Nat. Chem.*, **2013**, *5*, 607.

PALLADIUM (Compounds)

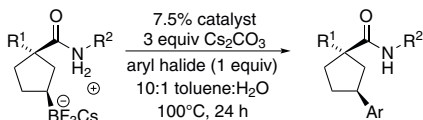
46-0278 **Methanesulfonato(diadamantyl-n-butylphosphino)-2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 95% [cataCXium® A Palladacycle Gen. 3]**
 $C_{37}H_{52}NO_3PPdS$; FW: 728.27; off-white powdr.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Patent WO 0210178.

NEW



Technical Note:

1. Precatalyst for the palladium-catalyzed cross-coupling of cesium trifluoroborate salts with aryl halides



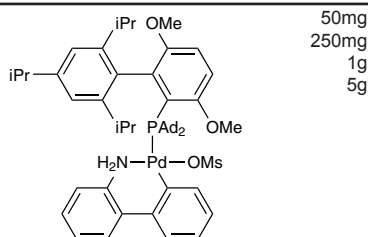
Tech. Note (1)
Ref. (1)

References:

1. *Org. Lett.*, **2015**, *17*, 940.

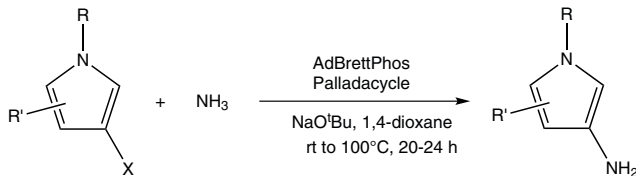
46-0480 **Methanesulfonato[2-(di-1-adamantylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [AdBrettPhos Palladacycle Gen. 3]**
 (1445972-29-1)
 $C_{56}H_{74}NO_3PPdS$; FW: 1010.65; brown to green solid
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620

NEW

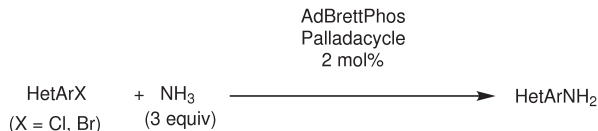


Technical Note:

1. Palladium catalyst used in the highly selective monoarylation of ammonia.



Tech. Note (1)
Ref. (2)



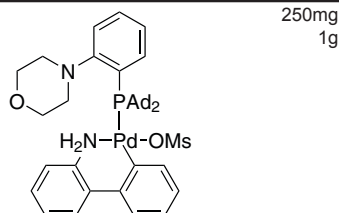
Tech. Note (1)
Ref. (2)

References:

1. *Org. Lett.*, **2013**, *15*, 3734
2. *ACS Catal.*, **2015**, *5*, 1386

46-0935 **Methanesulfonato[N-[2-(di-1-adamantylphosphino)phenyl]morpholine](2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [Mor-Dalpos Palladacycle Gen. 3]**
 $C_{43}H_{55}N_2O_4PPdS$; FW: 833.37; Beige to brown solid
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620

NEW

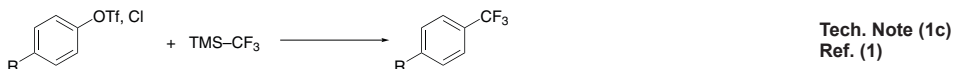
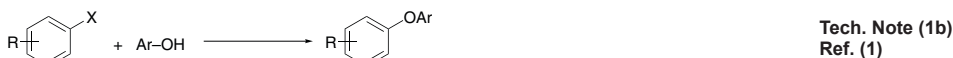
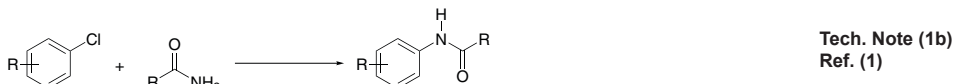
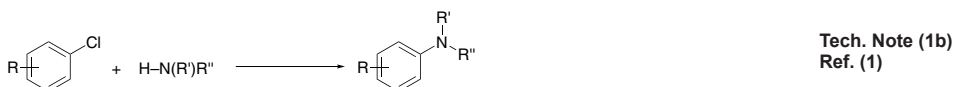
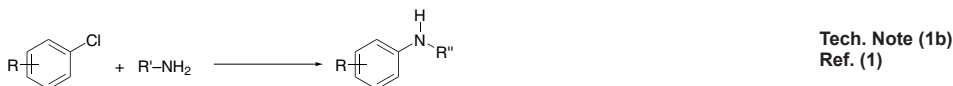


PALLADIUM (Compounds)

46-0935 Methanesulfonato{N-[2-(di-1-adamantylphosphino)phenyl]morpholine}(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [Mor-Dalpos Palladacycle Gen. 3]

Technical Note:

- Palladium precatalyst for general C–C and C–N cross-coupling reactions:
 - Suzuki-Miyaura coupling reactions
 - Arylation reactions of primary amines, secondary amines, primary amides, phenols, alcohols, tert-butyl acetate
 - Fluorination reactions



References:

- Chem. Sci.*, **2013**, 4, 916.

46-0940

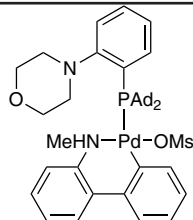
NEW

Methanesulfonato{N-[2-(di-1-adamantylphosphino)phenyl]morpholine}(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [MorDalpos Palladacycle Gen. 4]
C₄₄H₅₇N₂O₄PPdS; FW: 847.39; off-white to gray solid
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.

250mg
1g

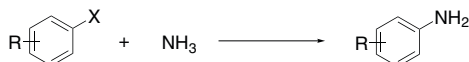
Technical Notes:

- Palladium catalyst for ammonia arylation.
- Palladium catalyst for multicomponent one-pot synthesis of indoles.
- Palladium catalyst for primary aliphatic amination of aryl mesylates.
- Palladium catalyst for ketone mono- α -arylation of aryl mesylates



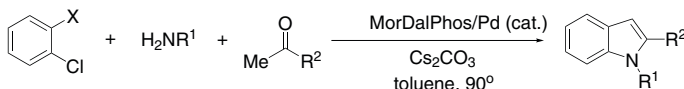
PALLADIUM (Compounds)

46-0940 Methanesulfonato{N-[2-(di-1-adamantylphosphino)phenyl]morpholine}(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98%
(continued) [MorDalPhos Palladacycle Gen. 4]

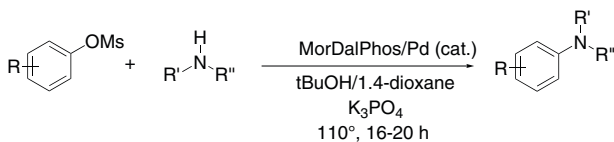


X = Cl or OTs
R = electron-donating or withdrawing group

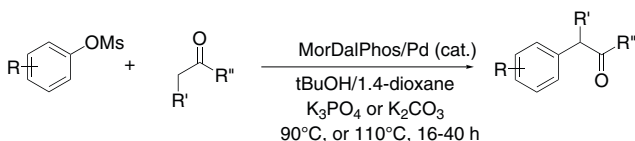
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (3)

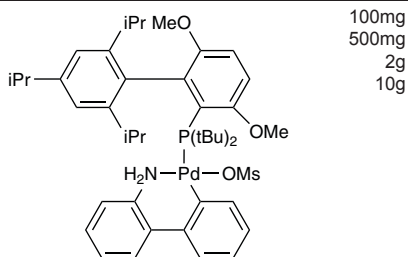
References:

1. *Angew. Int. Ed.*, **2010**, 49, 4071.
2. *Angew. Int. Ed.*, **2013**, 52, 7242.
3. *Adv. Synth. Catal.*, **2015**, 357, 100.

46-0365	Methanesulfonato[di-t-butyl(n-butyl)phosphine](2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [P(t-Bu)₂(n-Bu) Palladacycle Gen. 3] (1445086-17-8) C ₂₅ H ₄₀ NO ₃ PPdS; FW: 572.05; white to off-white powdr. Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.		250mg 1g 5g
46-0358	Methanesulfonato(di-t-butylneopentylphosphine)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [DTBNpP Palladacycle Gen. 3] (1507403-89-5) C ₂₆ H ₄₂ NO ₃ PPdS; FW: 586.08; white to off-white powdr. Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.		250mg 1g 5g
46-0357	Methanesulfonato(2-di-t-butylphosphino-1,1'-binaphthyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 95% [TrixePhos Palladacycle Gen. 3] C ₄₁ H ₄₄ NO ₃ PPdS; FW: 768.25; white to off-white powdr. Note: Patents: PCT/US2013/030779, US Serial No. 13/799620 For detailed technical note visit strem.com .		100mg 500mg 2g

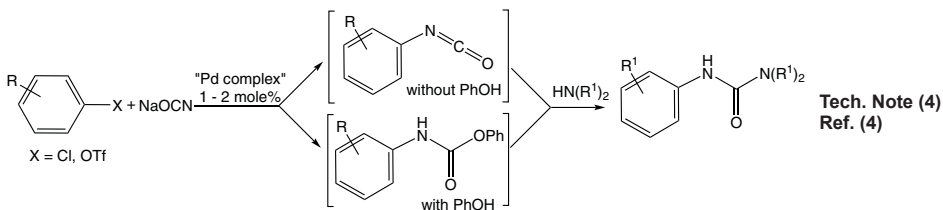
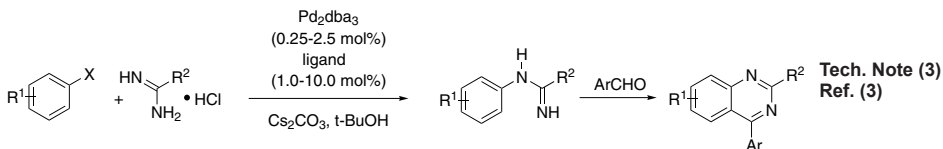
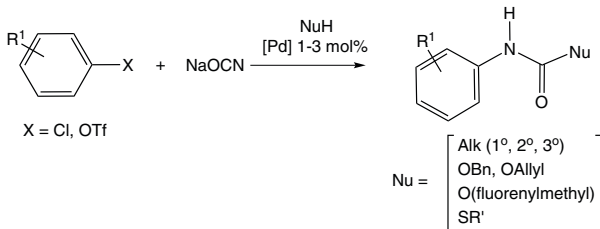
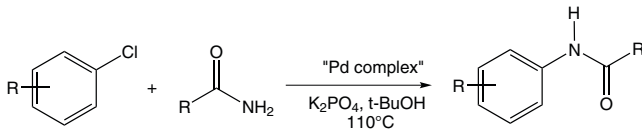
PALLADIUM (Compounds)

46-0325 Methanesulfonato(2-(di-*t*-butylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), dichloromethane adduct, min. 98% [t-BuBrettPhos Palladacycle Gen. 3] (1536473-72-9)
 $C_{44}H_{62}NO_5PPdS$; FW: 854.43; brown-green solid
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.



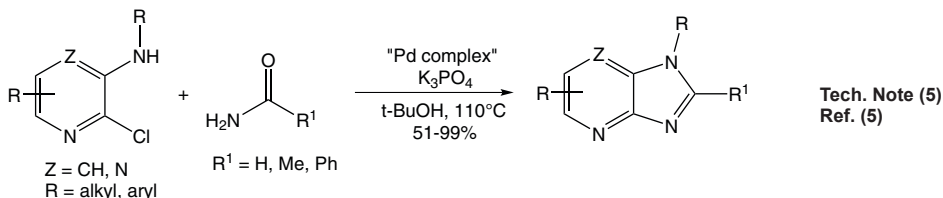
Technical Notes:

1. Palladium catalyst used for the arylation of primary amides.
2. Palladium catalyst used for the synthesis of N-aryl carbamates.
3. Palladium catalyst used for the N-monoarylation of amidines.
4. Palladium catalyst used for the cross-coupling of aryl chlorides and triflates with sodium cyanate – a practical synthesis of unsymmetrical ureas.
5. Palladium catalyst used in the synthesis of imidazo[4,5-b]pyridines and imidazo[4,5]pyrazines through amidation of 2-chloro-3-amino-heterocycles.
6. Palladium catalyst used in the N-arylation of 2-aminothiazoles
7. Palladium catalyst used in the synthesis of diarylethers under mild conditions.
8. Palladium catalyst used in the hydroxylation of aryl and heteroaryl halides.

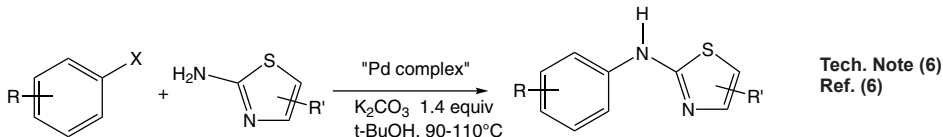


PALLADIUM (Compounds)

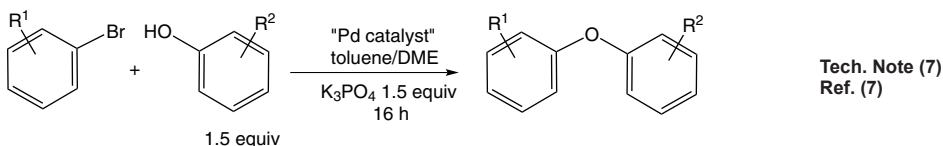
46-0325 Methanesulfonato(2-(di-*t*-butylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), dichloromethane adduct, min. 98% [t-BuBrettPhos Palladacycle Gen. 3] (1536473-72-9)



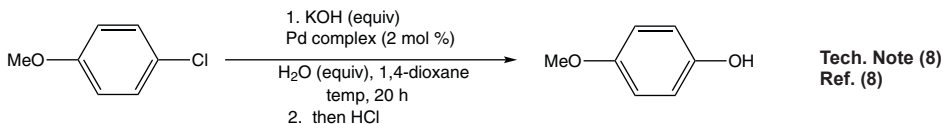
Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (6)



Tech. Note (7)
Ref. (7)

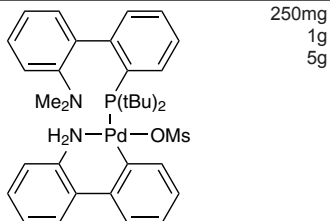


Tech. Note (8)
Ref. (8)

References:

1. *Org. Lett.*, **2013**, 15, 2876
2. *Org. Lett.*, **2013**, 15, 1394
3. *Org. Lett.*, **2012**, 14, 3800
4. *J. Am. Chem. Soc.*, **2012**, 134, 11132
5. *Org. Lett.*, **2012**, 14, 1764
6. *Org. Lett.*, **2012**, 14, 1432
7. *Org. Lett.*, **2012**, 14, 170
8. *J. Org. Chem.*, **2014**, 79, 5351

46-2135 Methanesulfonato[2-(di-*t*-butylphosphino)-2'-(*N*,*N*-dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [t-BuDavePhos Palladacycle Gen. 3] (1445085-92-6)
C₃₅H₄₅N₂O₃PPdS·CH₂Cl₂; FW: 711.20; green-yellow powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620



Technical Notes:

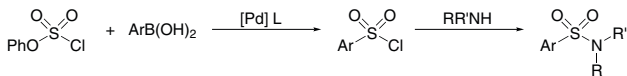
1. Palladium precatalyst for Suzuki-Miyaura coupling reactions.
2. Palladium precatalyst for arylation reactions of primary amines, secondary amines, primary amides, phenols, alcohols, tert-butyl acetate.
3. Palladium precatalyst for fluorination reactions.



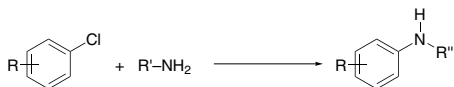
Tech. Note (1)
Ref. (1)

PALLADIUM (Compounds)

46-2135 Methanesulfonato[2-(di-*t*-butylphosphino)-2'-(*N,N*-dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [t-BuDavePhos Palladacycle Gen. 3] (1445085-92-6)



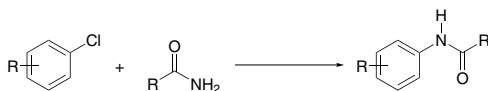
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (1)



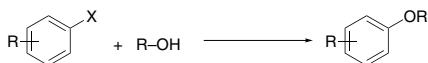
Tech. Note (2)
Ref. (1)



Tech. Note (2)
Ref. (1)



Tech. Note (2)
Ref. (1)



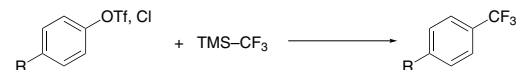
Tech. Note (2)
Ref. (1)



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (1)

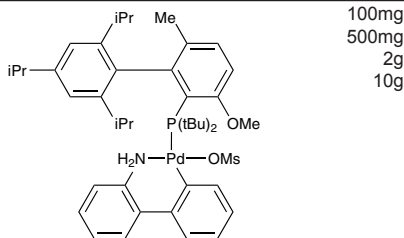


Tech. Note (3)
Ref. (1)

References:

1. *Chem. Sci.*, 2013, 4, 916.

46-0335 Methanesulfonato(2-(di-*t*-butylphosphino)-3-methoxy-6-methyl-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RockPhos Palladacycle Gen. 3] (2009020-38-4)
C₄₄H₆₂NO₄PPdS; FW: 838.43; brown powder.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.

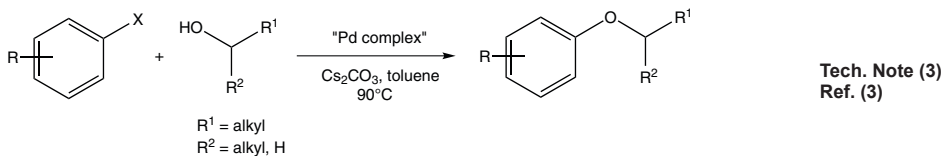
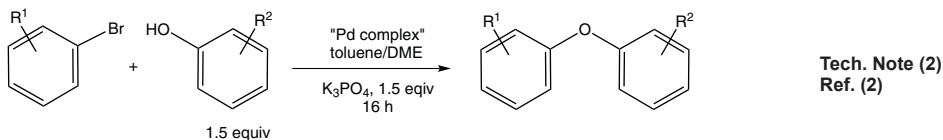
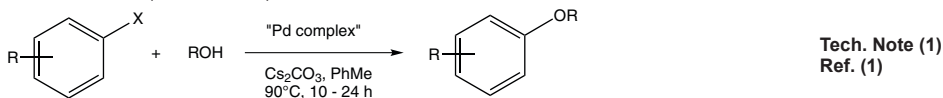


Technical Notes:

1. Palladium precatalyst used for the arylation of aliphatic alcohols.
2. Palladium precatalyst used for the synthesis of diaryl ethers under mild conditions.
3. Palladium precatalyst used for the intermolecular C-O bond formation with secondary and primary alcohols.

PALLADIUM (Compounds)

46-0335 Methanesulfonato(2-(di-*t*-butylphosphino)-3-methoxy-6-methyl-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RockPhos Palladacycle Gen. 3] (2009020-38-4)



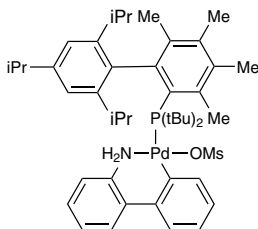
References:

1. *Org. Lett.*, **2013**, *15*, 2876
2. *Org. Lett.*, **2012**, *14*, 170
3. *Angew. Chem. Int. Ed.*, **2011**, *50*, 9943

46-2163

NEW

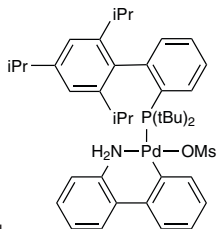
Methanesulfonato(2-di-*t*-butylphosphino-3,4,5,6-tetramethyl-2',4',6'-tri-*i*-propylbiphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 95% [Me4 *t*-ButylXPhos Palladacycle Gen. 3] (1507403-85-1)
C₄₆H₆₆NO₃PPdS; FW: 850.48; dark green powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620
For detailed technical note visit strem.com.



100mg
500mg
2g

46-0323

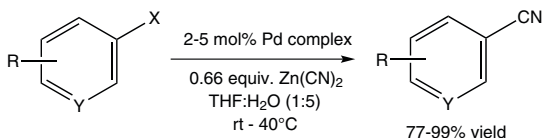
Methanesulfonato(2-di-*t*-butylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min.98% [t-BuXPhos Palladacycle Gen. 3] (1447963-75-8)
C₄₂H₅₈NO₃PPdS; FW: 794.38; yellow powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.



250mg
1g

Technical Note:

1. Mild palladium-catalyzed cyanation of (hetero)aryl halides and triflates in aqueous media.



References:

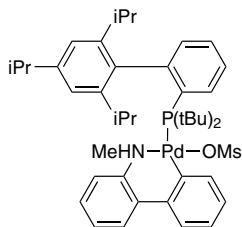
1. *Org. Lett.*, **2015**, *17*, 202.

PALLADIUM (Compounds)

46-0330

NEW

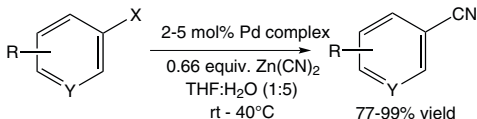
**Methanesulfonato(2-di-*t*-butylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl) palladium(II) dichloromethane adduct, min. 98% [t-BuXphos Palladacycle Gen. 4] (1599466-89-3)
C₄₃H₆₀NO₃PPdS; FW: 808.40; off-white to gray pwr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 4 (Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4) component.**



250mg
1g
5g

Technical Note:

- Alternative N-methyl catalyst for mild palladium-catalyzed cyanation of (hetero)aryl halides and triflates in aqueous media.



**Tech. Note (1)
Ref. (1)**

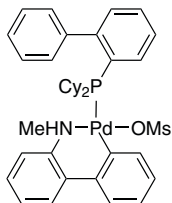
References:

- Org. Lett.*, **2015**, 17, 202. (Note this reference is for the non-methylated palladacycle, 46-0323, with the same ligand.)

46-0980

NEW

**Methanesulfonato(2-dicyclohexylphosphino-1,1'-biphenyl)(2'-methylamino-1,1-biphenyl-2-yl) palladium(II) dichloromethane adduct, min. 98% CyJohphos Palladacycle Gen. 4
C₃₈H₄₆NO₃PPdS; FW: 734.24; light brown solid
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620**

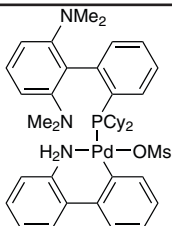


250mg
1g

46-0487

NEW

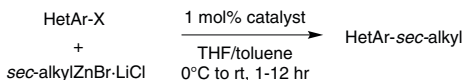
**Methanesulfonato(2-dicyclohexylphosphino-2',6'-bis(dimethylamino)-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), 98% [CPhos Palladacycle Gen. 3] (1447963-73-6)
C₄₄H₅₄N₄O₃PPdS; FW: 806.35; white to off-white pwr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.**



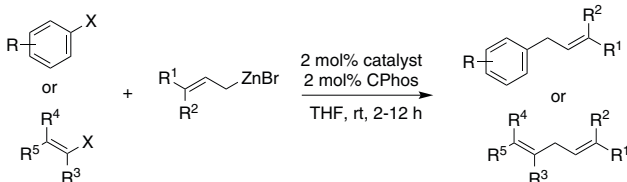
100mg
500mg
2g

Technical Notes:

- Catalyst for the highly selective cross-coupling of secondary alkylzinc reagents with heteroaryl halides
- Catalyst for the completely linear-selective Negishi cross-coupling of allylzinc halides with aryl and vinyl electrophiles



**Tech. Note (1)
Ref. (1)**



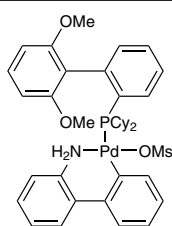
**Tech. Note (2)
Ref. (2)**

References:

- Org. Lett.*, **2014**, 16, 4638
- Angew. Chem. Int. Ed.*, **2013**, 52, 14098

PALLADIUM (Compounds)

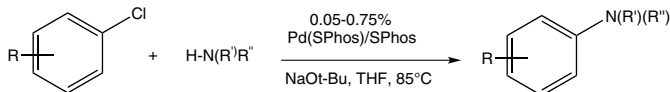
46-0318 Methanesulfonato(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II) dichloromethane adduct min. 98% [SPhos Palladacycle Gen. 3] (1445085-82-4) C₃₉H₄₈NO₅PPdS; FW: 780.26; pale yellow solid
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.



250mg
1g
5g
25g

Technical Note:

1. Palladium precatalyst for the arylation of amines.

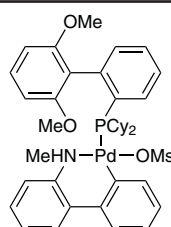


Tech. Note (1)
Ref. (1)

References:

1. *Chem. Sci.*, **2013**, *4*, 916

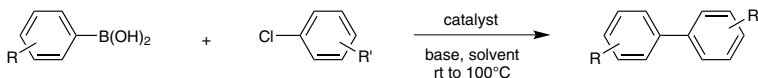
46-0320 **NEW** Methanesulfonato(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct min. 98% [SPhos Palladacycle Gen. 4] (1599466-87-1) C₄₀H₅₀NO₅PPdS; FW: 794.29; off-white to tan powder.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 4 (Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4) component.



250mg
1g
5g

Technical Note:

1. Alternative* Catalyst for the Suzuki-Miyaura Cross-Coupling reaction

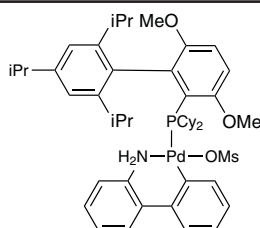


Tech. Note (1)
Ref. (1)

References:

1. *J. Am. Chem. Soc.*, **2005**, *127*, 4685. (Note this reference is for Pd₂(dba)₃ and SPhos.)

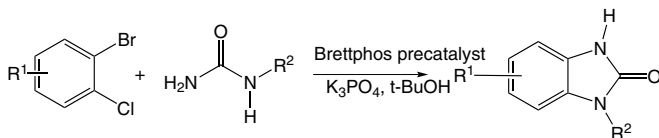
46-0322 Methanesulfonato(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 3] (1470372-59-8) C₄₈H₆₆NO₅PPdS; FW: 906.50; yellow to beige powder.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.



100mg
500mg
2g
10g

Technical Notes:

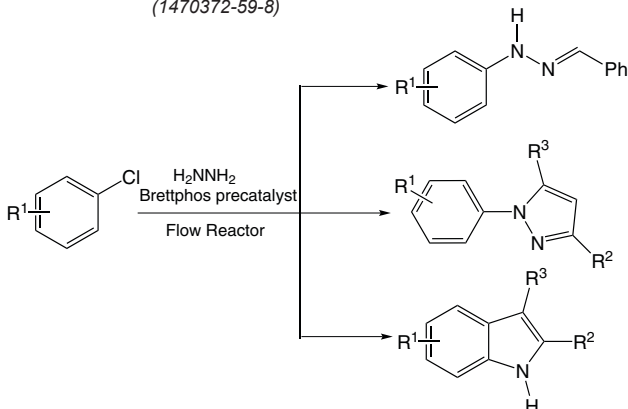
1. Catalyst used in the regioselective synthesis of benzimidazolones via cascade C-N coupling of monosubstituted ureas,
2. Catalyst used in a mild and rapid Pd-catalyzed cross-coupling with hydrazine in continuous flow - applications to the synthesis of functionalized heterocycles.



Tech. Note (1)
Ref. (1)

PALLADIUM (Compounds)

46-0322 Methanesulfonato(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl) (2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 3] (1470372-59-8)

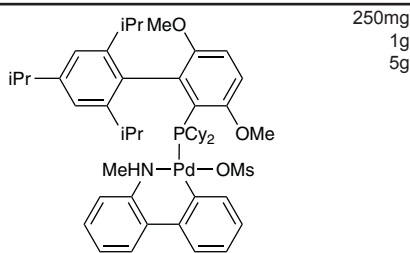


Tech. Note (2)
Ref. (2)

References:

1. *Org. Lett.*, **2014**, 16, 3844
2. *Angew. Chem. Int. Ed.*, **2013**, 52, 3434

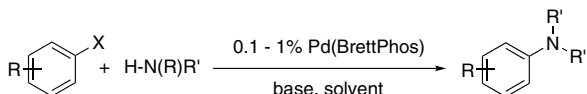
46-0333 **NEW** Methanesulfonato(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl) (2'-methylamino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [BrettPhos Palladacycle Gen. 4] (1599466-83-7)
C₄₉H₆₈NO₅PPdS; FW: 920.53; off-white to beige powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 4 (Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4) component.



250mg
1g
5g

Technical Note:

1. Catalyst used for the N-arylation of amines.

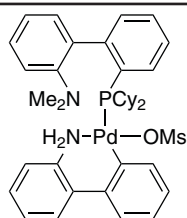


Tech. Note (1)
Ref. (1)

References:

1. *J. Org. Chem.*, **2014**, 79, 4161
2. *Chem. Sci.* **2013**, 4, 916

46-0237 Methanesulfonato[2-(dicyclohexylphosphino)-2'-(*N,N*-dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II) CH₂Cl₂ adduct, min. 98% [DavePhos Palladacycle Gen. 3] (1445085-87-9)
C₃₉H₄₉N₂O₃PPdS; FW: 763.28; white powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.

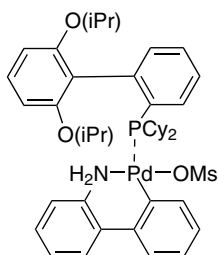


250mg
1g

PALLADIUM (Compounds)

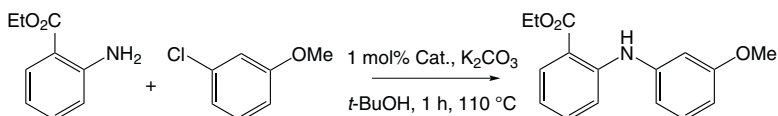
46-0314 Methanesulfonato(2-dicyclohexylphosphino-2',6'-di-*i*-propoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 3] (1445085-77-7) C₄₃H₅₆NO₅PPdS; FW: 836.37; white powdr.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.

250mg
 1g
 5g

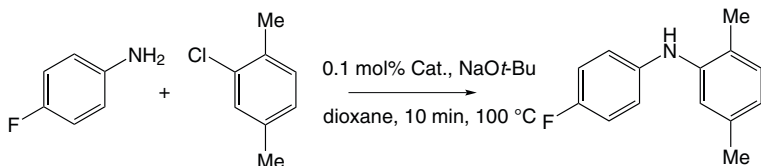


Technical Notes:

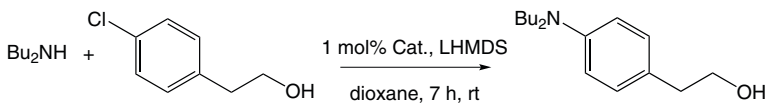
1. Palladium catalyst used for facile, C-N cross-coupling reactions.
2. A practical synthesis of indoles via a Pd-catalyzed C-N ring formation.



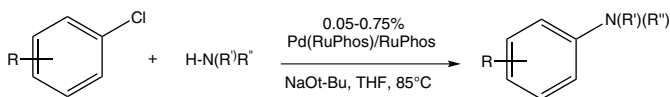
Tech. Note (1)
 Ref. (1)



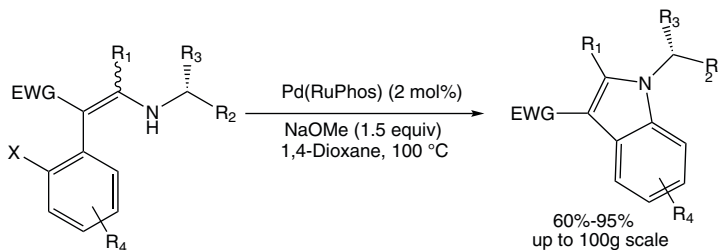
Tech. Note (1)
 Ref. (1)



Tech. Note (1)
 Ref. (2)



Tech. Note (1)
 Ref. (2)



Tech. Note (2)
 Ref. (3)

References:

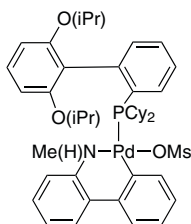
1. *J. Am. Chem. Soc.*, **2008**, *130*, 6686
2. *Chem. Sci.*, **2013**, *4*, 916
3. *Org. Lett.*, **2014**, *16*, 4117
4. *Angew. Chem. Int. Ed.*, **2013**, *52*, 615

PALLADIUM (Compounds)

46-0395

NEW

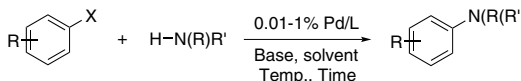
Methanesulfonato(2-dicyclohexylphosphino-2',6'-di-*i*-propoxy-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 4] (1599466-85-9)
 $C_{44}H_{58}NO_5PPdS$; FW: 850.40; off-white to tan powder.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620 Buchwald Palladacycle Precatalyst Kit 4 (Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4) component.



250mg
1g
5g

Technical Note:

1. Catalyst for the Buchwald-Hartwig Cross-Coupling Reaction



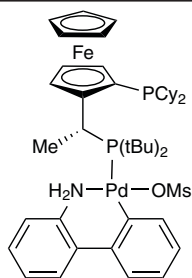
Tech. Note (1)
Ref. (1)

References:

1. *J. Org. Chem.*, **2014**, *79*, 4161

46-0353

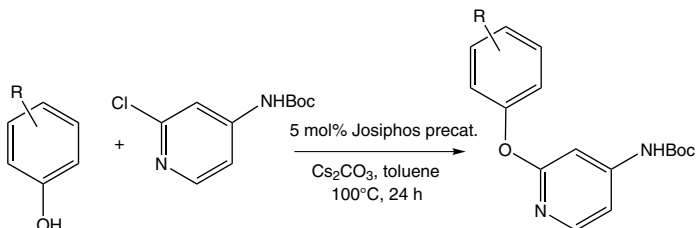
Methanesulfonato((R)-(-)-1-(S)-2-(dicyclohexylphosphino)ferrocenyl]ethylidenebutylphosphine)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98%
[Josiphos Palladacycle Gen. 3] (1702311-34-9)
 $C_{45}H_{65}FeNO_3P_2PdS$; FW: 924.28; red-orange solid
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.



100mg
500mg
2g
10g

Technical Note:

1. Catalyst used for C-O coupling reactions between electron-deficient phenols and functionalized heteroaryl chlorides.



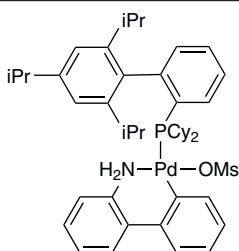
Tech. Note (1)
Ref. (1)

References:

1. *Tetrahedron Lett.*, **2015**, *56*, 2329

46-0320

Methanesulfonato(2-dicyclohexylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [Xphos Palladacycle Gen. 3] (1445085-55-1)
 $C_{46}H_{62}NO_3PPdS$; FW: 846.45; white to off-white powder.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.



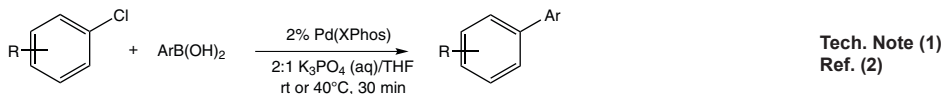
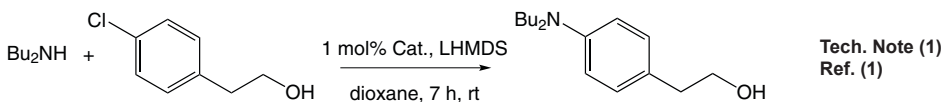
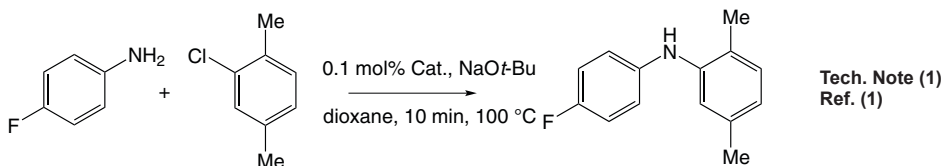
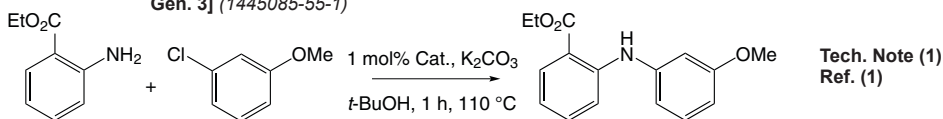
250mg
1g
5g

Technical Note:

1. Palladium precatalyst for facile C-N cross-coupling reactions.

PALLADIUM (Compounds)

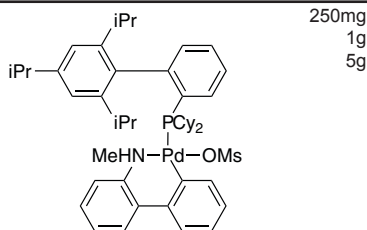
46-0322 Methanesulfonato(2-dicyclohexylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [Xphos Palladacycle Gen. 3] (1445085-55-1)



References:

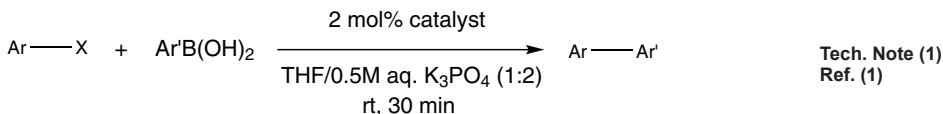
1. *J. Am. Chem. Soc.*, **2008**, *130*, 6686
2. *Chem. Sci.*, **2013**, *4*, 916

46-0327 Methanesulfonato(2-dicyclohexylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [XPhos Palladacycle Gen. 4] (1599466-81-5)
 C₄₇H₆₄NO₃PPdS; FW: 860.48; white to off-white powder.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 4 (Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4) component.



Technical Note:

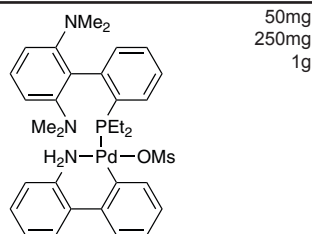
1. Palladium catalyst used in the Suzuki-Miyaura coupling of unstable boronic acids



References:

1. *J. Org. Chem.*, **2014**, *79*, 4161

46-0348 Methanesulfonato[2-diethylphosphino-2',6'-bis(dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [EtCPhos Palladacycle Gen. 3]
 C₃₃H₄₂N₃O₃PPdS; FW: 698.17; white to off-white solid
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620

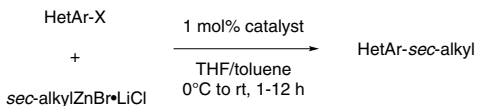


Technical Note:

1. Palladium catalyst for the cross-coupling of secondary alkylzinc reagents with heteroaryl halides

PALLADIUM (Compounds)

46-0348 Methanesulfonato[2-diethylphosphino-2',6'-bis(dimethylamino)-1,1'-biphenyl][2'-amino-(continued) 1,1'-biphenyl-2-yl]palladium(II), min. 98% [EtCPhos Palladacycle Gen. 3]



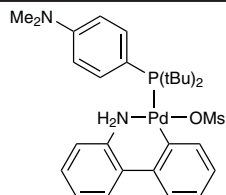
Tech. Note (1)
Ref. (1)

excellent selectivity
for non-rearranged products

References:

1. *Org. Lett.*, **2014**, *16*, 4638

46-0345 Methanesulfonato[[4-(N,N-dimethylamino)phenyl] di-t-butylphosphino](2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [Amphos Palladacycle Gen. 3] (1820817-64-8)
C₂₆H₄₁N₂O₃PPdS; FW: 635.11; beige to tan powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.

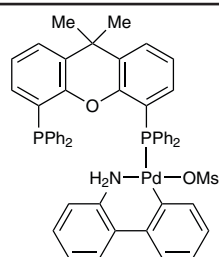


250mg
1g
5g

Technical Note:

1. See 15-1242.

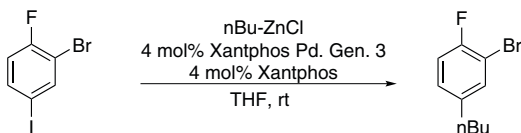
46-0957 Methanesulfonato[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene][2'-amino-1,1'-biphenyl]palladium(II) dichloromethane adduct, min. 98% [Xantphos Palladacycle Gen. 3] (1445085-97-1)
C₅₂H₄₅NO₄P₂PdS; FW: 948.35; pale yellow powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.



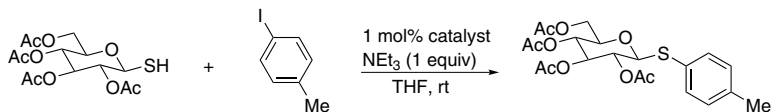
500mg
2g

Technical Notes:

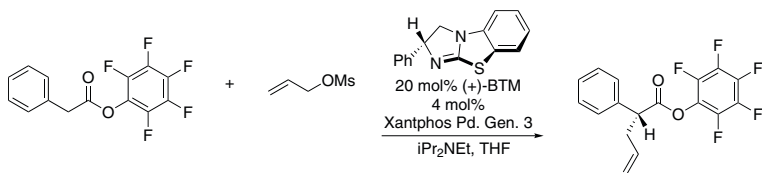
1. Catalyst for the Negishi coupling of aryl halides and alkylzinc reagents.
2. Catalyst for the synthesis of tetraacetylated p-tolyl thioglucose.
3. Cooperative catalyst for the direct asymmetric α -allylation of acyclic esters.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

References:

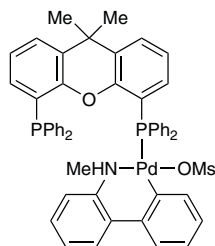
1. *J. Am. Chem. Soc.*, **2014**, *136*, 15757.
2. *Chem. Eur. J.*, **2015**, *21*, 8375.
3. *J. Am. Chem. Soc.*, **2016**, *138*, 5214.

PALLADIUM (Compounds)

46-0388

NEW

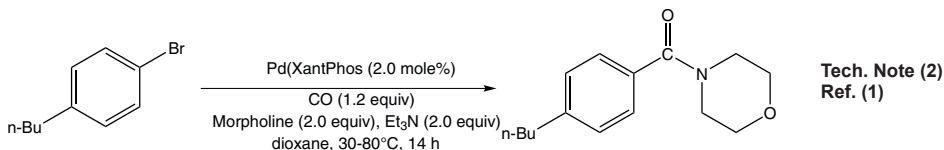
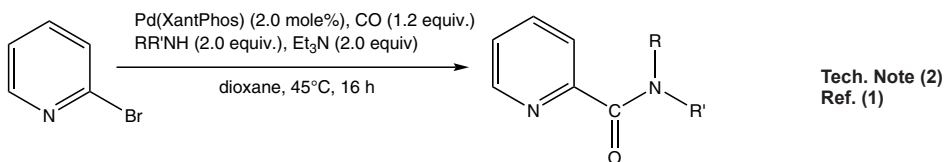
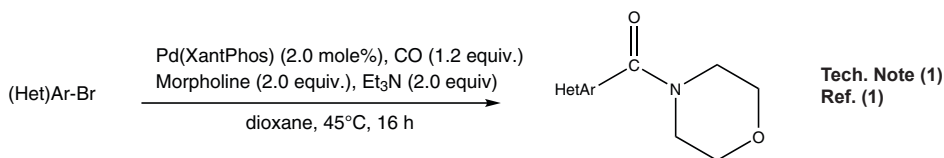
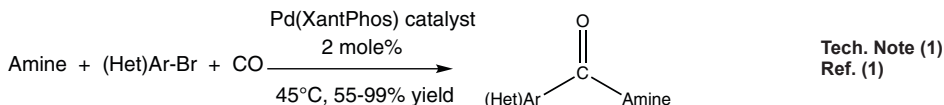
Methanesulfonato[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene](2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98%
[Xantphos Palladacycle Gen. 4] (1621274-19-8)
 $C_{53}H_{47}NO_4P_2PdS$; FW: 962.38; yellow solid
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 4 (Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4) component.



250mg
1g
5g

Technical Notes:

1. Catalyst used for the aminocarbonylation of (hetero)aryl bromides.
2. Catalyst used in the aminocarbonylation of bromopyridine and alkyl-substituted bromobenzene.



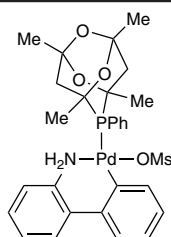
References:

1. *Org. Lett.*, 2014, 16, 4296

46-0392

NEW

Methanesulfonato(1,3,5,7-tetramethyl-8-phenyl-2,4,6-trioxa-8-phosphaadamantane)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% **[MeCgPPh Palladacycle Gen. 3]**
 $C_{29}H_{34}NO_2PPdS \cdot CH_2Cl_2$; FW: 662.04; white to tan powder.
air sensitive, moisture sensitive
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620



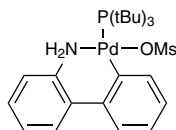
500mg
2g

PALLADIUM (Compounds)

46-0387

NEW

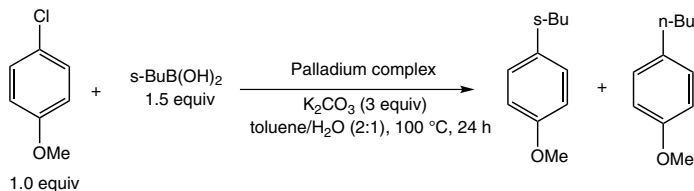
Methanesulfonato(tri-*t*-butylphosphino)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), 98%
[P(*t*-Bu)₃ Palladacycle Gen. 3] (1445086-17-8)
 C₂₅H₄₀NO₃PPdS; FW: 572.05; white powdr.
 Note: Patents: PCT/US2013/030779,
 US Serial No. 13/799620.



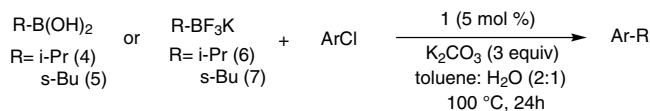
250mg
1g
5g

Technical Notes:

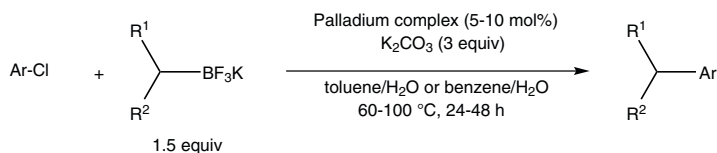
1. Pd-catalyzed cross-coupling reaction of *s*-BuB(OH)₂ and 4-chloroanisole.
2. Pd-catalyzed cross-coupling reaction of secondary alkylboronic acids and aryl chlorides.
3. Pd-catalyzed cross-coupling reaction of secondary alkyltrifluoroborates and aryl chlorides



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (1)

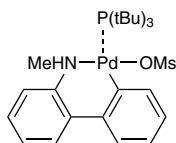
References:

1. *J. Am. Chem. Soc.*, **2014**, 136, 14027

46-0385

NEW

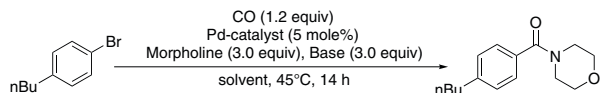
Methanesulfonato(tri-*t*-butylphosphino)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98%
[P(*t*-Bu)₃ Palladacycle Gen. 4] (1621274-11-0)
 C₂₆H₄₂NO₃PPdS; FW: 586.08; tan to yellow powdr.
 Note: Patents: PCT/US2013/030779,
 US Serial No. 13/799620 Buchwald Palladacycle
 Precatalyst Kit 4 (Methanesulfonato-2'-methylami-
 no-1,1'-biphenyl-2-yl- Palladacycles Gen. 4) component.



250mg
1g
5g

Technical Note:

1. Mild Pd-catalyzed aminocarbonylation of (hetero)aryl bromides with a palladacycle precatalyst.



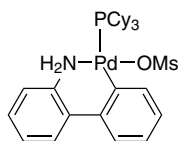
Tech. Note (1)
Ref. (1)

References:

1. *Org. Letters*, **2014**, 16, 4296.

PALLADIUM (Compounds)

46-0239 Methanesulfonato(tricyclohexylphosphine) (2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [PCy₃ Palladacycle Gen. 3] (1445086-12-3)
C₃₁H₄₆NO₃PPdS; FW: 650.16; off-white to beige powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.



250mg
1g
5g

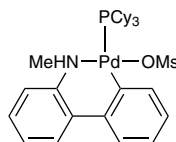
Technical Note:

1. A new palladium precatalyst for C-C and C-N cross-coupling reactions.

References:

1. *Chem. Sci.*, **2013**, 4, 916
2. *Chem. Eur. J.*, **2014**, 20, 12032.
3. *Org. Lett.*, **2017**, 19, 5038.

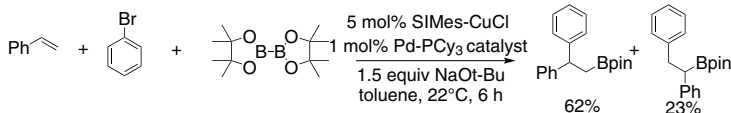
46-0379 Methanesulfonato(tricyclohexylphosphino) (2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98% [PCy₃ Palladacycle Gen. 4]
C₃₂H₄₈NO₃PPdS; FW: 664.19; white powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 4 (Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4) component.



250mg
1g
5g

Technical Note:

1. N-Methyl Alternative* Catalyst for the alkene carboboration enabled by synergistic catalysis

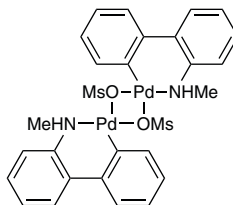


Tech. Note (1)
Ref. (1)

References:

1. *Chem. Eur. J.*, **2014**, 20, 12032. (Note this reference is for the non-methylated palladacycle, 46-0239, with the same ligand.)

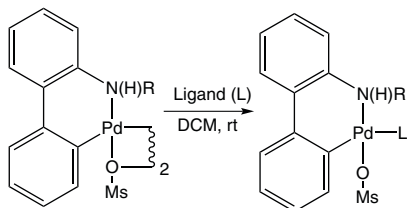
46-1553 (2'-Methylamino-1,1'-biphenyl-2-yl) methanesulfonatopalladium(II) dimer, min. 98% (1581285-85-9)
C₂₈H₃₀N₂O₈Pd₂S₂; FW: 767.52; light gray powdr.
air sensitive
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620



500mg
2g

Technical Note:

1. Dimeric palladium precursor, that when treated with phosphines at room temperature in dichloromethane, provides N-substituted precatalysts. These catalysts are useful in the aminocarbonylation of (hetero)aryl bromides, and general C-C and C-N cross-coupling reactions.



References:

1. *Org. Lett.*, **2014**, 16, 4296
2. *J. Org. Chem.*, **2014**, 79, 4161

PALLADIUM (Compounds)

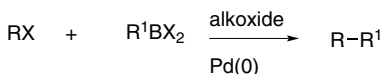
46-1780 Palladium(II) acetate, min. 98% (99.9+%-Pd) (3375-31-3) 1g
 Pd₃(OOCCH₃)₆; FW: 673.52; golden-brown xtl. 5g
 Note: Palladium Kit component. 25g

Technical Notes:

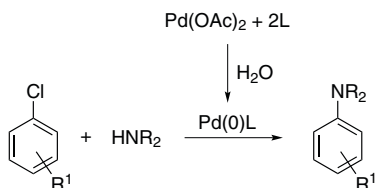
1. Efficient catalyst for the arylation of olefins (Heck reaction).
2. Catalyst for cross-coupling reactions.
3. Catalyst for C-H activation.
4. Precatalyst for enantioselective decarboxylative protonation of allyl β-ketoesters



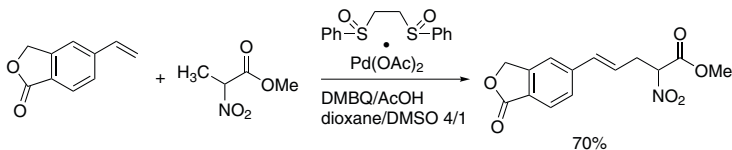
Tech. Note (1)
 Ref. (1)



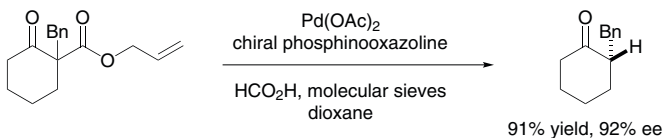
Tech. Note (2)
 Ref. (2,3)



Tech. Note (2)
 Ref. (2,3)



Tech. Note (3)
 Ref. (2,3)



Tech. Note (4)
 Ref. (10)

References:

1. *Angew. Chem. Int. Ed.*, **1994**, 33, 2379
2. *Acta. Chem. Scand.*, **1993**, 47, 221
3. *J. Org. Chem.*, **1994**, 59, 5034
4. *Palladium Reagents in Organic Synthesis (R.F. Heck)*, **1985**, Chapter 6
5. *Comprehensive Organic Synthesis*, **1991**, Vol. 3, Chapter, 2
6. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol.6, 3847
7. *Handbook of Organopalladium Chemistry for Organic Synthesis*, Negishi, E., Ed., Wiley-Interscience, New York, **2002**
8. *Org. Lett.*, **2008**, 10, 3505
9. *J. Am. Chem. Soc.*, **2008**, 130, 14090
10. *J. Am. Chem. Soc.*, **2006**, 128, 11348

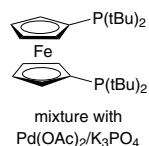
46-1781 Palladium(II) acetate, 99+% (99.95+%-Pd) (3375-31-3) 1g
 Pd₃(OOCCH₃)₆; FW: 673.52; golden-brown xtl. 5g
 Note: Palladium Kit component. 25g

Technical Note:

1. See 46-1780 (174)

PALLADIUM (Compounds)

46-2030 Palladium(II) acetate/1,1'-bis(di-t-butylphosphino)ferrocene/potassium phosphate admixture [CatKit single-use vials - 2.02 wt% Pd(OAc)₂] off-white pwdr.
 Note: Each vial contains 453mg of admixture.
 Weight-percent of components:
 2.02 wt% palladium acetate; 4.28 wt% phosphine ligand;
 93.7 wt% potassium phosphate
 Kit of CatKits - Single-Use Vials for low catalyst loading experiments Kit component..

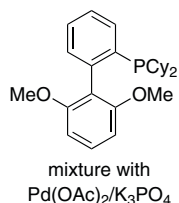


5 x 1vial
25 x 1vial

Technical Note:

1. Convenient, pre-weighed vial of palladium catalyst/base admixture useful for screening reactions. The vial contains 453mg of admixture, which will deliver 4 mole% of palladium catalyst and 2 equivalents of base, to a reaction using 1 mmole of substrate.

46-2033 Palladium(II) acetate/2-dicyclohexylphosphino-2,6-dimethoxy-1,1'-biphenyl (SPhos)/potassium phosphate admixture [CatKit single-use vials - 1.96 wt% Pd(OAc)₂] off-white pwdr.
 Note: Patents: US 6,395,916, US 6,307,087.
 Each vial contains 453mg of admixture.
 Weight-percent of components:
 1.96 wt% palladium acetate; 7.17 wt% phosphine ligand;
 90.8 wt% potassium phosphate
 Kit of CatKits - Single-Use Vials for low catalyst loading experiments Kit component.



5 x 1vial
25 x 1vial

Technical Note:

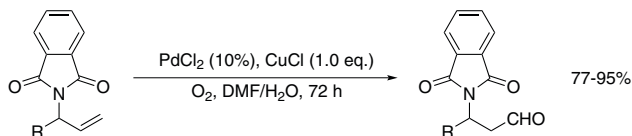
1. Convenient, pre-weighed vial of palladium catalyst/base admixture useful for screening reactions. The vial contains 453mg of admixture, which will deliver 4 mole% of palladium catalyst and 2 equivalents of base, to a reaction using 1 mmole of substrate.

46-1850 Palladium(II) chloride (99.9%-Pd) (7647-10-1)
 PdCl₂; FW: 177.31; rust colored xtl.; m.p. 500° dec.; d. 4.0
hygroscopic
 Note: Palladium Kit component.

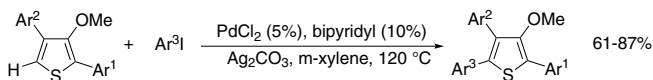
1g
5g
25g

Technical Notes:

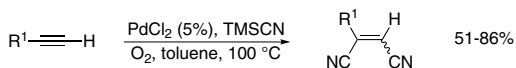
1. Catalyst for aldehyde selective Wacker oxidations of phthalimide protected allylic amines.
2. Catalyst for C-H arylation of thiophenes.
3. Palladium-catalyzed cyanation of carbon-carbon triple bonds.
4. Catalyst for Wacker oxidation of olefins.
5. Reagent for the intramolecular addition of alcohols to olefins.



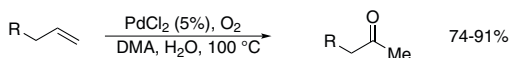
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



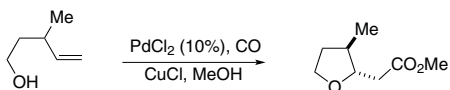
Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)

PALLADIUM (Compounds)

46-1850 Palladium(II) chloride (99.9%-Pd) (7647-10-1)
(continued)



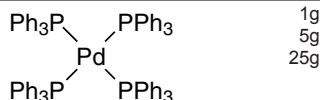
Tech. Note (5)
Ref. (5)

References:

1. *J. Am. Chem. Soc.*, **2009**, *131*, 9473
2. *J. Am. Chem. Soc.*, **2009**, *131*, 14622
3. *Angew. Chem. Int. Ed.*, **2009**, *48*, 4528
4. *Angew. Chem. Int. Ed.*, **2006**, *45*, 481
5. *J. Org. Chem.*, **1989**, *54*, 4483
6. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol, 6, 3872

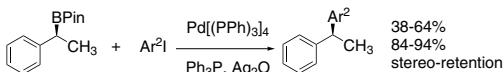
96-4650 Palladium Kit
See page 345

46-2150 Tetrakis(triphenylphosphine)palladium(0), 99%
(99.9+%-Pd) (14221-01-3)
Pd[(C₆H₅)₃P]₄; FW: 1155.57; bright yellow pwr.
air sensitive, (store cold)
Note: Palladium Kit component.

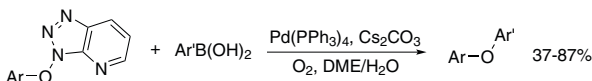


Technical Notes:

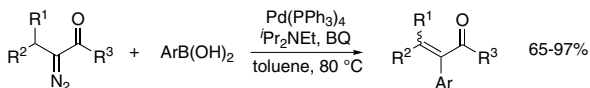
1. Catalyst for Suzuki coupling of chiral secondary organoboronic esters.
2. Palladium-catalyzed S_NAr reactions for the synthesis of heteroaryl ethers.
3. Catalyst for cross-coupling of α-diazocarbonyl compounds with arylboronic acids.
4. Diastereoselective synthesis of trans-1,2-diazetidines.
5. Palladium-catalyzed alkynyl iminium ion cyclization.
6. Widely used reagent in a variety of transformations including Heck arylation, enyne and diyne cycloisomerization.
7. Catalysts for cross-coupling.



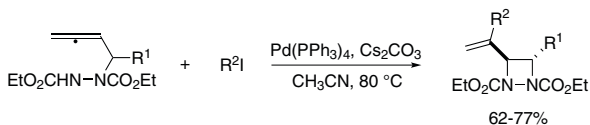
Tech. Note (1)
Ref. (1)



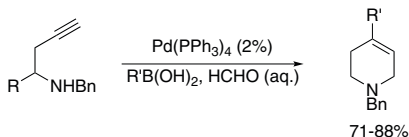
Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



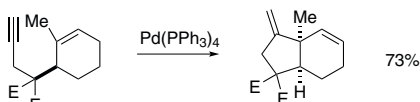
Tech. Note (4)
Ref. (4)



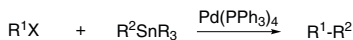
Tech. Note (5)
Ref. (5)

PALLADIUM (Compounds)

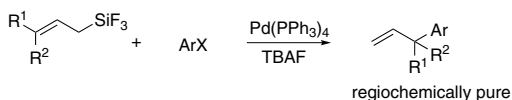
46-2150 Tetrakis(triphenylphosphine)palladium(0), 99% (99.9+%-Pd) (14221-01-3)
(continued)



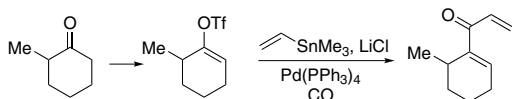
Tech. Note (6)
Ref. (6)



Tech. Note (7)
Ref. (9)



Tech. Note (7)
Ref. (8)



Tech. Note (7)
Ref. (9)

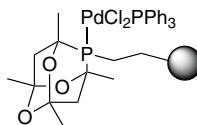
References:

1. *J. Am. Chem. Soc.*, **2009**, *131*, 5024
2. *J. Am. Chem. Soc.*, **2009**, *131*, 4174
3. *J. Am. Chem. Soc.*, **2008**, *130*, 1566
4. *Angew. Chem. Int. Ed.*, **2008**, *47*, 4581
5. *Angew. Chem. Int. Ed.*, **2008**, *47*, 4851
6. *Acc. Chem. Res.*, **1990**, *23*, 34
7. *Angew. Chem. Int. Ed.*, **1995**, *34*, 1721
8. *Pure Appl. Chem.*, **1994**, *66*, 1471
9. *J. Am. Chem. Soc.*, **1984**, *106*, 7500
10. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol. 7, 4788
11. *Comprehensive Organic Synthesis*, **1991**, Vol. 3, Chapter, 2.4, 521
12. *Palladium Reagents in Organic Synthesis*, **1995**, Chapter, 6
13. *Handbook of Organopalladium Chemistry for Organic Synthesis*, **1st**, Ed, John, Wiley, Sons

46-7860 Triphenylphosphinepalladium(II) dichloride
phosphaadamantane ethyl Silica
(PhosphonicS PAPd1r)

yellow solid

Note: Sold in collaboration with PhosphonicS Ltd.
for research purposes only.



500mg
2g

Particle size range: 60-200 microns

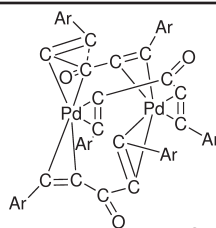
Palladium loading: 0.01 to 0.03 mmol/g

Technical Note:

1. Immobilized palladium heterogeneous catalyst successfully utilized in typical Suzuki and Heck reactions. The catalyst is effective for a wide range of substrates yielding coupled products in high yield. The catalyst can be simply filtered off and reused over several cycles, with no apparent loss in activity. Typical reactions using the homogeneous version of triphenylphosphinepalladium(II) dichloride phosphaadamantane can be found in *Org. Lett.* **2003**, *5*, 6, *Tetrahedron Lett.*, **2004**, *45*, 8319 and *J. Org. Chem.*, **2004**, *69*, 5082.

46-3005 Tris[di(4-acetoxybenzylidene)acetone]
dipalladium(0) di(4-acetoxybenzylidene)
acetone adduct, min. 97% (1196118-15-6)

C₆₃H₅₄O₁₅Pd₂; FW: 1263.93; dark purple pwdr.
air sensitive, moisture sensitive, (store cold)
Note: U.S. Patent No. 12/259,001



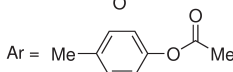
100mg
500mg

Technical Note:

1. Useful catalyst for the Suzuki polycondensation reactions.

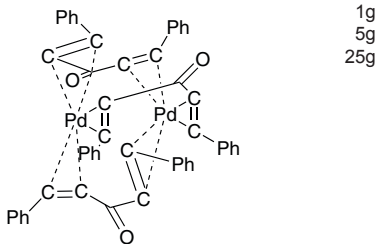
References:

1. *Macromolecules*, **2009**, *42*, 8611



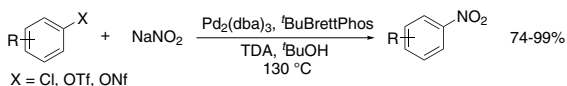
PALLADIUM (Compounds)

46-3000 **Tris(dibenzylideneacetone)dipalladium(0)**
 (51364-51-3)
 (C₂₆H₂₄CH=CHCOCH=CHC₆H₅)₃Pd₂; FW: 915.70;
 purple powdr.; m.p. 152-155°
air sensitive, moisture sensitive
 Note: Palladium Kit component.

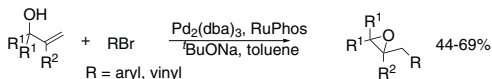


Technical Notes:

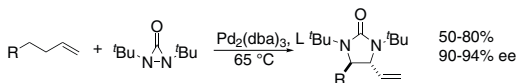
1. Catalyst precursor for conversion of aryl chlorides, triflates, and nonaflates to nitroaromatics.
2. Catalyst for the synthesis of epoxides.
3. Catalytic asymmetric allylic and homoallylic diamination of terminal olefins.
4. Site-selective benzylic sp³ palladium-catalyzed direct arylation.
5. Palladium-catalyzed one-pot synthesis of tricyclic indolines.
6. Active catalyst for the Suzuki-Miyaura coupling of 2-pyridyl nucleophiles.
7. Catalyst in combination with BINAP for the asymmetric Heck Arylation of olefins.
8. Catalyst for α-arylation of ketones.
9. Cross-coupling of aryl halides with aryl boronic acids.



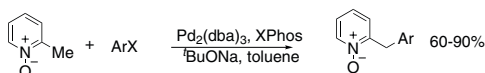
Tech. Note (1)
Ref. (1)



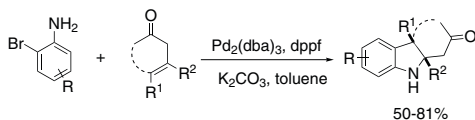
Tech. Note (2)
Ref. (2)



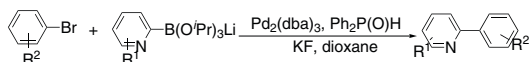
Tech. Note (3)
Ref. (3)



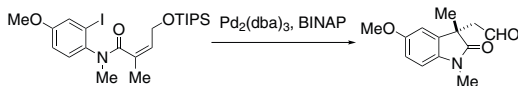
Tech. Note (4)
Ref. (4)



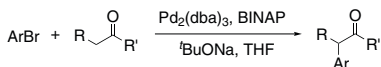
Tech. Note (5)
Ref. (5)



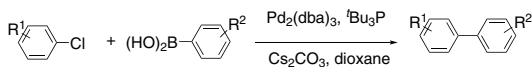
Tech. Note (6)
Ref. (6)



Tech. Note (7)
Ref. (7)



Tech. Note (8)
Ref. (8)



Tech. Note (9)
Ref. (9)

PALLADIUM (Compounds)

46-3000 Tris(dibenzylideneacetone)dipalladium(0) (51364-51-3)

(continued)

References:

1. *J. Am. Chem. Soc.*, **2009**, *131*, 12898.
2. *J. Am. Chem. Soc.*, **2009**, *131*, 2052.
3. *J. Am. Chem. Soc.*, **2008**, *130*, 8590.
4. *J. Am. Chem. Soc.*, **2008**, *130*, 3266.
5. *Angew. Chem. Int. Ed.*, **2008**, *47*, 177.
6. *Angew. Chem. Int. Ed.*, **2008**, *47*, 4695.
7. *J. Org. Chem.*, **1993**, *58*, 6949.
8. *J. Am. Chem. Soc.*, **1997**, *119*, 11108.
9. *Angew. Chem. Int. Ed.*, **1998**, *37*, 3387.

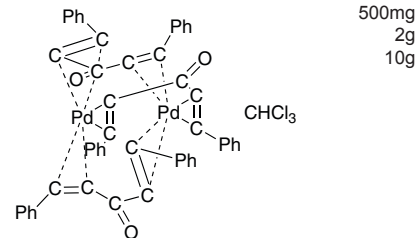
46-3010 Tris(dibenzylideneacetone)dipalladium(0)

chloroform adduct (52522-40-4)

(C₆H₅CH=CHCOCH=CHC₆H₅)₃Pd₂·CHCl₃; FW: 1035.08; red to brown solid; m.p. 131-135°

air sensitive, moisture sensitive

Note: Palladium Kit component.



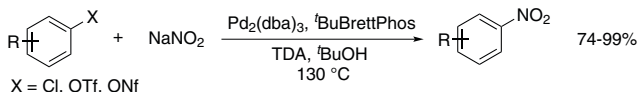
500mg

2g

10g

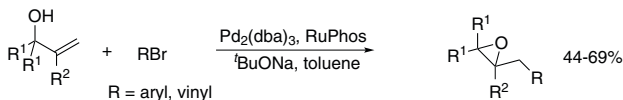
Technical Notes:

1. Used for Pd-catalyzed asymmetric arylation, vinylation, and Allenylation of tert-cyclobutanols via enantioselective C-C Bond cleavage.
2. Used for synthesis of chiral chromans through the Pd-catalyzed asymmetric allylic alkylation (AAA).
3. Catalyst for double N-arylation of primary amines to synthesize multisubstituted carbazoles from 2,2'-biphenylene ditriflates.
4. Palladium catalyst for regio- and enantioselective allylic alkylation of ketones through allyl enol carbonates.
5. Used for Pd-catalyzed enantioselective C-3 allylation of 3-substituted-1*H*-indoles using trialkylboranes.
6. Used for enantioselective construction of spirocyclic oxindolic cyclopentanes by Pd-catalyzed trimethylenemethane-[3+2]-cycloaddition.
7. Used for Pd-catalyzed insertion of α-diazoesters into vinyl halides to generate α,β-unsaturated γ-amino Esters.
8. Pd catalyst for decarboxylative asymmetric allylic alkylation of enol carbonates.
9. Palladium catalyst for asymmetric addition of oxindoles and allenes.
10. Catalyst for diastereo- and enantioselective formal [3+2]-cycloaddition between substituted vinylcyclopropanes and electron-deficient olefins.
11. Used for Pd-catalyzed asymmetric decarboxylative cycloaddition of vinyl ethylene carbonates with Michael acceptors.
12. Catalyst for enantioselective [6+4] cycloaddition of vinyl oxetanes with azadienes to access ten-membered heterocycles.



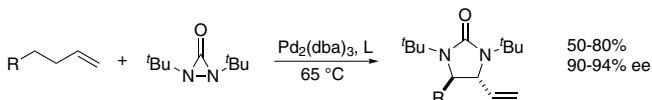
X = Cl, OTf, ONf

Tech. Note (1)
Ref. (1)



R = aryl, vinyl

Tech. Note (2)
Ref. (2)



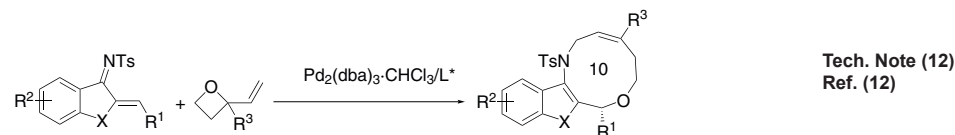
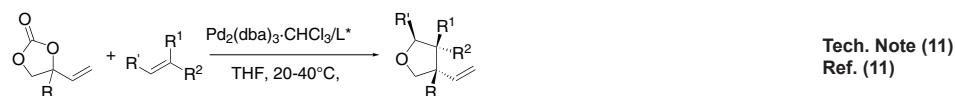
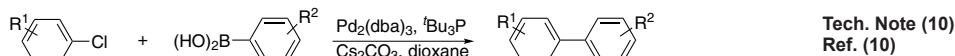
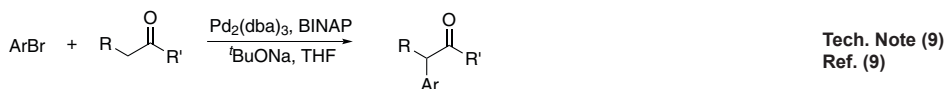
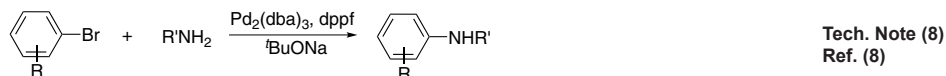
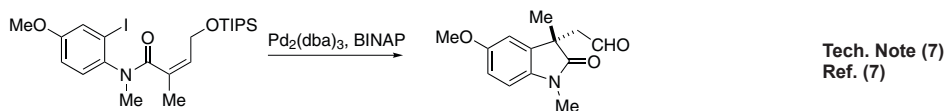
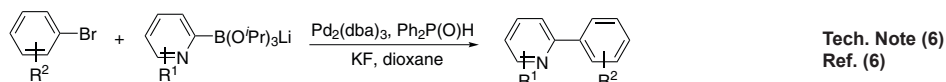
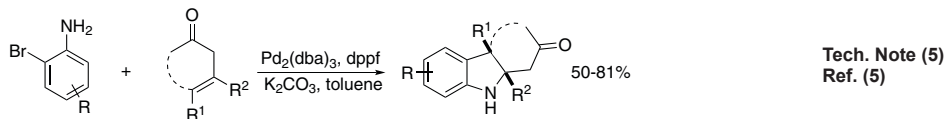
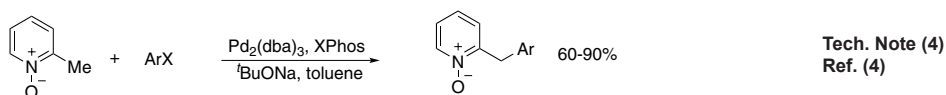
Tech. Note (3)
Ref. (3)

PALLADIUM (Compounds)

46-3010

Tris(dibenzylideneacetone)dipalladium(0) chloroform adduct (52522-40-4)

(continued)



References:

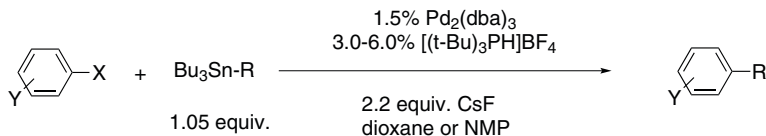
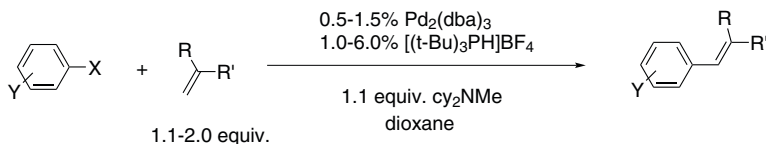
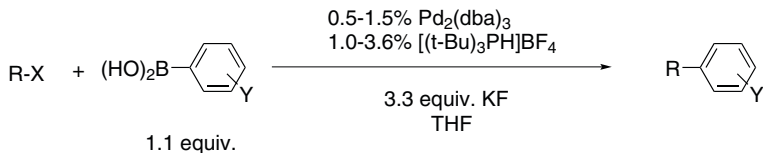
1. *J. Am. Chem. Soc.*, **2003**, 125, 8862.
2. *J. Am. Chem. Soc.*, **2004**, 126, 11965.
3. *J. Org. Chem.*, **2005**, 70, 413.
4. *J. Am. Chem. Soc.*, **2005**, 127, 2846.
5. *J. Am. Chem. Soc.*, **2006**, 128, 6314.
6. *J. Am. Chem. Soc.*, **2007**, 129, 12396.
7. *Angew. Chem. Int. Ed.*, **2009**, 48, 3677.
8. *J. Am. Chem. Soc.*, **2009**, 131, 18343.
9. *J. Am. Chem. Soc.*, **2011**, 133, 20611.
10. *J. Am. Chem. Soc.*, **2012**, 134, 17823.
11. *Angew. Chem. Int. Ed.*, **2014**, 53, 11257.
12. *Angew. Chem. Int. Ed.*, **2018**, 57, 1596.

PALLADIUM (Compounds)

46-3015 Tris(dibenzylideneacetone)dipalladium(0)/tri-*t*-butylphosphonium tetrafluoroborate admixture (molar Pd/P = 1:1.2) 1g
5g
 $C_{51}H_{42}O_3Pd_2[(C_4H_9)_3PH]BF_4$; purple powder.
air sensitive, moisture sensitive

Technical Note:

1. Stable, precatalyst mixture for the Suzuki, Heck, Stille, and Sonogashira, reactions of aryl/vinyl halides, under mild conditions. Active catalyst can be generated in situ by adding a base.



References:

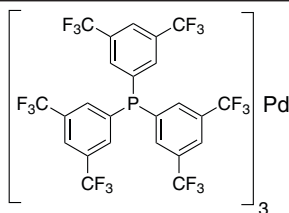
1. *Org. Lett.*, **2001**, 3, 4295

46-3020 Tris(dibenzylideneacetone)dipalladium(0)/tri-*t*-butylphosphonium tetrafluoroborate admixture (molar Pd/P = 1:2) 1g
5g
 $C_{51}H_{42}O_3Pd_2[(C_4H_9)_3PH]BF_4$; purple powder.
air sensitive, moisture sensitive

Technical Note:

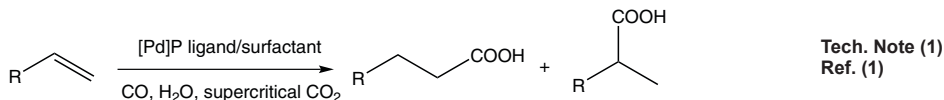
1. See 46-3015.

46-2185 Tris[tris(3,5-bis(trifluoromethyl)phenyl)phosphine]palladium(0), 99% (1130784-80-3) 500mg
2g
10g
 $C_{72}H_{27}F_{34}P_3Pd$; FW: 2117.24; yellow xtl.
 Note: Material can be stored at room temperature. Not sensitive to air, moisture, or light.



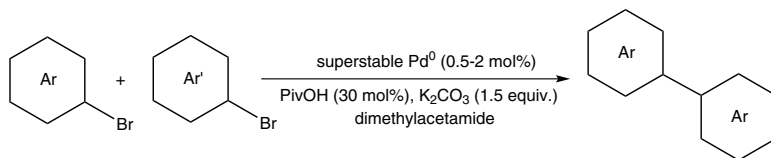
Technical Notes:

1. Catalyst used in the hydrocarboxylation of terminal alkenes in supercritical carbon dioxide.
2. Palladium catalyst used for the direct arylation of heteroarenes.
3. Catalyst used in a nonoxidative cyclization reaction.
4. Air and thermostable catalyst used for Suzuki coupling reactions.

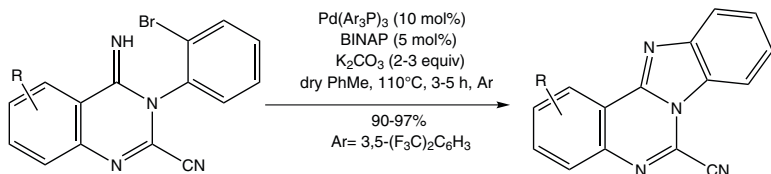


PALLADIUM (Compounds)

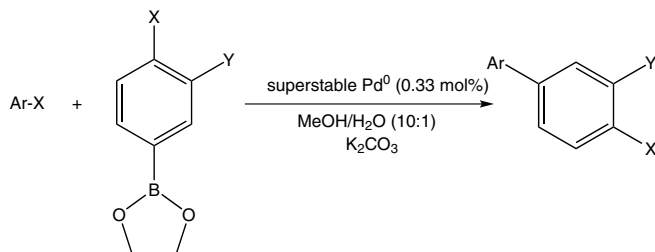
46-2185 Tris(tris[3,5-bis(trifluoromethyl)phenyl]phosphine)palladium(0), 99% (1130784-80-3)
(continued)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)

References:

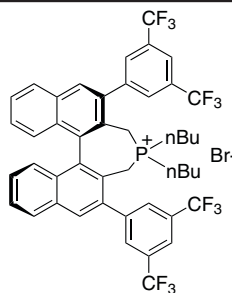
1. *Eur. J. Inorg.Chem.*, **2008**, 22, 3524
2. *Eur. J. Org.Chem.*, **2015**, 2015(1), 56
3. *J. Org.Chem.*, **2015**, 80, 8329
4. *Eur. J. Org.Chem.*, **2015**, 2015(1), 60

PHOSPHORUS (Compounds)

96-5900 Chiral Quest Catalyst and Ligand Toolbox Kit for Asymmetric Hydrogenation
See page 333

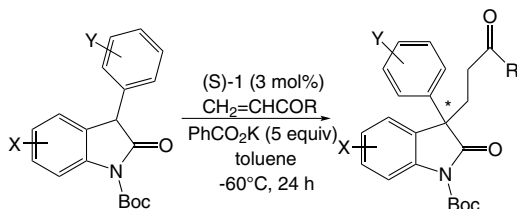
15-1457 (11bR)-(+)-4,4-Dibutyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99%
R-MARUOKA CAT P-NB
[C₄₆H₃₈F₁₂P]⁺Br⁻; FW: 929.65; white xtl.; m.p. 262-263°
Note: Maruoka Chiral Phase-Transfer Phosphonium Organocatalyst Kit component.

50mg
250mg



Technical Note:

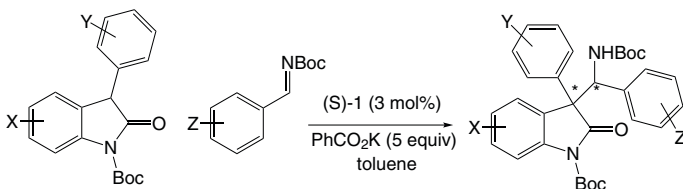
1. Chiral, phase-transfer catalyst for the asymmetric Michael and Mannich reactions of 3-aryloxindoles.



Tech. Note (1)
Ref. (1)

PALLADIUM (Compounds)

15-1457 (11bR)-(+)-4,4-Dibutyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% R-MARUOKA CAT P-NB



Tech. Note (1)
Ref. (1)

References:

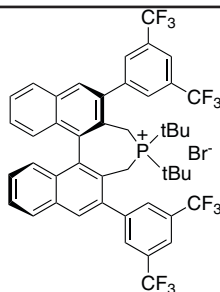
1. *Angew. Chem. Int. Ed.*, **2009**, *48*, 4559.

15-1458 (11bS)-(-)-4,4-Dibutyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% S-MaruoKa CAT P-NB 50mg
(1110711-01-7) 250mg
[C₄₆H₃₀F₁₂P]⁺Br⁻; FW: 929.65; white xt.; m.p. 262-263°
Note: MaruoKa Chiral Phase-Transfer Phosphonium Organocatalyst Kit component.

Technical Note:

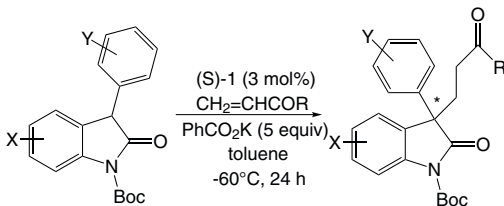
1. See 15-1457 (page 182)

15-1464 (11bR)-(+)-4,4-Di-*t*-butyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% R-MARUOKA CAT P-TB 50mg
[C₄₆H₃₈F₁₂P]⁺Br⁻; FW: 929.65; white xtl.; m.p. 202-204° 250mg
Note: MaruoKa Chiral Phase-Transfer Phosphonium Organocatalyst Kit component.

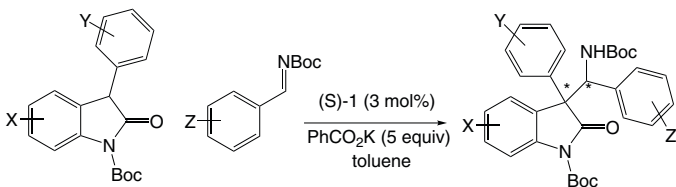


Technical Note:

1. Chiral, phase-transfer catalyst for the asymmetric Michael and Mannich reactions of 3-aryloxindoles.



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)

References:

1. *Angew. Chem. Int. Ed.*, **2009**, *48*, 4559.

15-1465 (11bS)-(-)-4,4-Di-*t*-butyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% S-MARUOKA CAT P-TB 50mg
[C₄₆H₃₈F₁₂P]⁺Br⁻; FW: 929.65; white xtl.; m.p. 202-203° 250mg
Note: MaruoKa Chiral Phase-Transfer Phosphonium Organocatalyst Kit component.

Technical Note:

1. See 15-1464 (page 183)

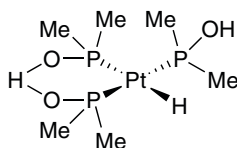
96-3750 MaruoKa Chiral Phase-Transfer Phosphonium Organocatalyst Kit
See page 345

PLATINUM (Elemental Forms)

96-6717	BASF Heterogeneous Catalyst Kit See page 323	
96-6721	BASF Platinum Catalyst Kit See page 324	
78-3015 NEW	Platinum nanoparticles, 1% on carbon black (surfactant and reactant-free) (7440-06-4) Pt; FW: 195.10; black solid (store cold) Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.	5g 25g
78-3020 NEW	Platinum nanoparticles, 5% on carbon black (surfactant and reactant-free) (7440-06-4) Pt; FW: 195.10; black solid (store cold) Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.	5g 25g
78-3030 NEW	Platinum nanoparticles, 10% on carbon black (surfactant and reactant-free) (7440-06-4) Pt; FW: 195.10; black solid (store cold) Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.	1g 5g
78-3032 NEW	Platinum nanoparticles, 20% on carbon black (surfactant and reactant-free) (7440-06-4) Pt; FW: 195.10; black solid (store cold) Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.	1g 5g
78-3035 NEW	Platinum nanoparticles, 30% on carbon black (surfactant and reactant-free) (7440-06-4) Pt; FW: 195.10; black solid (store cold) Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.	1g 5g
78-3012 NEW	Platinum nanoparticles, 1% on Titania (anatase) (surfactant and reactant-free) (7440-06-4) Pt; FW: 195.10; gray solid (store cold) Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.	5g 25g
78-3005 NEW	Platinum nanoparticles, 1% on Titania (rutile) (surfactant and reactant-free) (7440-06-4) Pt; FW: 195.10; light gray solid (store cold) Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.	5g 25g
78-3026 NEW	Platinum nanoparticles, 10% on Titania (anatase) (surfactant and reactant-free) (7440-06-4) Pt; FW: 195.10; dark gray solid (store cold) Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.	1g 5g
78-3023 NEW	Platinum nanoparticles, 10% on Titania (rutile) (surfactant and reactant-free) (7440-06-4) Pt; FW: 195.10; dark gray solid (store cold) Note: Manufactured by laser ablation. Sold in collaboration with Particular® for research purposes only.	1g 5g

PLATINUM (Compounds)

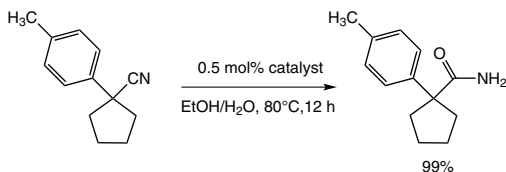
78-0725 **Hydrido(dimethylphosphinous acid-kP) [hydrogen bis(dimethylphosphinito-kP)] platinum(II) Ghaffar-Parkins catalyst (173416-05-2)**
 $C_8H_{21}O_3P_3Pt$; FW: 429.23; white to off-white powdr.



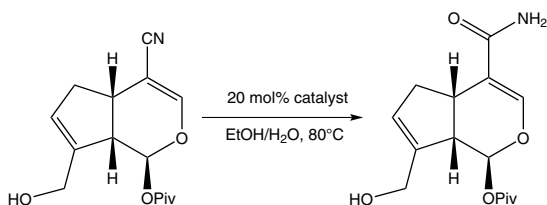
100mg
500mg
2g

Technical Note:

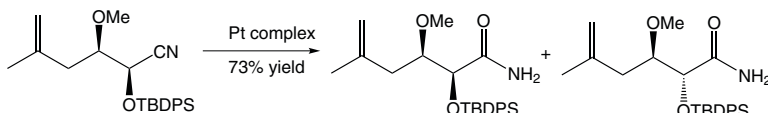
1. Widely used in complex multi-step organic syntheses. This mild hydration catalyst converts hindered and acid/base sensitive nitriles to amides. The amide is released from the metal coordination sphere preventing further hydrolysis to acid. Typically, turnover frequency (TOF) ranges from 16 to 380 h⁻¹ depending on steric factors. For optimal results avoid the presence of coordinating anions especially cyanide and halide.



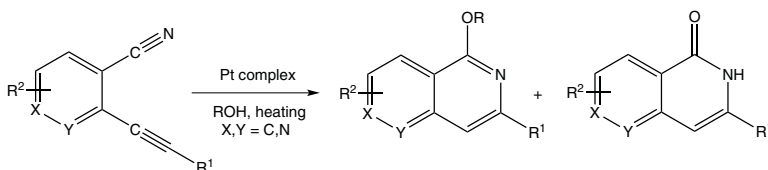
Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (2)



Tech. Note (1)
Ref. (3)



Tech. Note (1)
Ref. (4)

References:

1. *J. Org. Chem.*, **2004**, 69, 2327
2. *Org. Lett.*, **2006**, 8, 2643
3. *J. Org. Chem.*, **2009**, 74, 5405
4. *Tetrahedron Lett.*, **2010**, 51, 6422
5. *Appl. Sci.*, **2015**, 5, 380 (catalyst review article)

78-1892 HAZ	Platinum(IV) oxide hydrate (~80-82% Pt) (99.95+%-Pt) ADAMS' CATALYST [BASF C7018] (52785-06-5) PtO ₂ ·XH ₂ O; FW: 227.09; brown powdr. Note: Sold in collaboration with BASF for research purposes only. BASF Platinum Catalyst Kit component.	250mg 1g 5g
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78-1890 HAZ	Platinum(IV) oxide hydrate (~80-81% Pt) ADAMS' CATALYST (52785-06-5) PtO ₂ ·XH ₂ O; FW: 227.09; brown powdr.; SA: high	250mg 1g 5g
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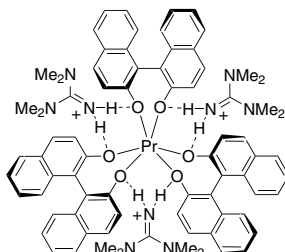
PRASEODYMIUM (Compounds)

59-1000

NEW

Tris[N,N,N,N-tetramethylguanidinium] [tris(1S)-(1,1'-binaphlene)-2,2'-diolato] praseodymate Pr-HTMG-B
 $C_{75}H_{78}N_8O_6Pr$; FW: 1342.38; off-white pwdr.
 Note: U.S. Patent 14/898,925.

250mg
1g



Technical Note:

- See 57-1250 (page 80)

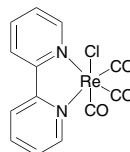
RHENIUM (Compounds)

75-2360

NEW

Chlorotricarbonyl(2,2'-bipyridine)rhenium(I), 99%
 (55658-96-3)
 $C_{13}H_8ClN_2O_3Re$; yellow solid

250mg
1g



Technical Note:

- This catalyst is used for the reduction of carbon dioxide and carbonyls (Ref. 1-6).

References:

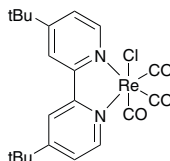
- ACS Catal.*, **2015**, 5, 900
- J. Phys. Chem. Lett.*, **2014**, 5, 2033
- Inorg. Chem.*, **2014**, 53, 2606
- J. Am. Chem. Soc.*, **2013**, 135, 1823
- Dalton Trans.*, **2013**, 42, 2062
- Chem. Eur. J.*, **2012**, 18, 15722

75-2365

NEW

Chlorotricarbonyl(4,4'-di-t-butyl-2,2'-bipyridine) rhenium(I), 99% (165612-19-1)
 $C_{21}H_{24}ClN_2O_3Re$; FW: 574.09; yellow solid

250mg
1g



Technical Note:

- This catalyst is used for the reduction of carbon dioxide.

References:

- J. Phys. Chem. A*, **2015**, 119, 959.
- Proceedings of the National Academy of Sciences of the United States of America*, **2014**, 111, 9745.
- Polyhedron*, **2013**, 58, 229
- Inorg. Chem.*, **2010**, 49, 9283

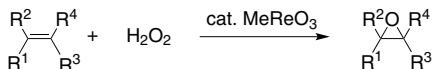
75-2375

Methyltrioxorhenium(VII), 98% (70197-13-6)
 CH_3ReO_3 ; FW: 249.23; colorless to pale-gray xtl.; m.p. 111°; b.p. subl.
 65°/0.001mm

250mg
1g
5g

Technical Note:

- Catalyst used with H_2O_2 for oxidation of a variety of substrates.
 - Alkenes
 - Secondary amines
 - Arenes
 - Silyl enol ethers/Silyl ketene acetals
 - Sulfides
 - Bayer-Villager-Type oxidation
 - Amine oxidation
 - Phenol oxidation

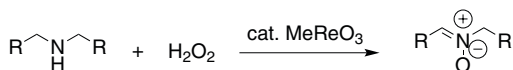


Tech. Note (1a)
Ref. (1-3)

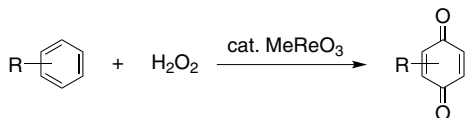
RHENIUM (Compounds)

75-2375 Methyltrioxorhenium(VII), 98% (70197-13-6)

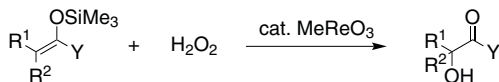
(continued)



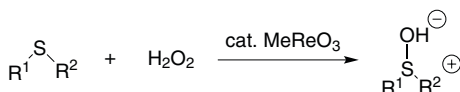
Tech. Note (1b)
Ref. (4-6)



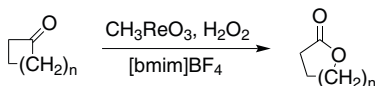
Tech. Note (1c)
Ref. (7)



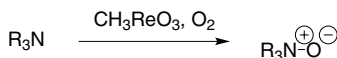
Tech. Note (1d)
Ref. (8,9)



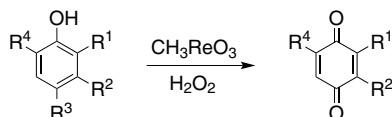
Tech. Note (1e)
Ref. (10)



Tech. Note (1f)
Ref. (11)



Tech. Note (1g)
Ref. (12)



Tech. Note (1h)
Ref. (13)

References:

1. *Tetrahedron Lett.*, **2002**, 43, 1001
2. *Tetrahedron Lett.*, **1999**, 40, 3991
3. *J. Org. Chem.*, **2000**, 65, 8651
4. *Tetrahedron Lett.*, **1996**, 37, 6025
5. *J. Org. Chem.*, **1996**, 61, 8099
6. *Bull. Soc. Chem. Jpn.*, **1997**, 70, 877
7. *Inorg. Chim. Acta*, **1998**, 270, 55
8. *J. Org. Chem.*, **1998**, 63, 4129
9. *J. Org. Chem.*, **2000**, 65, 5528
10. *Tetrahedron Lett.*, **1994**, 50, 13121
11. *Tetrahedron Lett.*, **2003**, 44, 8991
12. *Tetrahedron Lett.*, **2003**, 44, 3235.
13. *Tetrahedron*, **2002**, 58, 8493
14. *J. Organometallic Chem.*, **2004**, 689, 4149. (review)

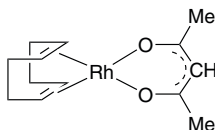
RHODIUM (Compounds)

45-0016 Acetylacetonatobis(cyclooctene)rhodium(I), min. 97% (34767-55-0)
Rh(C₈H₁₄)₂(C₅H₇O₂); FW: 422.41; yellow powdr.
air sensitive, (store cold)

100mg
500mg
2g

45-0010 Acetylacetonato(1,5-cyclooctadiene)rhodium(I), 98% (12245-39-5)
Rh(C₈H₁₂)(C₅H₇O₂); FW: 310.19; orange xtl.
air sensitive, (store cold)

100mg
500mg



RHENIUM (Compounds)

45-0109	Bis(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (35138-22-8) Rh(C ₈ H ₁₂) ₂ ⁺ BF ₄ ⁻ ; FW: 406.07; red-brown solid <i>air sensitive</i>	100mg 500mg 2g
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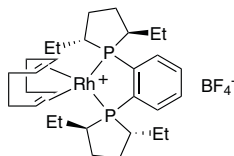
Technical Notes:

1. Convenient catalyst precursor, for example, with (R,R)QuinoxP* for asymmetric alkylations and hydrogenations.
2. Catalyst precursor with chiral biaryl bisphosphine ligands for [2+2+2] enantioenriched cycloadditions. (Ref. 2,3).

References:

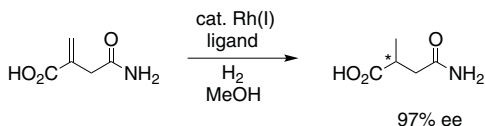
1. See 15-0126.
2. *Angew. Chem. Int. Ed.*, **2009**, *48*, 5470
3. *Tetrahedron*, **2009**, *65*, 5001

45-0148	(-)-1,2-Bis((2R,5R)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (R,R)-Et-DUPHOS-Rh (228121-39-9) Rh(C ₈ H ₁₂)(C ₂₂ H ₃₈ P ₂) ⁺ BF ₄ ⁻ ; FW: 660.37; red-orange xtl. <i>air sensitive</i> Note: (R,R)-Duphos and BPE Rhodium Catalysts Kit component.	100mg 500mg 2g
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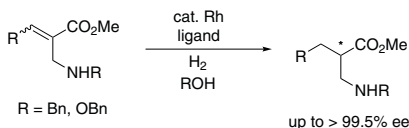


Technical Notes:

1. See 15-0097.
2. Ligand used in asymmetric hydrogenation of 2-methylenesuccinamic acid.
3. Ligand used for the Rh-catalyzed asymmetric hydrogenation of α -aminomethylacrylates.



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (2)

References:

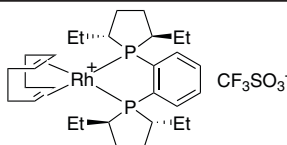
1. *Org. Process Res. Dev.*, **2003**, *7*, 407
2. *Proc. Natl. Acad. Sci.*, **2007**, *104*, 16787

45-0149	(+)-1,2-Bis((2S,5S)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (S,S)-Et-DUPHOS-Rh (213343-64-7) Rh(C ₈ H ₁₂)(C ₂₂ H ₃₈ P ₂) ⁺ BF ₄ ⁻ ; FW: 660.37; red-orange xtl. <i>air sensitive</i> Note: (S,S)-Duphos and BPE Rhodium Catalysts Kit component.	100mg 500mg 2g
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Technical Note:

1. See 45-0148 (page 188)

45-0150	(-)-1,2-Bis((2R,5R)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (R,R)-Et-DUPHOS-Rh (136705-77-6) Rh(C ₈ H ₁₂)(C ₂₂ H ₃₈ P ₂) ⁺ CF ₃ SO ₃ ⁻ ; FW: 722.63; orange xtl. <i>air sensitive, (store cold)</i> Note: (R,R)-Duphos and BPE Rhodium Catalysts Kit component.	100mg 500mg 2g
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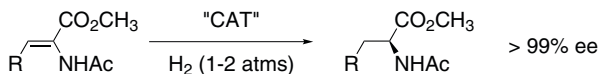
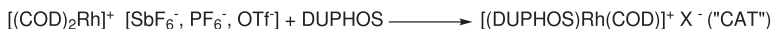


RHODIUM (Compounds)

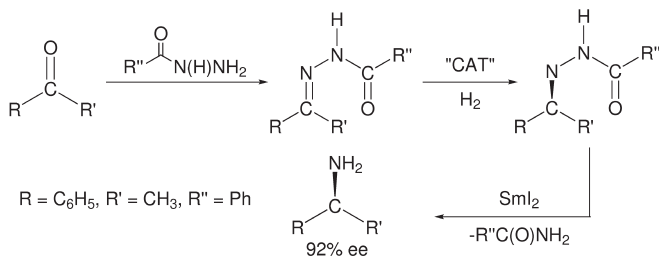
45-0150 (-)-1,2-Bis((2R,5R)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) (continued) trifluoromethanesulfonate, 98+% (R,R)-Et-DUPHOS-Rh (136705-77-6)

Technical Notes:

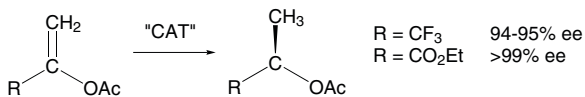
1. The DUPHOS family of catalysts is highly efficient for the asymmetric hydrogenation of various substituted acetamidoacrylates and enol acetates yielding products of high enantiomeric excesses. Efficient ligand for the asymmetric hydrogenation of tetrasubstituted enamides.
2. Forms superior catalysts for asymmetric reductive aminations.
3. Catalyst used for the asymmetric hydrogenation of enol phosphonates.
4. A novel enantioselective synthesis of β -amino alcohols and 1,2-diamines.
5. Ligand for the catalytic asymmetric [4+1] cycloaddition of vinylallenes with CO.
6. Ligand for the Rh-catalyzed asymmetric enyne cycloisomerization.
7. Catalytic enantioselective addition of dialkylzinc to N-Diphenylphosphinoylimines.
8. Palladium catalyzed asymmetric phosphination.



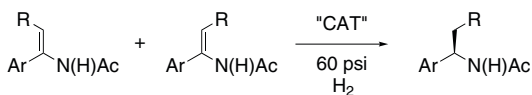
Tech. Note (1)
Ref. (1)



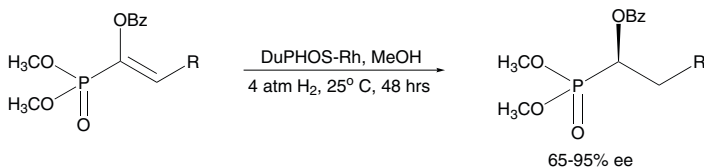
Tech. Note (2)
Ref. (2)



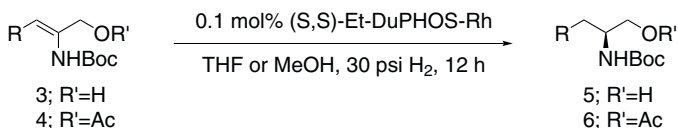
Tech. Note (1)
Ref. (3)



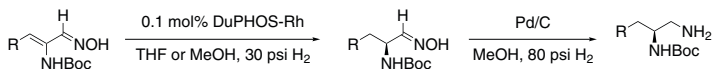
Tech. Note (1)
Ref. (4)



Tech. Note (3)
Ref. (7)



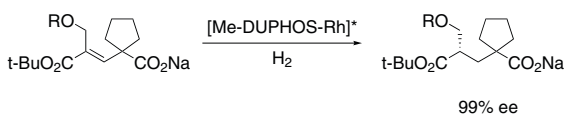
Tech. Note (4)
Ref. (8)



Tech. Note (4)
Ref. (8)

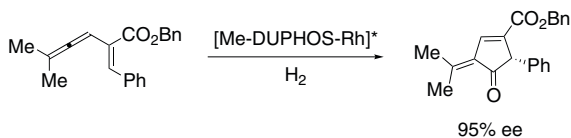
RHODIUM (Compounds)

45-0150 (-)-1,2-Bis((2*R*,5*R*)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (*R,R*)-Et-DUPHOS-Rh (136705-77-6)

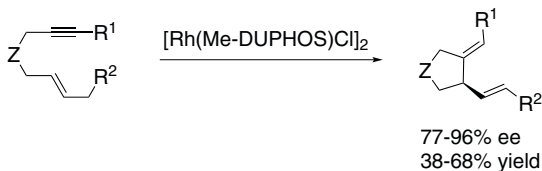


Intermediate in the synthesis of Cadoxatril

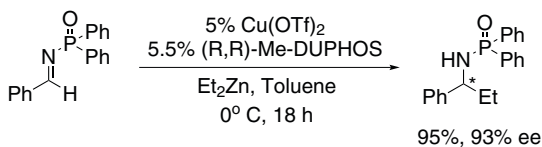
Tech. Note (1)
Ref. (9)



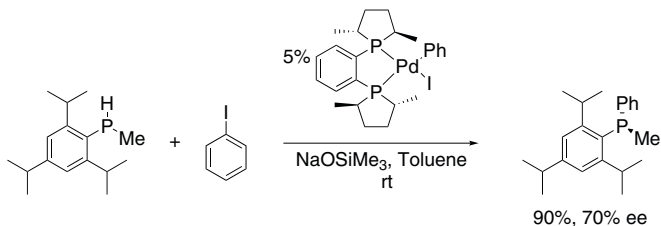
Tech. Note (5)
Ref. (10)



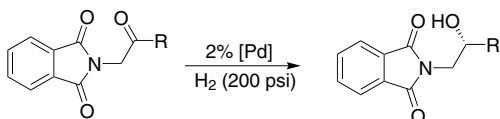
Tech. Note (6)
Ref. (11)



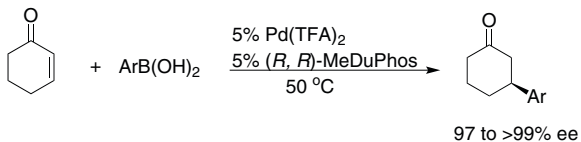
Tech. Note (7)
Ref. (13)



Tech. Note (8)
Ref. (14)



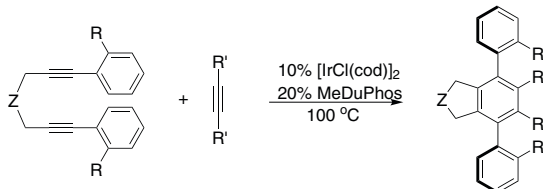
Tech. Note (8)
Ref. (15)



Tech. Note (8)
Ref. (16)

RHODIUM (Compounds)

45-0150 (-)-1,2-Bis((2R,5R)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I)
(continued) trifluoromethanesulfonate, 98+% (R,R)-Et-DUPHOS-Rh (136705-77-6)



Tech. Note (8)
Ref. (17)

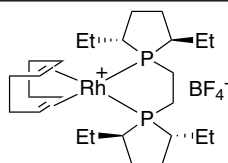
References:

1. *J. Am. Chem. Soc.*, **1993**, *115*, 10125
2. *J. Am. Chem. Soc.*, **1992**, *114*, 6266
3. *J. Am. Chem. Soc.*, **1991**, *113*, 8518
4. *J. Am. Chem. Soc.*, **1996**, *118*, 5142
5. *J. Am. Chem. Soc.*, **1995**, *117*, 9375
6. Burk, M.J., *Handbook of Chiral Chemicals*, Abel, Ager, D.J., Ed. (Marcel Dekker, Inc., New York, 1999) Ch 18, p. 339 (review article)
7. *Organic Lett.*, **1999**, *1*, 387
8. *Tetrahedron Lett.*, **1999**, *40*, 6685
9. *J. Org. Chem.*, **1999**, *64*, 3290
10. *J. Am. Chem. Soc.*, **1999**, *121*, 4130
11. *Angew. Chem. Int. Ed.*, **2000**, *39*, 4104
12. *Acc. Chem. Res.*, **2000**, *33*, 363, 372. (review)
13. *J. Am. Chem. Soc.*, **2003**, *125*, 1692
14. *J. Am. Chem. Soc.*, **2002**, *124*, 13356
15. *Org. Lett.*, **2005**, *7*, 3235
16. *Org. Lett.*, **2005**, *7*, 5309
17. *J. Am. Chem. Soc.*, **2004**, *126*, 8382

45-0151 (+)-1,2-Bis((2S,5S)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+%
(S,S)-Et-DUPHOS-Rh (142184-30-3)
Rh(C₈H₁₂)(C₂₂H₄₆P₂)·CF₃SO₃⁻; FW: 722.63; orange xtl.
air sensitive, (store cold)
Note: (S,S)-Duphos and BPE Rhodium Catalysts Kit component.

100mg
500mg
2g

45-3010 1,2-Bis((2R,5R)-2,5-diethylphospholano)ethane(cyclooctadiene)rhodium(I) tetrafluoroborate (136705-70-9)
C₂₆H₄₈BF₄P₂Rh; FW: 612.32; orange-red solid
air sensitive
Note: Sold under license from Kanata for research purposes only.

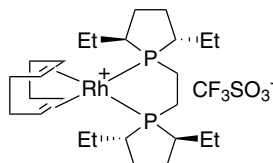


100mg
500mg

45-3011 1,2-Bis((2S,5S)-2,5-diethylphospholano)ethane(cyclooctadiene)rhodium(I) tetrafluoroborate
C₂₆H₄₈BF₄P₂Rh; FW: 612.32; orange-red solid
air sensitive
Note: Sold under license from Kanata for research purposes only.

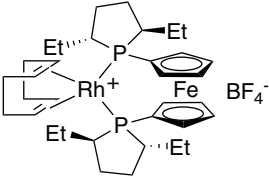
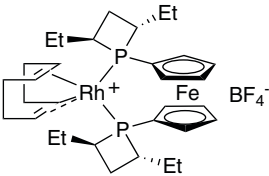
100mg
500mg

45-3016 1,2-Bis((2S,5S)-2,5-diethylphospholano)ethane(cyclooctadiene)rhodium(I) trifluoromethanesulfonate
C₂₇H₄₈F₃O₃P₂RhS; FW: 674.58; orange-red solid
air sensitive
Note: Sold under license from Kanata for research purposes only.



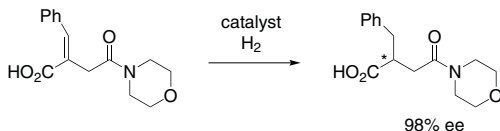
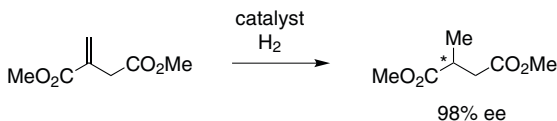
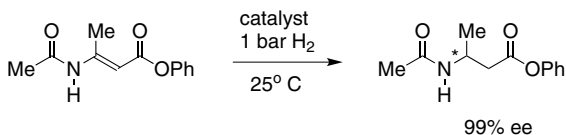
100mg
500mg

RHODIUM (Compounds)

45-3018	<p>1,1'-Bis((2R,5R)-2,5-diethylphospholano)ferrocene(cyclooctadiene)rhodium(I) tetrafluoroborate (162412-90-0) $C_{34}H_{52}BF_4FeP_2Rh$; FW: 768.28; orange-red solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only.</p>		100mg 500mg
45-3019	<p>1,1'-Bis((2S,5S)-2,5-diethylphospholano)ferrocene(cyclooctadiene)rhodium(I) tetrafluoroborate (290347-88-5) $C_{34}H_{52}BF_4FeP_2Rh$; FW: 768.28; orange-red solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only.</p>		100mg 500mg
45-0155	<p>(-)-1,1'-Bis((2S,4S)-2,4-diethylphosphotano)ferrocene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% $[(C_8H_4(C_7H_{14}P))_2Fe](C_8H_{12})Rh \cdot BF_4$; FW: 740.24; orange powder, m.p. 207° <i>air sensitive</i> Note: **Limited quantities available** Sold in collaboration with Chirotech for research purposes only. US Patent no. 5936109.</p>		100mg

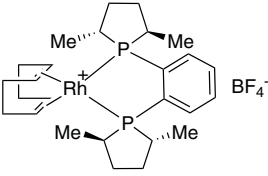
Technical Notes:

1. See 26-0201.
2. Effective catalyst for enantioselective hydrogenation of [E] - β-aminoacrylates.
3. Effective catalyst for asymmetric hydrogenation of α,β-unsaturated substrates.



References:

1. *Angew. Chem. Int. Ed.*, **2003**, 42, 913
2. *Angew. Chem. Int. Ed.*, **2000**, 39, 1981

45-0158	<p>(-)-1,2-Bis((2R,5R)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (R,R)-Me-DUPHOS-Rh (210057-23-1) $Rh(C_8H_{12})(C_{18}H_{28}P_2) \cdot BF_4$; FW: 604.26; red-orange xtl. <i>air sensitive</i> Note: (R,R)-Duphos and BPE Rhodium Catalysts Kit component.</p>		100mg 500mg 2g
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Technical Note:

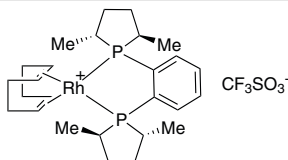
1. See 45-0150 (page 188)

RHODIUM (Compounds)

45-0159 (+)-1,2-Bis((2S,5S)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+%
(S,S)-Me-DUPHOS-Rh (205064-10-4)
 Rh(C₈H₁₂)(C₁₈H₂₈P₂)⁺BF₄⁻; FW: 604.26; red-orange xtl.
air sensitive
 Note: (S,S)-Duphos and BPE Rhodium Catalysts Kit component.

100mg
 500mg
 2g

45-0160 (-)-1,2-Bis((2R,5R)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+%
(R,R)-Me-DUPHOS-Rh (187682-63-9)
 Rh(C₈H₁₂)(C₁₈H₂₈P₂)⁺CF₃SO₃⁻; FW: 666.53;
 orange xtl.
air sensitive, (store cold)
 Note: (R,R)-Duphos and BPE Rhodium Catalysts Kit component.



100mg
 500mg
 2g

Technical Note:

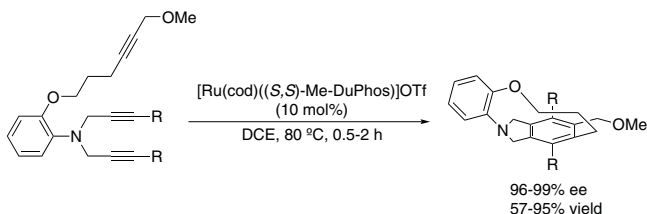
1. See 45-0150 (page 188)

45-0161 (+)-1,2-Bis((2S,5S)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I)trifluoromethanesulfonate, 98+% **(S,S)-Me-DUPHOS-Rh**
 (136705-75-4)
 Rh(C₈H₁₂)(C₁₈H₂₈P₂)⁺CF₃SO₃⁻; FW: 666.53; orange xtl.
air sensitive, (store cold)
 Note: (S,S)-Duphos and BPE Rhodium Catalysts Kit component.

100mg
 500mg
 2g

Technical Notes:

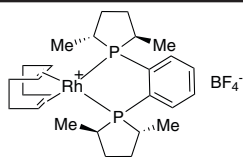
1. Catalyst for the enantioselective [2+2+2] cycloaddition of triynes.
2. See 15-0096.



References:

1. *Org. Lett.*, **2009**, *11*, 3906

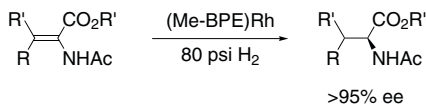
45-0168 (+)-1,2-Bis((2R,5R)-2,5-dimethylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% **(R,R)-Me-BPE-Rh**
 (305818-67-1)
 Rh(C₈H₁₂)(C₁₄H₂₈P₂)⁺BF₄⁻; FW: 556.21; red-orange xtl.
air sensitive
 Note: (R,R)-Duphos and BPE Rhodium Catalysts Kit component.



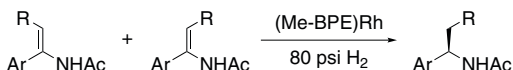
100mg
 500mg
 2g

Technical Note:

1. The DUPHOS family of catalysts is highly efficient for the asymmetric hydrogenation of various substituted acetamidoacrylates and enol acetates yielding products of high enantiomeric excesses. Efficient ligand for the asymmetric hydrogenation of tetrasubstituted enamides.¹



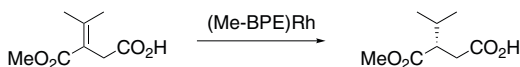
Ref. (1)



Ref. (2)

RHODIUM (Compounds)

45-0168 (+)-1,2-Bis((2R,5R)-2,5-dimethylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (R,R)-Me-BPE-Rh (305818-67-1)



Ref. (3)

References:

1. *J. Am. Chem. Soc.*, **1995**, *117*, 9375
2. *J. Am. Chem. Soc.*, **1996**, *118*, 5142
3. *Angew. Chem. Int. Ed.*, **1998**, *37*, 1931

45-0169 (-)-1,2-Bis((2S,5S)-2,5-dimethylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (S,S)-Me-BPE-Rh (213343-65-8)

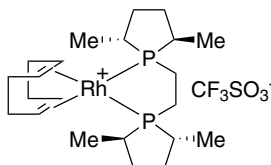
Rh(C₈H₁₂)(C₁₄H₂₈P₂)⁺BF₄⁻; FW: 556.21; red-orange xtl.
air sensitive

Note: (S,S)-Duphos and BPE Rhodium Catalyst Kit component.

100mg
500mg
2g

45-3032 1,2-Bis((2R,5R)-2,5-dimethylphospholano)ethane(cyclooctadiene)rhodium(I) trifluoromethanesulfonate (854275-87-9)
C₂₂H₄₀F₃O₃P₂RhS; FW: 618.48; orange-red solid
air sensitive

Note: Sold under license from Kanata for research purposes only.



100mg
500mg

45-3033 1,2-Bis((2S,5S)-2,5-dimethylphospholano)ethane(cyclooctadiene)rhodium(I) trifluoromethanesulfonate (854920-90-4)

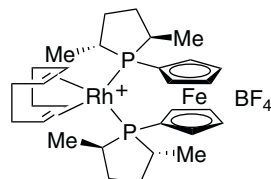
C₂₂H₄₀F₃O₃P₂RhS; FW: 618.48; orange-red solid
air sensitive

Note: Sold under license from Kanata for research purposes only.

100mg
500mg

45-3036 1,1'-Bis((2R,5R)-2,5-dimethylphospholano)ferrocene(cyclooctadiene)rhodium(I) tetrafluoroborate (854275-87-9)
C₃₀H₄₄BF₄FeP₂Rh; FW: 712.17; orange-red solid
air sensitive

Note: Sold under license from Kanata for research purposes only.

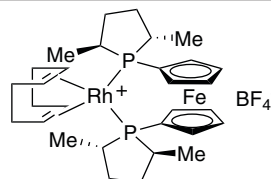


100mg
500mg

45-3037 1,1'-Bis((2S,5S)-2,5-dimethylphospholano)ferrocene(cyclooctadiene)rhodium(I) tetrafluoroborate (854920-90-4)

C₃₀H₄₄BF₄FeP₂Rh; FW: 712.17; orange-red solid
air sensitive

Note: Sold under license from Kanata for research purposes only.

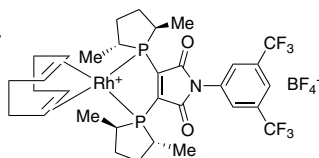


100mg
500mg

45-0766 (-)-2,3-Bis[(2R,5R)-2,5-dimethylphospholanyl]-1-[3,5-bis(trifluoromethyl)phenyl]-1H-pyrrole-2,5-dione(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% [catASium® MNXYI(F)Rh]

Rh(C₈H₁₂)(C₂₄H₂₇F₆NO₂P₂)⁺BF₄⁻; FW: 835.31; red to dark red solid
air sensitive

Note: Sold in collaboration with Solvias for research purposes only. Patent WO 03084971.



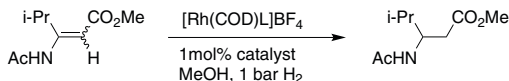
100mg

Technical Notes:

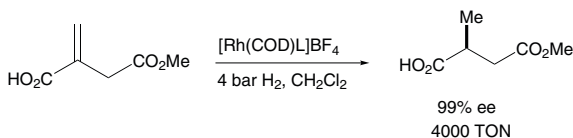
1. Highly enantioselective catalyst for the hydrogenation of E or Z β-acylamido acrylates under mild conditions and low pressure.
2. Highly enantioselective for the hydrogenation of itaconates at room temperature.

RHODIUM (Compounds)

45-0766 (-)-2,3-Bis[(2R,5R)-2,5-dimethylphospholanyl]-1-[3,5-bis(trifluoromethyl)phenyl]-1H-pyrrole-2,5-dione(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% [catASium® MNXYL(R)Rh]



Tech. Note (1)
Ref. (1)

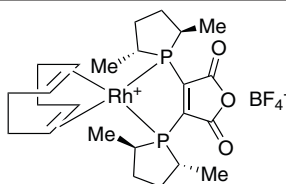


Tech. Note (2)
Ref. (2)

References:

1. *J. Org. Chem.*, **2003**, 68, 1701
2. *Adv. Synth. Catal.*, **2004**, 346, 1263

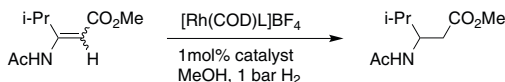
45-0750 (-)-4,5-Bis[(2R,5R)-2,5-dimethylphospholanyl](1,2-dimethyl-1,2-dihydropyridazine-3,6-dione)(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 95% [catASium® MNN(R)Rh] (908128-78-9) Rh(C₈H₁₂)(C₁₈H₃₀N₂O₂P₂)⁺BF₄⁻; FW: 666.28; orange-brown powdr. *air sensitive*
Note: Sold in collaboration with Solvias for research purposes only. Patent WO 03084971.



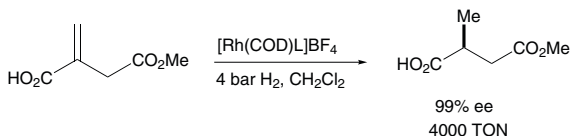
100mg

Technical Notes:

1. Highly enantioselective catalyst for the hydrogenation of E or Z β-acylamido acrylates under mild conditions and low pressure.
2. Highly enantioselective for the hydrogenation of itaconates at room temperature.



Tech. Note (1)
Ref. (1)

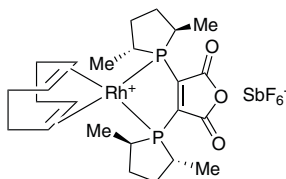


Tech. Note (2)
Ref. (2)

References:

1. *J. Org. Chem.*, **2003**, 68, 1701
2. *Adv. Synth. Catal.*, **2004**, 346, 1263

45-0754 (-)-2,3-Bis[(2R,5R)-2,5-dimethylphospholanyl] maleic anhydride(1,5-cyclooctadiene) rhodium(I) hexafluoroantimonate, min. 97% [catASium® M(R)RhSbF₆] Rh(C₈H₁₂)(C₁₆H₂₄O₃P₂)⁺SbF₆⁻; FW: 773.15; orange-brown powdr. *air sensitive*
Note: Sold in collaboration with Evonik for research purposes only. Patent WO 03084971.



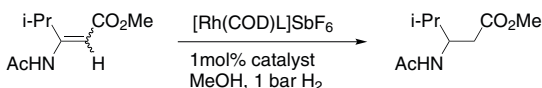
100mg
500mg

Technical Notes:

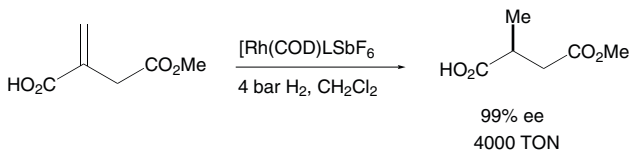
1. Highly enantioselective catalyst for the hydrogenation of E or Z β-acylamido acrylates under mild conditions and low pressure.
2. Highly enantioselective for the hydrogenation of itaconates at room temperature.

RHODIUM (Compounds)

45-0754 (-)-2,3-Bis[(2R,5R)-2,5-dimethylphospholanyl]maleic anhydride(1,5-cyclooctadiene) rhodium(I) hexafluoroantimonate, min. 97% [catASium® M(R)RhSbF₆]



Tech. Note (1)
Ref. (1)

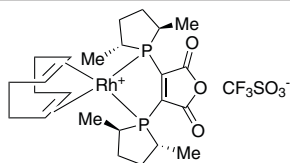


Tech. Note (2)
Ref. (2)

References:

1. *J. Org. Chem.*, **2003**, *68*, 1701
2. *Adv. Synth. Catal.*, **2004**, *346*, 1263

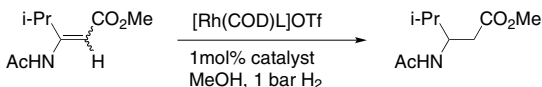
45-0758 (-)-2,3-Bis[(2R,5R)-2,5-dimethylphospholanyl]maleic anhydride(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, min. 97% [catASium® M(R)RhOTf] Rh(C₈H₁₂)(C₁₆H₂₄O₃P₂)⁺CF₃SO₃⁻; FW: 686.46; orange powdr. *air sensitive*
Note: Sold in collaboration with EVONIK for research purposes only.
Patent WO 03084971.



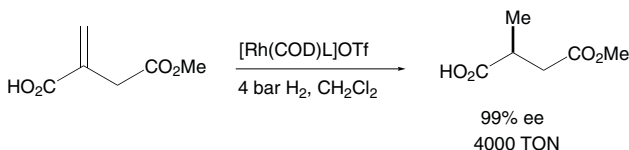
100mg

Technical Notes:

1. Highly enantioselective catalyst for the hydrogenation of E or Z β-acylamido acrylates under mild conditions and low pressure.
2. Highly enantioselective for the hydrogenation of itaconates at room temperature.



Tech. Note (1)
Ref. (1)

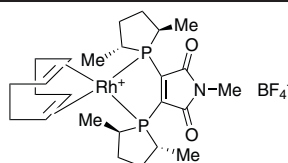


Tech. Note (2)
Ref. (2)

References:

1. *J. Org. Chem.*, **2003**, *68*, 1701
2. *Adv. Synth. Catal.*, **2004**, *346*, 1263

45-0176 (-)-2,3-Bis[(2R,5R)-2,5-dimethylphospholanyl]-1-methyl-1H-pyrrole-2,5-dione(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% [catASium® MN(R)Rh] Rh(C₈H₁₂)(C₁₇H₂₇NO₂P₂)⁺BF₄⁻; FW: 637.24; red-orange powdr. *air sensitive*
Note: Optical purity: 95% Sold in collaboration with Solvias for research purposes only.
Patent WO 03084971.



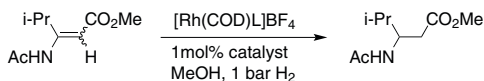
100mg

Technical Notes:

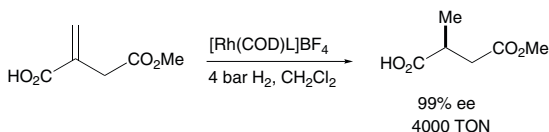
1. Highly enantioselective catalyst for the hydrogenation of E or Z β-acylamido acrylates under mild conditions and low pressure.
2. Highly enantioselective for the hydrogenation of itaconates at room temperature.

RHODIUM (Compounds)

45-0176 (-)-2,3-Bis[(2R,5R)-2,5-dimethylphospholanyl]-1-methyl-1H-pyrrole-2,5-dione(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% [catASium® MN(R)Rh]



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

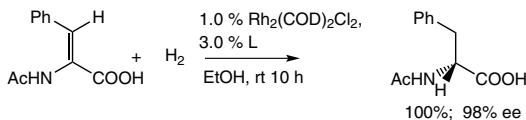
1. *J. Org. Chem.*, **2003**, *68*, 1701
2. *Adv. Synth. Catal.*, **2004**, *346*, 1263

45-0177 (+)-2,3-Bis[(2S,5S)-2,5-dimethylphospholanyl]-1-methyl-1H-pyrrole-2,5-dione(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% [catASium® MN(S)Rh] Rh(C₈H₁₂)(C₁₇H₂₇NO₂P₂)⁺BF₄⁻; FW: 637.24; red orange powdr. *air sensitive*
Note: Optical purity: 95% Sold in collaboration with EVONIK for research purposes only. Patent WO 03084971. 100mg

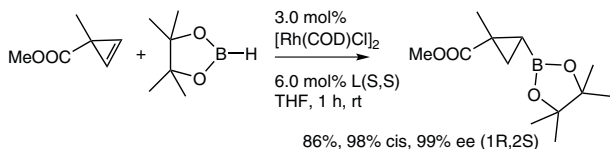
45-0184 (2R,3R)-(-)-2,3-Bis(diphenylphosphino)bicyclo[2.2.1]hept-5-ene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (R,R)-NORPHOS-Rh (521272-85-5) [Rh(C₈H₁₂)(C₃₁H₂₈P₂)⁺BF₄⁻]; FW: 760.39; red-orange powdr. *air sensitive* 100mg
500mg

Technical Notes:

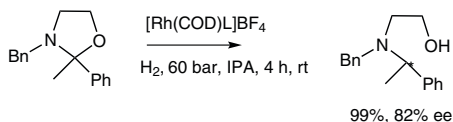
1. Ligand used in the enantioselective rhodium catalyzed hydrogenation of α-dehydroaminoesters and enamides.
2. Ligand used in the enantioselective rhodium catalyzed hydroboration of cyclopropenes.
3. Ligand used in the asymmetric rhodium catalyzed cleavage of racemic 1,3-oxazolidines.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

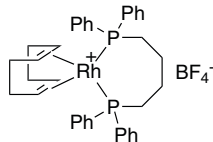
References:

1. *Angew. Chem.*, **1979**, *91*, 655
2. *J. Am. Chem. Soc.*, **2003**, *125*, 7198
3. *Adv. Synth. Catal.* **2003**, *345*, 239

RHODIUM (Compounds)

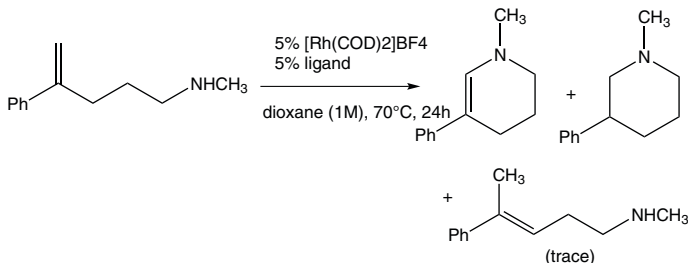
45-0185 (2*S*,3*S*)-(+)-2,3-Bis(diphenylphosphino)bicyclo[2.2.1]hept-5-ene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (S,S)-NORPHOS-Rh (78355-59-6) 100mg
 [Rh(C₈H₁₂)(C₃₁H₂₈P₂)]·BF₄⁻; FW: 760.39; red-orange powdr. 500mg
air sensitive
 Note: Manufactured under license of Takasago patent application
 PCT/JP2011/064490.

45-0190 1,4-Bis(diphenylphosphino)butane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, dichloromethane adduct, min. 98% (79255-71-3) 100mg
 [Rh(C₈H₁₂)(C₂₈H₂₈P₂)]·BF₄⁻·CH₂Cl₂; FW: 724.36 (809.29); orange powdr. 500mg
air sensitive

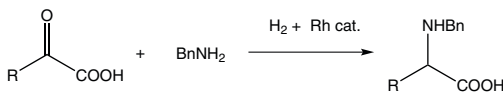


Technical Notes:

1. Catalyst used in the intramolecular, hydroamination of olefins.
2. Catalyst used for reductive aminations.



Tech. Note (1)
 Ref. (1)

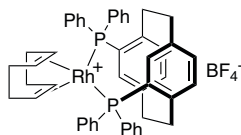


Tech. Note (2)
 Ref. (2)

References:

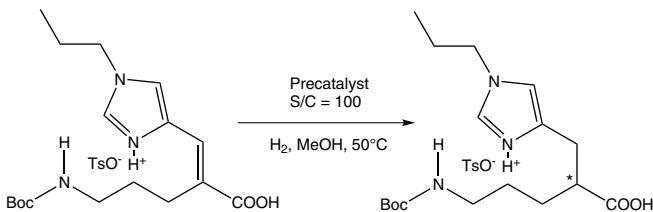
1. *J. Am. Chem. Soc.*, **2006**, *128*, 6042
2. *J. Org. Chem.*, **2003**, *68*, 4067

45-0217 (R)-(-)-4,12-Bis(diphenylphosphino)[2.2]paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (849950-56-7) 100mg
 C₄₈H₄₆BF₄P₂Rh; FW: 874.54; yellow-orange solid 500mg
air sensitive
 Note: Sold in collaboration with JM for research purposes only.



Technical Note:

1. Catalyst use in the asymmetric synthesis of an imidazole-substituted delta-amino acid.



Tech. Note (1)
 Ref. (1)

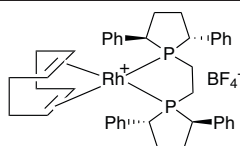
References:

1. *Org. Lett.*, **2005**, *7*, 1931.

45-0218 (S)-(+)-4,12-Bis(diphenylphosphino)[2.2]paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (200808-73-7) 100mg
 C₄₈H₄₆BF₄P₂Rh; FW: 874.54 500mg
air sensitive
 Note: Sold in collaboration with JM for research purposes only.

RHODIUM (Compounds)

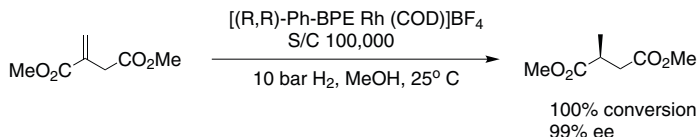
45-0201 (-)-1,2-Bis((2R,5R)-2,5-diphenylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (R,R)-Ph-BPE-Rh (528565-84-6)
 $[\text{Rh}(\text{C}_8\text{H}_{12})(\text{C}_{34}\text{H}_{36}\text{P}_2)]^+\text{BF}_4^-$; FW: 804.49; orange xtl.
air sensitive
 Note: (R,R)-Duphos and BPE Rhodium Catalysts Kit component.



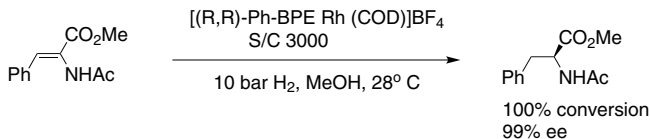
100mg
 500mg
 2g

Technical Notes:

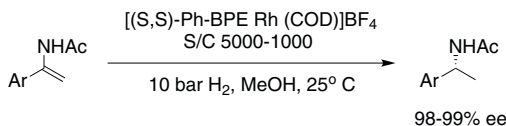
1. Phenyl-BPE exhibits enhanced activity and selectivity over existing members of the BPE ligand family in rhodium catalyzed asymmetric hydrogenation.
2. This ligand is highly efficient for the hydrogenation of N-acyl aryl-enamides.
3. Molar substrate/catalyst ratios of up to 100,000/1 are achieved with excellent reactivity and enantioselectivity using commercial grade substrates and solvents.
4. Ligand in the rhodium-catalyzed asymmetric hydroformylation of olefins.



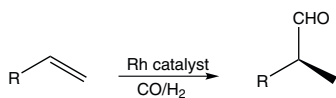
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (2)



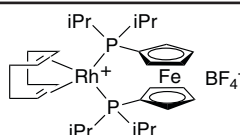
Tech. Note (4)
Ref. (3)

References:

1. *Org. Lett.*, **2003**, 5, 1273
2. *Tetrahedron Lett.*, **2004**, 45, 9277
3. *Angew. Chem. Int. Ed.*, **2005**, 44, 5834

45-0202 (+)-1,2-Bis((2S,5S)-2,5-diphenylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (S,S)-Ph-BPE-Rh (849950-53-4)
 $[\text{Rh}(\text{C}_8\text{H}_{12})(\text{C}_{34}\text{H}_{36}\text{P}_2)]^+\text{BF}_4^-$; FW: 804.49; orange xtl.
air sensitive
 Note: (S,S)-Duphos and BPE Rhodium Catalysts Kit component.

45-0205 1,1'-Bis(di-i-propylphosphino)ferrocene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (157772-65-1)
 $[[(\text{C}_7\text{H}_7)_2\text{PC}_6\text{H}_4\text{Fe}](\text{C}_8\text{H}_{12})\text{Rh}]\text{BF}_4^-$; FW: 716.22;
 orange-brown powdr.
air sensitive



250mg
 1g

Technical Note:

1. Highly efficient catalyst for the hydrogenation of aldehydes and ketones. This hydrogenation catalyst represents a versatile replacement of hydride-based reducing agents.

References:

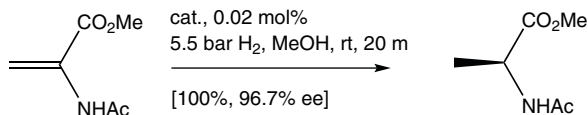
1. *Tetrahedron Lett.*, **1994**, 35, 4963

RHODIUM (Compounds)

45-0210	<p>(+)-1,2-Bis((2R,5R)-2,5-di-i-propylphospholano)benzene)1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (R,R)-i-Pr-DUPHOS-Rh (569650-64-2) $[\text{Rh}(\text{C}_8\text{H}_{12})(\text{C}_{26}\text{H}_{44}\text{P}_2)]^+\text{BF}_4^-$; FW: 716.47; red-orange xtl. <i>air sensitive</i> Note: Manufactured under US Patent 5,021,131 and US Patent 5,171,892. (R,R)-Duphos and BPE Rhodium Catalysts Kit component.</p>		<p>100mg 500mg 2g</p>
45-0211	<p>(-)-1,2-Bis((2S,5S)-2,5-di-i-propylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (S,S)-i-Pr-DUPHOS-Rh (569650-64-2) $[\text{Rh}(\text{C}_8\text{H}_{12})(\text{C}_{26}\text{H}_{44}\text{P}_2)]^+\text{BF}_4^-$; FW: 716.47; red-orange xtl. <i>air sensitive</i> Note: Manufactured under US Patent 5,021,131 and US Patent 5,171,892. (S,S)-Duphos and BPE Rhodium Catalysts Kit component.</p>		<p>100mg 500mg 2g</p>
45-3021	<p>1,2-Bis((2R,5R)-2,5-di-i-propylphospholano)ethane(cyclooctadiene)rhodium(I) tetrafluoroborate (136705-72-1) $\text{C}_{30}\text{H}_{56}\text{BF}_4\text{P}_2\text{Rh}$; FW: 668.42; orange-red solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only.</p>		<p>100mg 500mg</p>
45-3022	<p>1,2-Bis((2S,5S)-2,5-di-i-propylphospholano)ethane(cyclooctadiene)rhodium(I) tetrafluoroborate (213343-67-0) $\text{C}_{30}\text{H}_{56}\text{BF}_4\text{P}_2\text{Rh}$; FW: 668.42; orange-red solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only.</p>		<p>100mg 500mg</p>
45-0328	<p>1,1'-Bis((2R,5R)-2,5-di-i-propylphospholano)ferrocene(cyclooctadiene)rhodium(I) tetrafluoroborate (849773-96-2) $\text{C}_{38}\text{H}_{60}\text{BF}_4\text{FeP}_2\text{Rh}$; FW: 824.39; orange-red solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only.</p>		<p>100mg 500mg</p>
45-3029	<p>1,1'-Bis((2S,5S)-2,5-di-i-propylphospholano)ferrocene(cyclooctadiene)rhodium(I) tetrafluoroborate (854920-94-8) $\text{C}_{38}\text{H}_{60}\text{BF}_4\text{FeP}_2\text{Rh}$; FW: 824.39; orange-red solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only.</p>		<p>100mg 500mg</p>
45-0213	<p>(R)-(-)-4,12-Bis(di-3,5-xylylphosphino)[2.2]paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (619334-93-9) $[\text{C}_{96}\text{H}_{62}\text{P}_2\text{Rh}]^+\text{BF}_4^-$; FW: 986.75; yellow-orange xtl. <i>air sensitive</i> Note: Sold in collaboration with Johnson Matthey for research purposes only. Patent WO 2006/067412, US5874629.</p>		<p>100mg</p>

Technical Note:

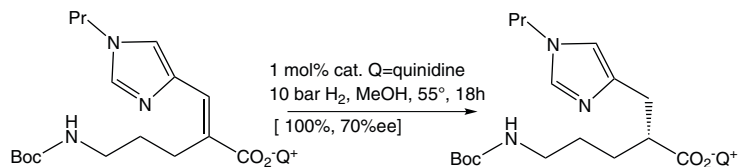
- Catalyst for the enantioselective hydrogenation of unsaturated amino acid derivatives.



Tech. Note (1)
Ref. (2)

RHODIUM (Compounds)

45-0213 (continued) (R)-(-)-4,12-Bis(di-3,5-xylylphosphino)[2.2]paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (619334-93-9)



Tech. Note (1)
Ref. (2)

References:

1. *Org. Lett.*, **2004**, 6, 1927
2. *Org. Lett.*, **2005**, 7, 1931

45-0214 (S)-(+)-4,12-Bis(di-3,5-xylylphosphino)[2.2]paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (1174218-30-4) 100mg

$C_{56}H_{62}P_2Rh$; BF_4^- ; FW: 986.75; yellow-orange xtl.

air sensitive

Note: Sold in collaboration with Johnson Matthey for research purposes only.

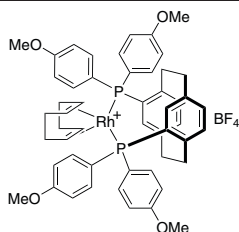
Patent WO 2006/067412, US5874629.

45-0255 (R)-4,12-Bis(4-methoxyphenyl)-[2.2]-paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (1038932-67-0) 100mg
500mg

$C_{52}H_{54}BF_4O_4P_2Rh$; FW: 994.64

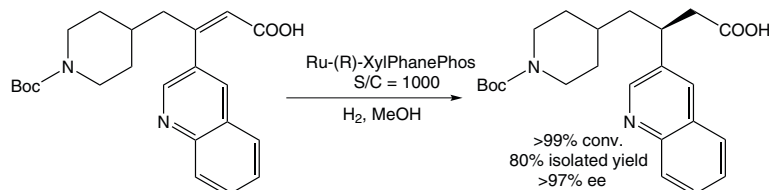
air sensitive

Note: Sold in collaboration with JM for research purposes only.



Technical Note:

1. Catalyst use in the efficient, enantioselective synthesis of β,β -disubstituted carboxylic acids.



Tech. Note (1)
Ref. (1)

References:

1. *Tetrahedron Lett.*, **2008**, 49, 5328.

45-0256 (S)-4,12-Bis(4-methoxyphenyl)-[2.2]-paracyclophane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% 100mg
500mg

$C_{52}H_{54}BF_4O_4P_2Rh$; FW: 994.64

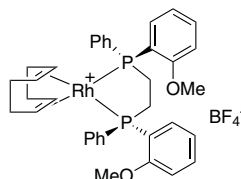
air sensitive

Note: Sold in collaboration with JM for research purposes only.

45-0225 (R,R)-(-)-1,2-Bis[(o-methoxyphenyl)(phenyl)phosphino]ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 95% (56977-92-5) 100mg
500mg

$[(C_{28}H_{28}O_2P_2)(C_8H_{12}Rh)]^+BF_4^-$; FW: 756.38; orange powdr.

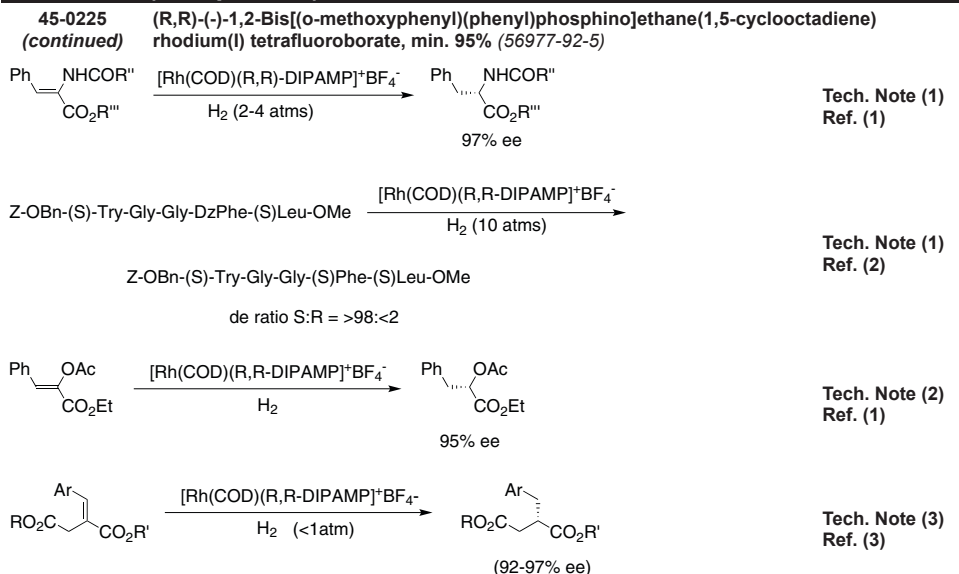
air sensitive



Technical Notes:

1. Highly reactive enantioselective catalyst for the asymmetric hydrogenation of various substituted dehydroalanines to N-protected aminoacids. Also, catalyst is very effective in the asymmetric reduction of pentapeptides that contain unsaturated Phe or Tyr linkages to enkephalin, a brain peptide hormone.
2. Efficient catalyst for the asymmetric reduction of enol acetates to esters.
3. Catalyst used to prepare chiral 2-substituted succinic acid derivatives.

RHODIUM (Compounds)



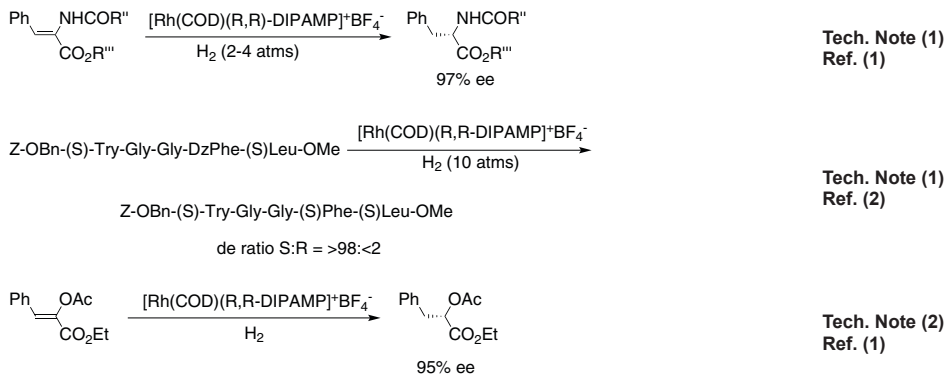
References:

1. J.D. Morrison, Ed., *Asymmetric Synthesis* (Academic Press, New York, 1985), Vol. 5, 71.
2. *Tetrahedron: Asymmetry*, **1992**, 3, 1247
3. J.R. Kosak and T.A. Johnson, Eds., *Chem Ind.* (Marcel Dekker, Inc., New York, 1994), Vol. 53, 81.

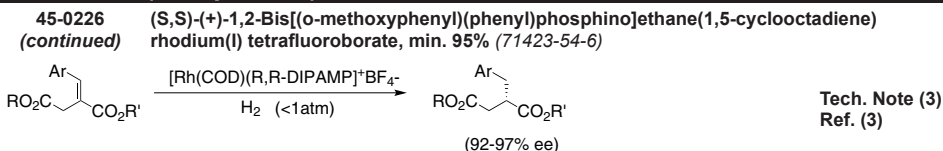
45-0226 (S,S)-(+)-1,2-Bis[(o-methoxyphenyl)(phenyl)phosphino]ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 95% (71423-54-6) 100mg
500mg
[Rh(C₈H₁₂)(C₂₈H₂₈O₂P₂)]⁺BF₄⁻; FW: 756.38; orange pwdr.
air sensitive

Technical Notes:

1. Highly reactive enantioselective catalyst for the asymmetric hydrogenation of various substituted dehydroalanines to N-protected aminoacids. Also, catalyst is very effective in the asymmetric reduction of pentapeptides that contain unsaturated Phe or Tyr linkages to enkephalin, a brain peptide hormone.
2. Efficient catalyst for the asymmetric reduction of enol acetates to esters.
3. Catalyst used to prepare chiral 2-substituted succinic acid derivatives.



RHODIUM (Compounds)



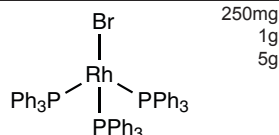
References:

1. J.D. Morrison, Ed., *Asymmetric Synthesis* (Academic Press, New York,1985), Vol.5, 71.
2. *Tetrahedron: Asymmetry*, **1992**, 3, 1247
3. J.R. Kosak and T.A. Johnson, Eds., *Chem Ind.* (Marcel Dekker, Inc., New York, 1994), Vol.53, 81.

45-0655 Bromotris(triphenylphosphine)rhodium(I), 99% (99.9%-Rh)

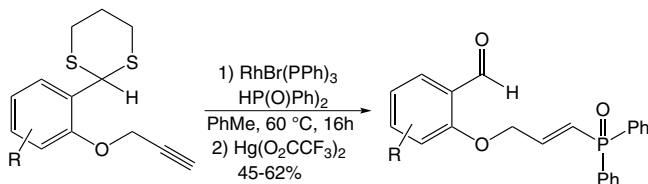
NEW

(14973-89-8)
C₅₄H₄₅BrP₃Rh; FW: 969.67

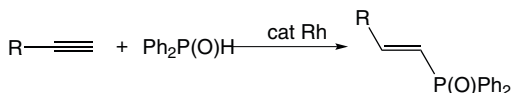


Technical Notes:

1. Rhodium-catalyzed regio- and stereoselective addition of diphenylphosphine oxide to alkynes.
2. Rhodium- catalyzed hydrophosphinylation.



Tech. Note (1)
Ref. (1)



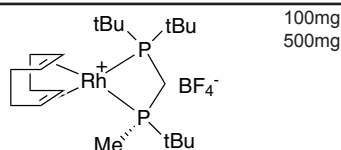
Tech. Note (2)
Ref. (2)

References:

1. *Org. Lett.*, **2008**, 10, 3141
2. *J. Org. Chem.*, **2001**, 66, 5929

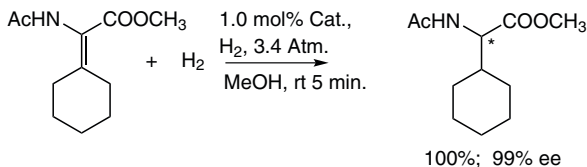
45-0667 (R)-(-)-t-Butylmethyl(di-t-butylphosphinomethyl) phosphino(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (R)-TCFP-Rh (705945-70-6)

Rh(C₈H₁₂)(C₁₄H₃₂P₂)⁺BF₄⁻; FW: 560.24;
yellow to orange powdr.
air sensitive



Technical Note:

1. Catalyst for highly enantioselective, rapid, hydrogenation of α and β-acetamido dehydroaminoacids and related enamides and unsaturated acids.



Tech. Note (1)
Ref. (1,2,3)

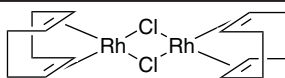
References:

1. *J. Am. Chem. Soc.*, **2004**, 126, 5966
2. *Org. Lett.*, **2004**, 6, 3645
3. *J. Am. Chem. Soc.*, **2008**, 130, 2560

RHODIUM (Compounds)

96-7650 CATHY™ Catalyst Kit for Asymmetric Transfer Hydrogenation of Ketones and Imines
See page 332

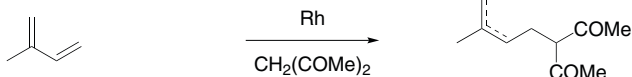
45-0380 Chloro(1,5-cyclooctadiene)rhodium(I) dimer, 98%
(12092-47-6)
[RhCl(1,5-C₈H₁₂)₂]₂; FW: 493.08;
yellow to orange xtl.
hygroscopic



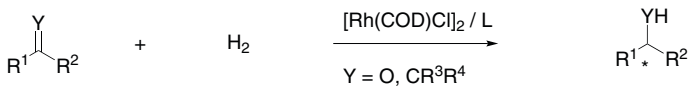
250mg
1g
5g

Technical Notes:

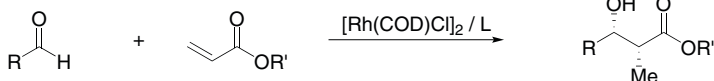
1. Catalyst for coupling 1,3-dienes with activate methylene compounds.
2. Rhodium source for various asymmetric hydrogenation systems and asymmetric hydrosilylation of ketones.
3. Rhodium source for asymmetric reductive aldol reaction.
4. Cis-hydroboration of terminal alkynes.
5. Rhodium source for [5 + 2] additions.
6. Highly enantioselective for [2+2+2] carbocyclization reactions.
7. Enantioselective hydroboration of cyclopropenes.
8. Ring opening reactions of oxabicyclic alkenes.
9. Aqueous Pauson-Khand type reactions.
10. Rh-catalyzed tandem vinylcyclopropanation of strained alkenes.
11. Rh-catalyzed silylation of cyanides.
12. Rh-catalyzed cycloisomerization: formation of indoles, benzofurans, and lactones.
13. Rh-catalyzed decarbonylation of aldehydes.
14. Rh-catalyzed C-H functionalization.
15. Rh-catalyzed cross-coupling of organoboron compounds with vinyl acetate.
16. Rh-catalyzed addition of borates to Baylis-Hillman adducts.



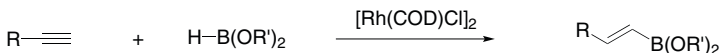
Tech. Note (1)
Ref. (1)



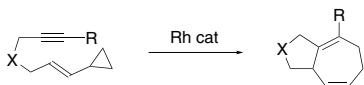
Tech. Note (2)
Ref. (2)



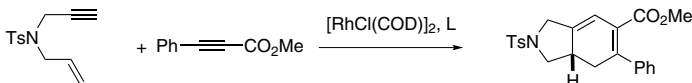
Tech. Note (3)
Ref. (3)



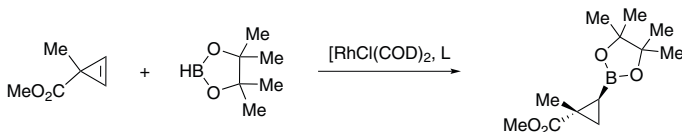
Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (7)



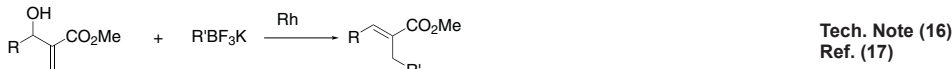
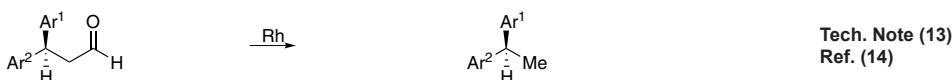
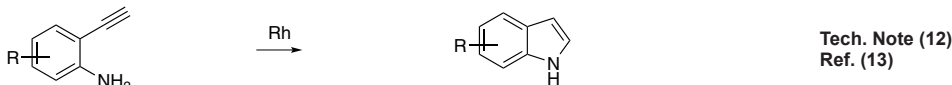
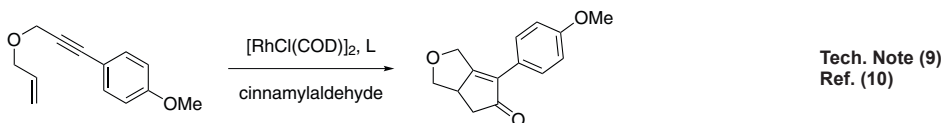
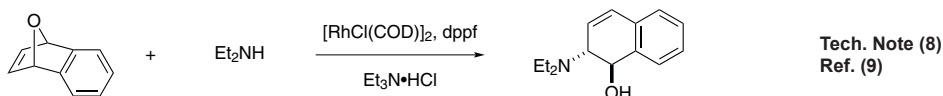
Tech. Note (7)
Ref. (8)

RHODIUM (Compounds)

45-0380

Chloro(1,5-cyclooctadiene)rhodium(I) dimer, 98% (12092-47-6)

(continued)

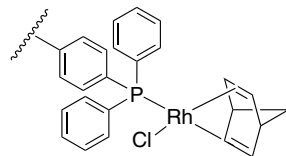


References:

1. *Pure Appl. Chem.*, **1994**, 66, 1509
2. *Catalytic Asymmetric Synthesis*, **2000**, Ch. 1, 2
3. *J. Am. Chem. Soc.*, **2000**, 122, 4528
4. *J. Am. Chem. Soc.*, **2000**, 122, 4990
5. *Angew. Chem. Int. Ed.*, **2002**, 41, 4550
6. *Angew. Chem. Int. Ed.*, **2002**, 41, 3892
7. *J. Am. Chem. Soc.*, **2005**, 127, 12466
8. *J. Am. Chem. Soc.*, **2003**, 125, 7198
9. *J. Am. Chem. Soc.*, **2003**, 125, 14887
10. *Chem. Eur. J.*, **2005**, 11, 3872
11. *J. Am. Chem. Soc.*, **2006**, 128, 5338
12. *J. Am. Chem. Soc.*, **2006**, 128, 8152
13. *Angew. Chem. Int. Ed.*, **2007**, 46, 2074
14. *Angew. Chem. Int. Ed.*, **2007**, 46, 9331
15. *J. Am. Chem. Soc.*, **2008**, 130, 8136
16. *Angew. Chem. Int. Ed.*, **2009**, 48, 7217
17. *Adv. Synth. Catal.*, **2006**, 348, 317

RHODIUM (Compounds)

45-1700 Chloronorbornadienetriphenylphosphinerhodium(I) (~5% Rh) polymer-bound FibreCat™
 yellow, fibrous solid
air sensitive
 Note: Limited quantities available.

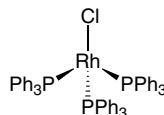


5g

Technical Note:

1. Versatile polymer-bound catalyst used for the selective hydrogenation of polyolefins. The supported rhodium catalyst exhibits similar selectivity to its homogeneous counterpart. In most cases, rhodium leaching is negligible.

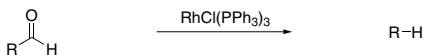
45-0650 Chlorotris(triphenylphosphine)rhodium(I), 99% WILKINSON'S CATALYST (14694-95-2)
 $\text{RhCl}(\text{P}(\text{C}_6\text{H}_5)_3)_3$; FW: 925.23; maroon xtl.



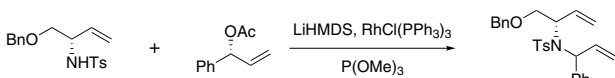
250mg
 1g
 5g

Technical Notes:

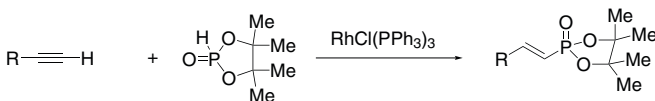
1. A homogeneous hydrogenation catalyst which operates under mild conditions.
2. Catalyst for the decarbonylation of aldehydes.
3. Catalyst for regio- and stereoselective allylic substitution reactions.
4. Alkyne hydro-phosphorylation
5. Heck-type reaction with α,β -unsaturated esters.
6. Rh(I)-catalyzed ortho-alkenylation of aromatic ketimines with alkynes
7. Allylic alcohol-olefin coupling.
8. Terminal alkenes from ketones.
9. Rh-catalyzed isomerization of α -aryl propargyl alcohols to indanones.
10. Reductive deprotection of silyl groups.
11. Intramolecular carbo-acylation reaction.
12. Rearrangement of 3-iminocyclopropenes.
13. Reductive α -acylation of enones to form 1,3-diketones.
14. Rh-catalyzed C-H activation/cycloisomerization.
15. Rh-catalyzed [2+2+2] cycloaddition.
16. Cross-coupling of alcohols at β -position with aldehydes.



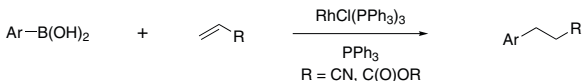
Tech. Note (2)
 Ref. (2)



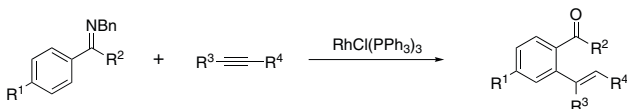
Tech. Note (3)
 Ref. (4)



Tech. Note (4)
 Ref. (5)



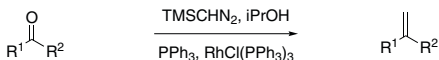
Tech. Note (5)
 Ref. (6)



Tech. Note (6)
 Ref. (7)



Tech. Note (7)
 Ref. (8)



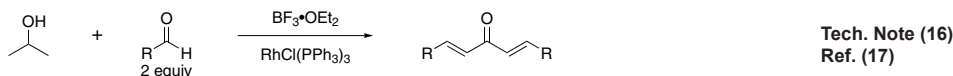
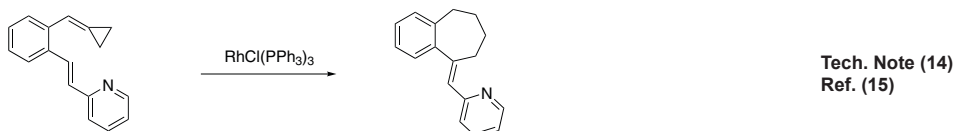
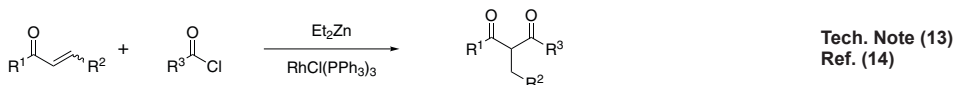
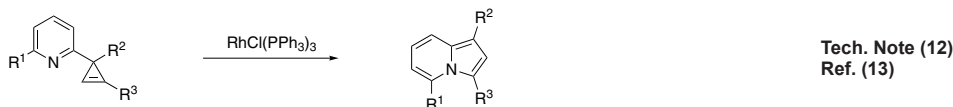
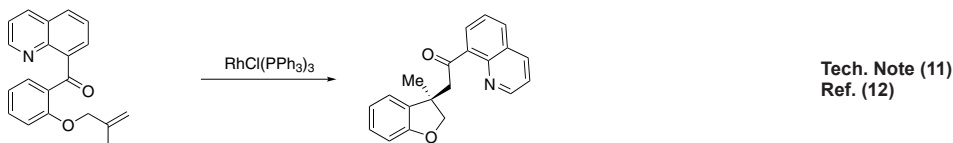
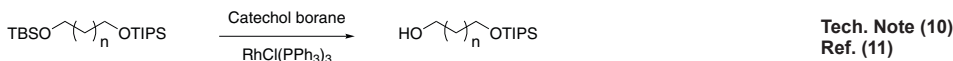
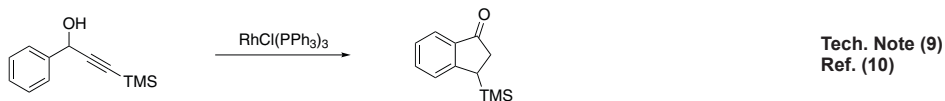
Tech. Note (8)
 Ref. (9)

RHODIUM (Compounds)

45-0650

Chlorotris(triphenylphosphine)rhodium(I), 99% WILKINSON'S CATALYST (14694-95-2)

(continued)

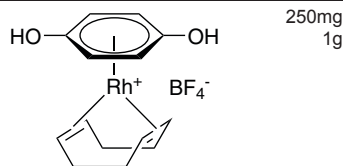


References:

1. *Progress Inorg. Chem.*, **1984**, 28
2. *J. Org. Chem.*, **1992**, 57, 5075
3. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol. 2, 1253
4. *Org. Lett.*, **1999**, 1, 1929
5. *Angew. Chem. Int. Ed.*, **2001**, 40, 1929
6. *Chem. Commun.*, **2003**, 2438
7. *Org. Lett.*, **2003**, 5, 2759
8. *J. Org. Chem.*, **2002**, 67, 3945
9. *Org. Lett.*, **2004**, 6, 3047
10. *J. Am. Chem. Soc.*, **2005**, 127, 2872
11. *Tetrahedron Lett.*, **2007**, 48, 5289
12. *J. Am. Chem. Soc.*, **2009**, 131, 412
13. *Org. Lett.*, **2007**, 9, 4463
14. *Org. Lett.*, **2008**, 10, 2405
15. *J. Am. Chem. Soc.*, **2007**, 129, 14836
16. *Org. Lett.*, **2007**, 9, 3695
17. *Tetrahedron. Lett.*, **2009**, 50, 4178

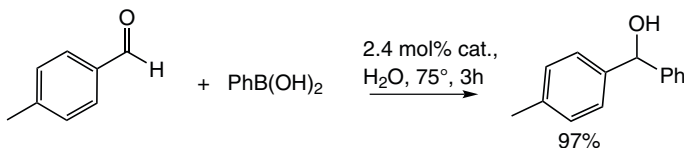
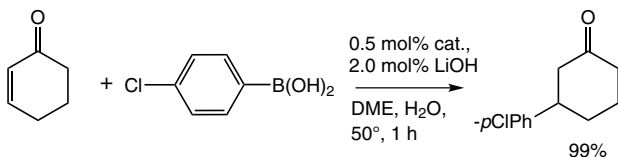
RHODIUM (Compounds)

45-0652 **1,5-Cyclooctadiene(hydroquinone)rhodium(I) tetrafluoroborate** (120967-70-6)
 [Rh(C₈H₁₂)(C₆H₆O₂)]⁺BF₄⁻; FW: 408.00; yellow powdr.
 Note: Sold in collaboration with Brown University for research purposes only. Commercial use requires a license. US Patent Application 11/454,760.



Technical Notes:

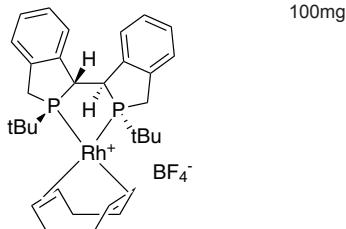
1. A phosphorous free pre-catalyst for the efficient 1,4-conjugate addition of arylboronic acids to enones.
2. A pre-catalyst for addition of arylboronic acids to aryl aldehydes.
3. With aluminum isopropoxide forms a self-supported heterogeneous catalyst for the stereoselective polymerization of phenylacetylene to cis-poly(phenylacetylene). (Ref. 3)



References:

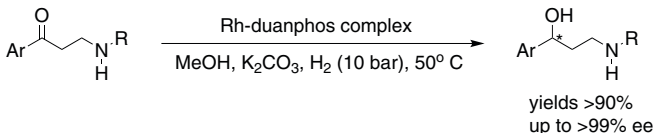
1. *Organometallics*, **2006**, 25, 3548
2. *J. Am. Chem. Soc.*, **2005**, 127, 12238
3. *J. Am. Chem. Soc.*, **2006**, 128, 8740

45-0663 **(1R,1'R,2S,2'S)-(+)-2,2'-Di-t-butyl-2,3,2',3'-tetrahydro-1,1'-bi-1H-isophosphindole(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (R,R,S,S)-DUANPHOS-Rh**
 [Rh(C₈H₁₂)(C₂₄H₃₂P₂)]⁺BF₄⁻; FW: 680.35; orange xtl.
air sensitive
 Note: Sold in collaboration with Chiral Quest for research purposes only. US Patent No. 7105702, 7153809, 7169953. Chiral Quest Catalyst and Ligand Toolbox Kit component.



Technical Note:

1. As a highly electron-donating and conformationally rigid ligand, the rhodium complex of DuanPhos has exhibited remarkably high enantioselectivities and reactivities for the hydrogenation of a variety of functionalized olefins.

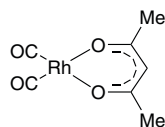


References:

1. *Angew. Chem. Int. Ed.*, **2005**, 44, 1687

RHODIUM (Compounds)

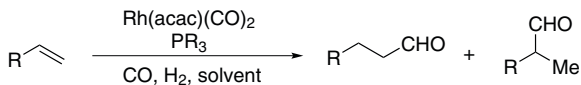
45-0700 Dicarbonylacetylacetonato rhodium(I), 99%
(14874-82-9)
Rh(CO)₂(C₅H₇O₂); FW: 258.04; greenish-red xtl.;
m.p. 144-147° subl.



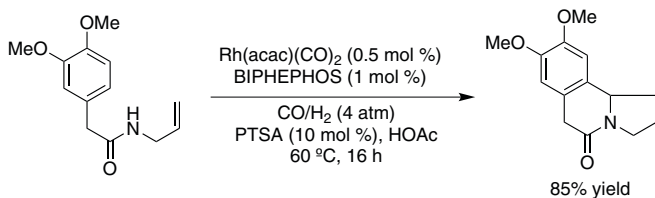
250mg
1g
5g

Technical Notes:

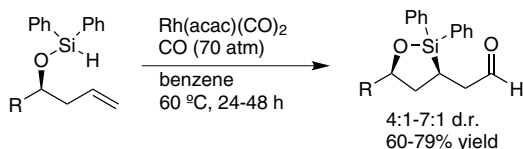
1. Precatalyst for hydroformylation of olefins.
2. Precatalyst for silylformylation of olefins.
3. Precatalyst for carbonylative silylcarbo-cyclization in the syntheses of isodomoic acids.
4. Precatalyst for the conjugate addition of aryl- and alkenylboronic acids to enones.



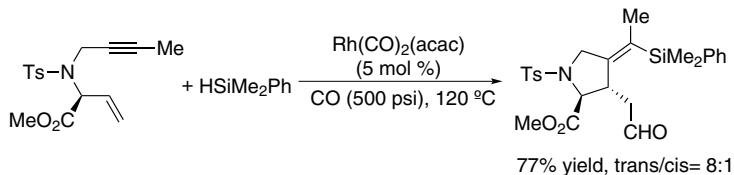
Tech. Note (1)
Ref. (1)



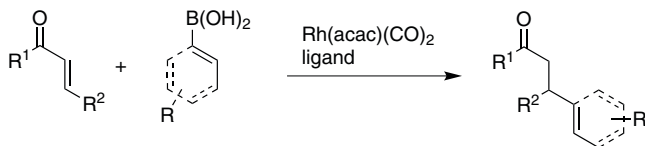
Tech. Note (1)
Ref. (2)



Tech. Note (2)
Ref. (3)



Tech. Note (3)
Ref. (4)



Tech. Note (4)
Ref. (5,6)

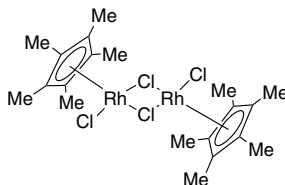
References:

1. *Synthesis*, **2001**, 1
2. *Org. Lett.*, **2009**, *11*, 2659
3. *J. Am. Chem. Soc.*, **1997**, *119*, 12416
4. *J. Am. Chem. Soc.*, **2009**, *131*, 14188
5. *Organometallics*, **1997**, *16*, 4229
6. *Org. Lett.*, **2009**, *11*, 971

RHODIUM (Compounds)

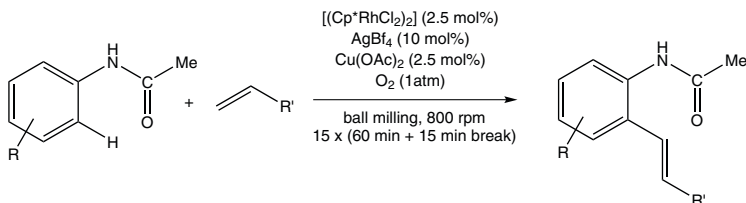
45-0195 Dichloro(pentamethylcyclopentadienyl) rhodium(III) dimer, **99%** (12354-85-7)
 $[(CH_3)_5C_5RhCl_2]_2$; FW: 618.08; red xtl.
 Note: CATHy™ Catalyst Kit component.

100mg
 500mg
 2g

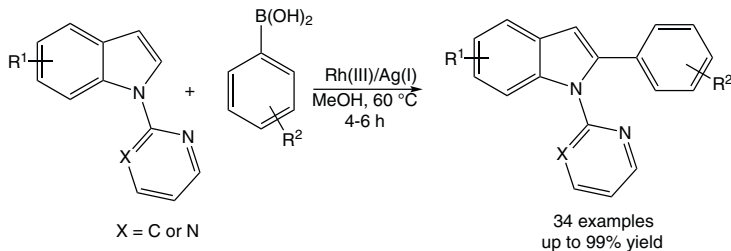


Technical Notes:

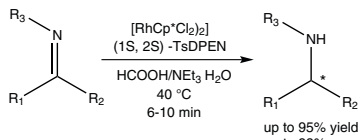
1. Catalyst used in the functionalization of acetanilides under solventless conditions in a ball mill.
2. Rhodium- catalyzed regioselective direct C-H arylation of indoles with aryl boronic acids.
3. Catalyst used in the asymmetric transfer hydrogenation of imines in water.
4. Facile rhodium-catalyzed synthesis of fluorinated pyridines.
5. Rhodium-catalyzed alkylation of azobenzenes with allyl acetates.



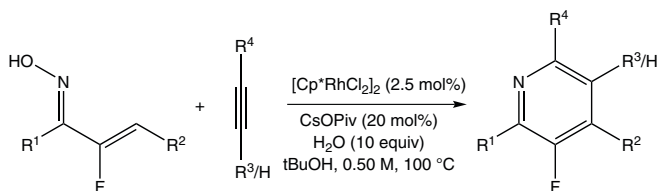
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



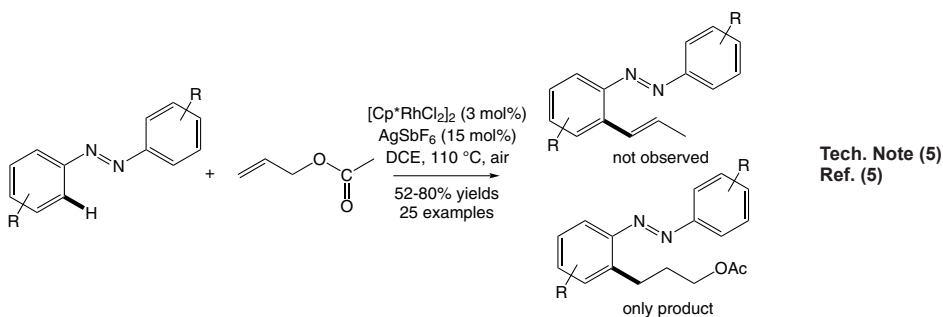
Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)

RHODIUM (Compounds)

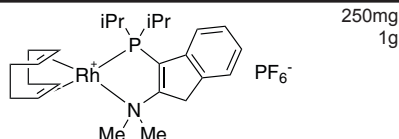
45-0195 Dichloro(pentamethylcyclopentadienyl)rhodium(III) dimer, 99% (12354-85-7)
(continued)



References:

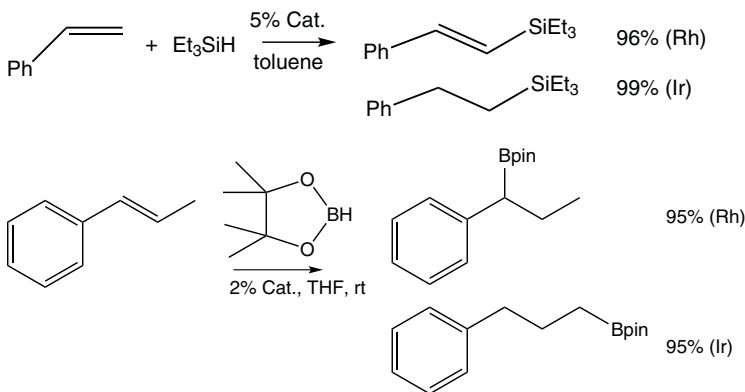
1. *Angew. Chem. Int. Ed.*, **2015**, 54, 7414
2. *Tetrahedron Lett.*, **2015**, 56, 3754
3. *Org. Lett.*, **2015**, 17, 2878
4. *Org. Lett.*, **2015**, 17, 2567
5. *Org. Lett.*, **2015**, 17, 2450

45-0198 **NEW** 3-Di-*i*-propylphosphino-2-(*N,N*-dimethylamino)-1*H*-indene(1,5-cyclooctadiene)rhodium(I) hexafluorophosphate, min. 98%
 $[RhC_{25}H_{38}NP]^+PF_6^-$; FW: 631.42; orange powdr.



Technical Note:

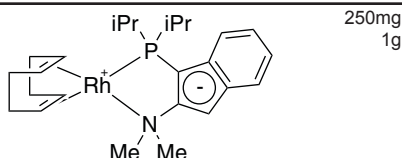
1. Zwitterionic hydrogenation, hydrosilylation and hydroboration catalyst soluble in non-polar solvents.



References:

1. *Organometallics*, **2007**, 26, 594
2. *Organometallics*, **2006**, 25, 5965

45-0197 3-Di-*i*-propylphosphoranylidene-2-(*N,N*-dimethylamino)-1*H*-indene(1,5-cyclooctadiene)rhodium(I), min. 95%
 (540492-55-5)
 $C_{25}H_{37}NPRh$; FW: 485.45; orange-red xtl.



Technical Note:

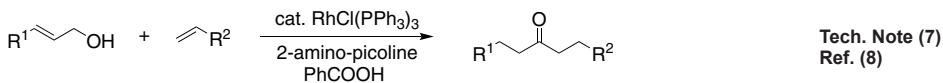
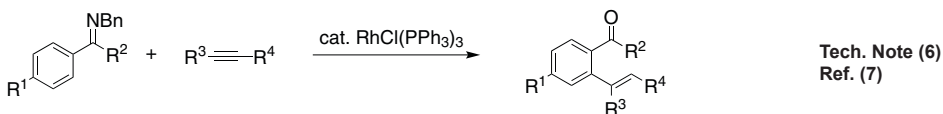
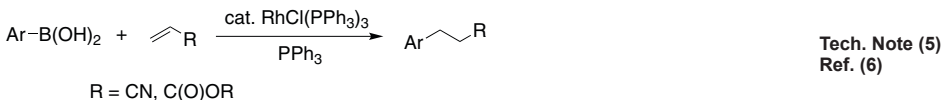
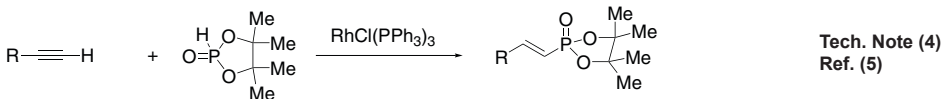
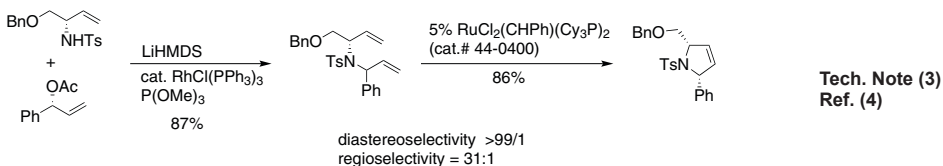
1. See 45-0198 (page 211)

RHODIUM (Compounds)

96-4730	(R,R)-Duphos and BPE Rhodium Catalyst Kit for Asymmetric Hydrogenation See page 335	
96-4731	(S,S)-Duphos and BPE Rhodium Catalyst Kit for Asymmetric Hydrogenation See page 336	
45-0670	Polymer-bound chlorotris(triphenylphosphine)rhodium(I) on styrene-divinylbenzene copolymer (20% cross-linked) (14694-95-2) maroon beads; 20-60 mesh <i>air sensitive</i>	1g 5g

Technical Notes:

1. A homogeneous hydrogenation catalyst which operates under mild conditions.
2. Catalyst for the decarbonylation of aldehydes.
3. Catalyst for regio- and stereoselective allylic substitution reactions.
4. Alkyne hydro-phosphorylation
5. Heck-type reaction with α,β -unsaturated esters.
6. Rh(I)-catalyzed ortho-alkenylation of aromatic ketimines with alkynes
7. Allylic alcohol-olefin coupling.

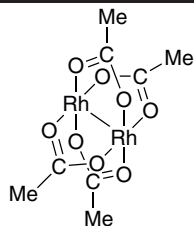


References:

1. *Progress Inorg. Chem.*, **1984**, 28
2. *J. Org. Chem.*, **1992**, 57, 5075
3. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol, 2, 1253
4. *Org. Lett.*, **1999**, 1, 1929
5. *Angew. Chem. Int. Ed.*, **2001**, 40, 1929
6. *Chem. Commun.*, **2003**, 2438
7. *Org. Lett.*, **2003**, 5, 2759
8. *J. Org. Chem.*, **2002**, 67, 3945

RHODIUM (Compounds)

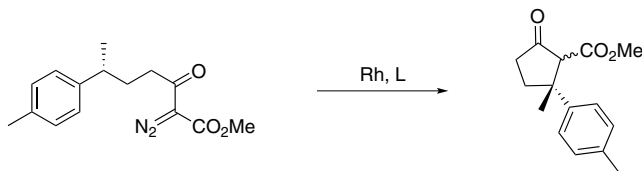
45-1730 Rhodium(II) acetate dimer, 99% (15956-28-2)
 $\text{Rh}_2(\text{OOCCH}_3)_4$; FW: 442.00; greenish-black xtl.



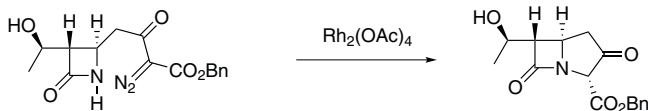
100mg
 500mg
 2g
 25g

Technical Notes:

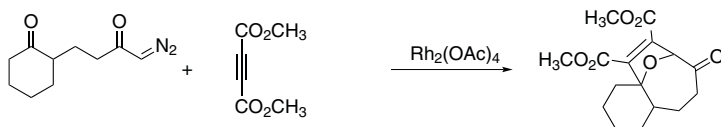
1. Catalyst for insertion into C-H and X-H bonds.
2. Catalyst for Ylide generation.
3. Doyle-Kirmse Reaction of Allylic Sulfides with Diazoalkane
4. Claisen rearrangement.
5. Epoxides from aldehydes.
6. Synthesis of aziridines from allylic N-tosylloxycarbamates.
7. Rh/NHC catalyzed direct intermolecular arylation of C-H bonds.
8. Chiral Bronsted acid-Rh catalyzed three component reactions of diazo compounds with alcohols and imines.
9. Rh-catalyzed cyclopropanations of ynamides.
10. Tandem asymmetric aza-Darzens/ring-opening reactions.



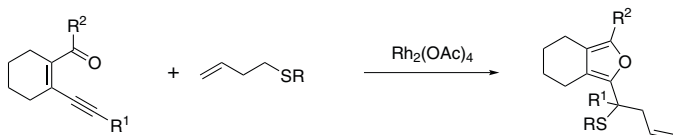
Tech. Note (1)
 Ref. (4)



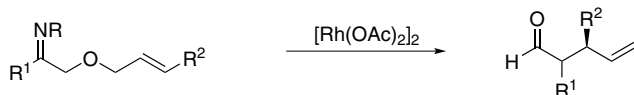
Tech. Note (1)
 Ref. (5)



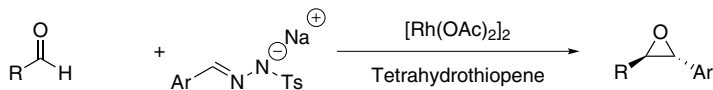
Tech. Note (2)
 Ref. (6)



Tech. Note (3)
 Ref. (7)



Tech. Note (4)
 Ref. (8)



Tech. Note (5)
 Ref. (9)



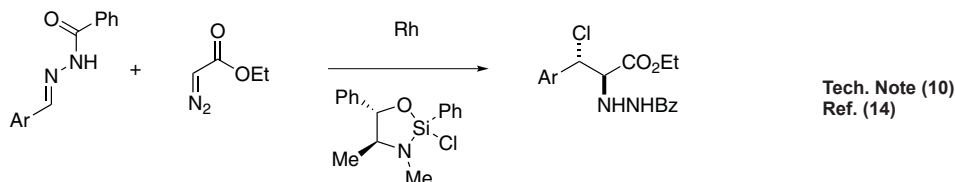
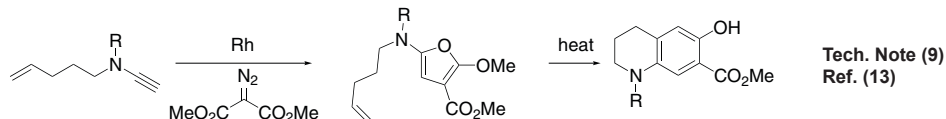
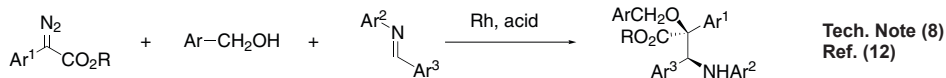
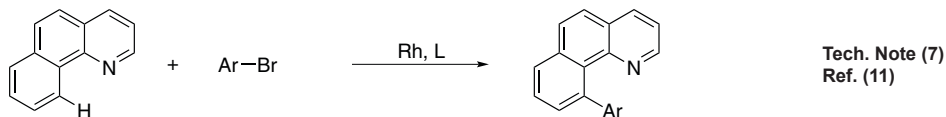
Tech. Note (6)
 Ref. (10)

RHODIUM (Compounds)

45-1730

Rhodium(II) acetate dimer, 99% (15956-28-2)

(continued)



References:

1. *Tetrahedron*, **1991**, 47, 1765
2. *Comprehensive Organic Synthesis*, **1991**, Vol. 4, Chapter 4.8, 1031
3. *Comprehensive Organic Synthesis*, **1991**, Vol. 3, Chapter 4.2, 1045
4. *J. Am. Chem. Soc.*, **1985**, 107, 196
5. *Tetrahedron Lett.*, **1982**, 23, 2293
6. *J. Org. Chem.*, **1991**, 56, 3271
7. *Org. Lett.*, **2003**, 5, 2619
8. *J. Am. Chem. Soc.*, **2002**, 124, 12426
9. *Angew. Chem. Int. Ed.*, **2001**, 40, 1430
10. *J. Am. Chem. Soc.*, **2005**, 127, 14198
11. *Angew. Chem. Int. Ed.*, **2009**, 48, 8935
12. *J. Am. Chem. Soc.*, **2008**, 130, 7782
13. *Org. Lett.*, **2009**, 11, 4462
14. *J. Am. Chem. Soc.*, **2009**, 131, 14638

45-1878

Rhodium(III) chloride, anhydrous (10049-07-7)

RhCl₃; FW: 209.28; red powd.; m.p. 450° dec.

hygroscopic

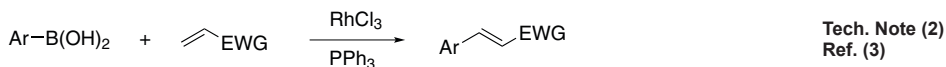
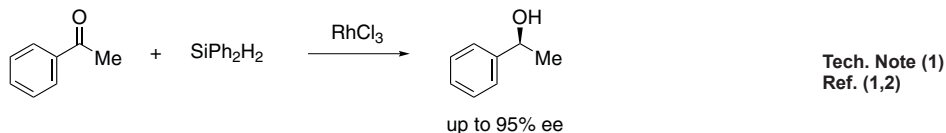
250mg

1g

5g

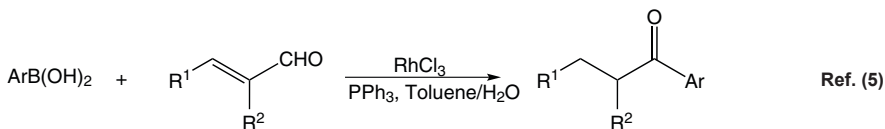
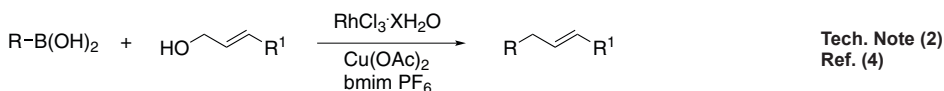
Technical Notes:

1. Catalyst in conjunction with "pybox" for the asymmetric hydrosilylation of ketones.
2. C-C bond forming reactions.



RHODIUM (Compounds)

45-1878 Rhodium(III) chloride, anhydrous (10049-07-7)
(continued)



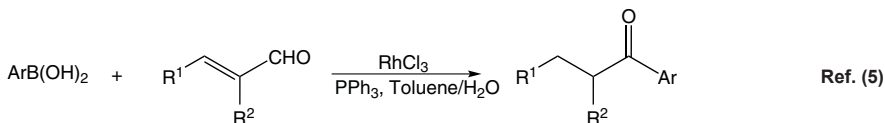
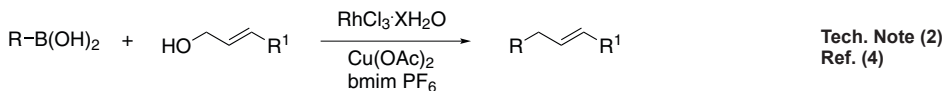
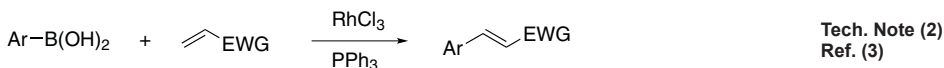
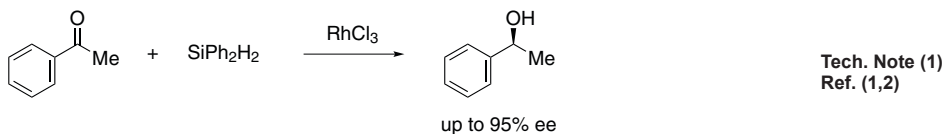
References:

1. *Catalytic Asymmetric Synthesis*, **1993**, Ch, 6, 303
2. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol. 6, 4409
3. *Chem. Commun.*, **2003**, 2438
4. *Org. Lett.*, **2003**, 5, 893
5. *Chem. Commun.*, **2004**, 1192

45-1880	Rhodium(III) chloride hydrate (38-41% Rh) (20765-98-4) RhCl ₃ ·XH ₂ O; FW: 209.28; dark red powder; m.p. 100° (dec.) hygroscopic	250mg 1g 5g 25g
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Technical Notes:

1. Catalyst in conjunction with "pybox" for the asymmetric hydrosilylation of ketones.
2. C-C bond forming reactions.

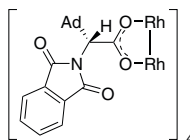


References:

1. *Catalytic Asymmetric Synthesis*, **1993**, Ch, 6, 303
2. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol. 6, 4409
3. *Chem. Commun.*, **2003**, 2438
4. *Org. Lett.*, **2003**, 5, 893
5. *Chem. Commun.*, **2004**, 1192

RHODIUM (Compounds)

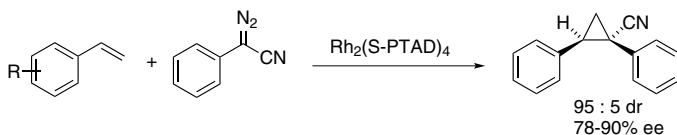
45-2070 Tetrakis[(R)-(-)-(1-adamantyl)-(N-phthalimido)acetato]dirhodium(II) $\text{Rh}_2(\text{R-PTAD})_4$ (909393-65-3)
 $\text{C}_{80}\text{H}_{80}\text{N}_4\text{O}_{16}\text{Rh}_2$; FW: 1559.32; green pwdr.
 Note: Sold for research purposes only. US Patent Application 11/606,782.



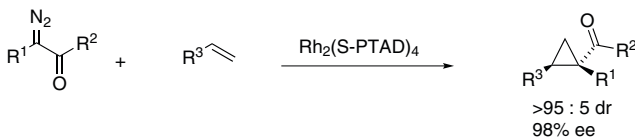
50mg
250mg

Technical Notes:

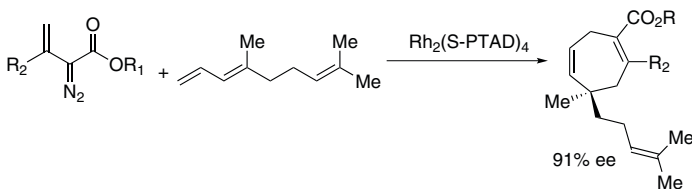
1. Enantioselective reactions of carbenoids and olefins.
2. Enantioselective C-H insertion reactions of carbenoids.
3. Enantioselective oxygen transfer from diazosulfonylamidines.



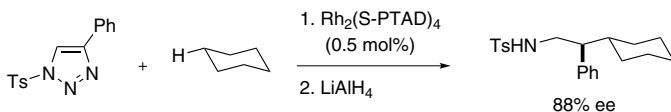
Tech. Note (1)
Ref. (1)



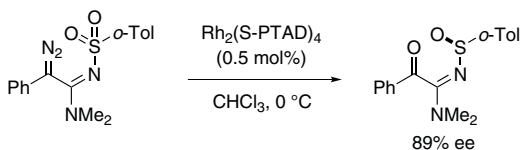
Tech. Note (1)
Ref. (2)



Tech. Note (1)
Ref. (3)



Tech. Note (2)
Ref. (4)



Tech. Note (3)
Ref. (5)

References:

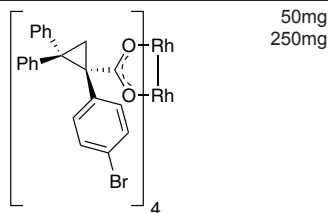
1. *Chem. Commun.*, **2008**, 1238.
2. *Org. Lett.*, **2009**, 11, 787.
3. *J. Am. Chem. Soc.*, **2009**, 131, 8329.
4. *J. Am. Chem. Soc.*, **2011**, 133, 10352.
5. *J. Am. Chem. Soc.*, **2012**, 134, 2477.

45-2071 Tetrakis[(S)-(+)-(1-adamantyl)-(N-phthalimido)acetato]dirhodium(II) $\text{Rh}_2(\text{S-PTAD})_4$ (909389-99-7)
 $\text{C}_{80}\text{H}_{80}\text{N}_4\text{O}_{16}\text{Rh}_2$; FW: 1559.32; green pwdr.
 Note: Sold for research purposes only. US Patent Application 11/606,782.

50mg
250mg

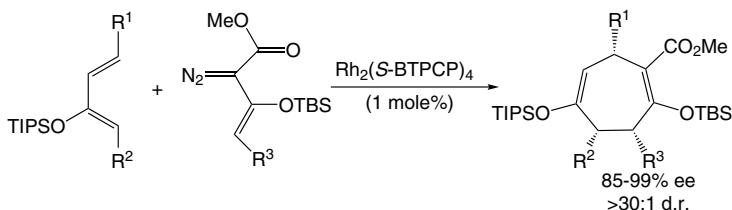
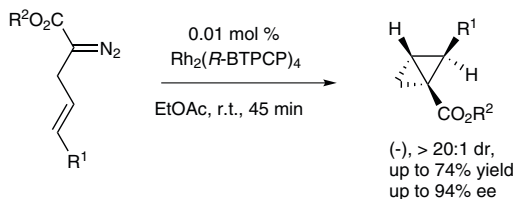
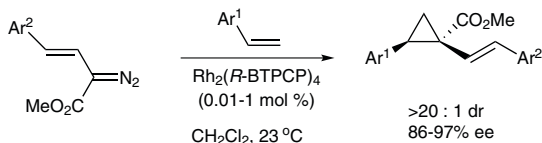
RHODIUM (Compounds)

45-2080 Tetrakis[(R)-(-)-[(1R)-1-(4-bromophenyl)-2,2-diphenylcyclopropanecarboxylato]dirhodium(II) Rh₂(R-BTPCP)₄ (1345974-62-0)
C₈₈H₆₄Br₄O₈Rh₂; FW: 1774.87; green solid
Note: Patent PCT/US2012/040608.



Technical Notes:

1. Chiral catalyst used for the enantioselective formation of cyclopropanes from the reaction of aryls with styryl diazoacetates.
2. Chiral catalyst used for the asymmetric synthesis of bicyclo[1.1.0]butane rings via the rhodium-catalyzed decomposition of 2-diazo-5-arylpent-4-enoates.
3. Rhodium-Catalyzed [4+3] Cycloaddition between Vinyl diazoacetates and Dienes



References:

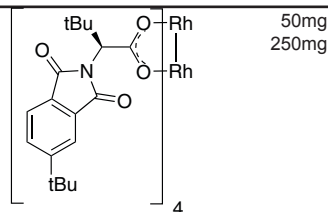
1. *J. Am. Chem. Soc.*, **2011**, 133, 19198
2. *Org. Lett.*, **2013**, 15, 310
3. *Angew. Chem. Int. Ed.*, **2014**, 53, 13083

45-2081 Tetrakis[(S)-(+)-[(1S)-1-(4-bromophenyl)-2,2-diphenylcyclopropanecarboxylato]dirhodium(II) Rh₂(S-BTPCP)₄ (1345974-63-1)
C₈₈H₆₄Br₄O₈Rh₂; FW: 1774.87; green solid
Note: Patent PCT/US2012/040608.

50mg
250mg

45-2105 Tetrakis[5-*t*-butyl-phthaloyl-N-(S)-tert-leucinato]dirhodium bis(ethyl acetate) adduct Rh₂(S-tertPTTL)₄ (1884452-99-6)
C₇₂H₈₈N₄O₁₆Rh₂; FW: 1471.30; green powder.
Note: Sold for research and development purposes only.
Patent 2014. 2014903620.

NEW

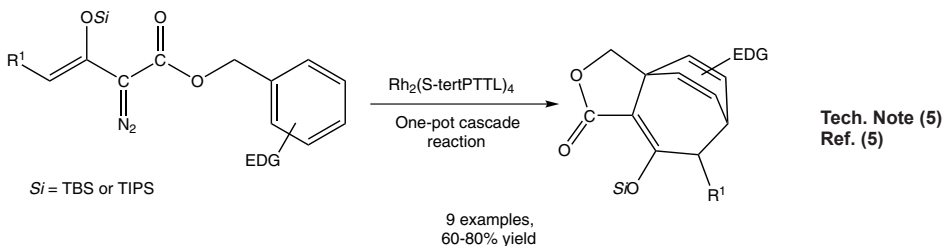
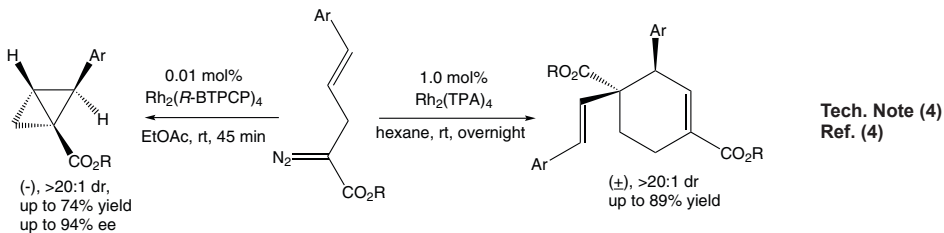
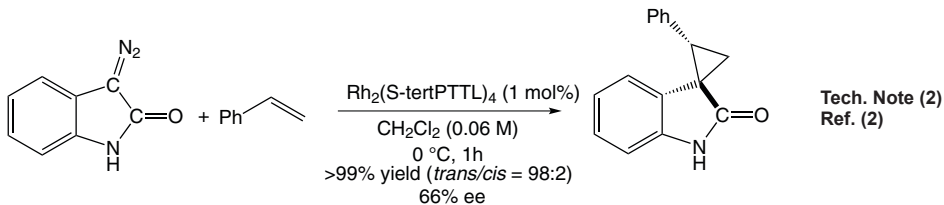
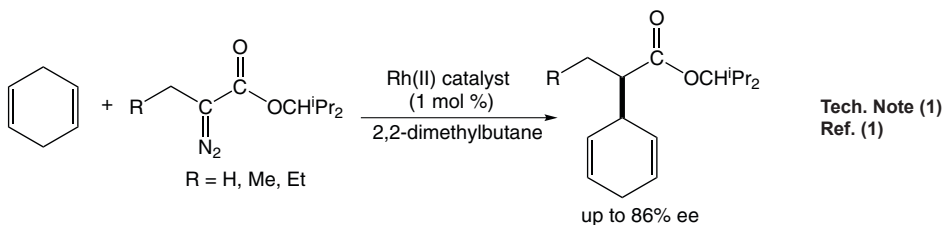


Technical Notes:

1. Catalyst used for the asymmetric, intermolecular C-H insertion of 1,4-cyclohexadiene with α-alkyl-α-diazoesters.
2. Catalyst used for a catalytic cyclopropanation using diazoindole.
3. Catalyst used for the asymmetric, intramolecular C-H insertion of sulfonyldiazoacetates.
4. Catalyst used for the enantioselective synthesis of 2-arylbicyclo[1.1.0]butane carboxylates.
5. Access to the [3.2.2] nonatriene structural frameworks via an intramolecular cyclopropanation/ Buchner reaction/Cope rearrangement cascade.
6. Catalyst used for the cyclopropanation of styrene with dimethyl-α-diazobenzylphosphonate.

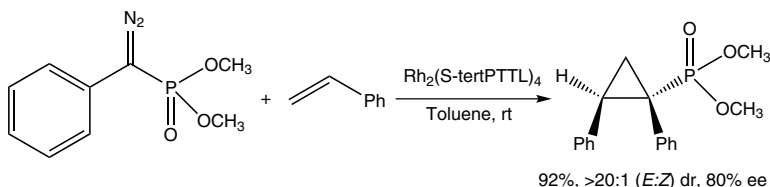
RHODIUM (Compounds)

45-2105 Tetrakis[5-*t*-butyl-phthaloyl-*N*-(*S*)-*tert*-leucinato]dirhodium bis(ethyl acetate) adduct
 (continued) Rh₂(*S*-*tert*PTTL)₄ (1884452-99-6)



RHODIUM (Compounds)

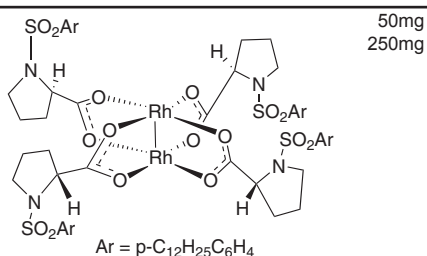
45-2105 Tetrakis[5-*t*-butyl-phthaloyl-*N*-(*S*)-*tert*-leucinato]dirhodium bis(ethyl acetate) adduct
(continued) Rh₂(*S*-*tert*PTTL)₄ (1884452-99-6)



References:

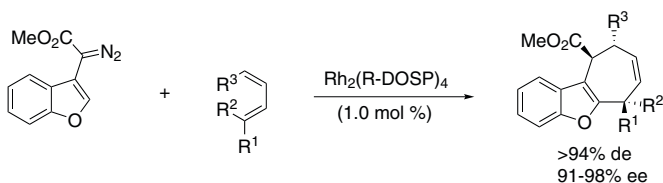
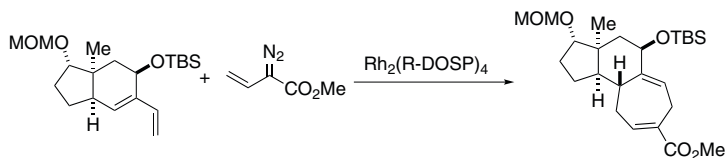
1. *Heterocycles*, **2012**, 86, 1647
2. *SynLett*, **2013**, 24, 29
3. *Tetrahedron-Asymmetry*, **2013**, 24, 151
4. *Org. Lett.*, **2013**, 15, 310
5. *Org. Lett.*, **2015**, 17, 790
6. *Tetrahedron Lett.*, **2016**, 57, 852

45-2100 Tetrakis[(*R*)-(+)-*N*-(*p*-dodecylphenyl)sulfonyl]prolinato]dirhodium(II)
Rh₂(*R*-*DOSP*)₄ (178879-60-2)
[C₂₃H₃₆NO₄S]₄Rh₂; FW: 1896.22;
green powdr.
Note: Sold under license for research purposes.



Technical Notes:

1. Catalyst used for tandem asymmetric cyclopropanation/ Cope rearrangement.
2. Catalyst used for an asymmetric [4 + 3] cycloaddition.



References:

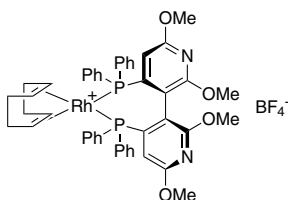
1. *Angew. Chem. Int. Ed.*, **2009**, 48, 2398
2. *Org. Lett.*, **2008**, 10, 573

45-2101 Tetrakis[(*S*)-(-)-*N*-(*p*-dodecylphenyl)sulfonyl]prolinato]dirhodium(II)
Rh₂(*S*-*DOSP*)₄ (179162-34-6)
[C₂₃H₃₆NO₄S]₄Rh₂; FW: 1896.22; green powdr.
Note: Sold under license for research purposes.

50mg
250mg

RHODIUM (Compounds)

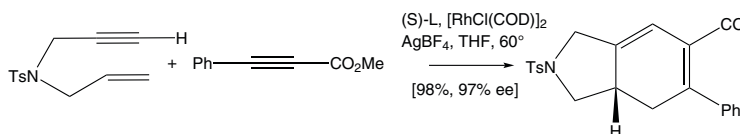
45-2110 (R)-(+)-2,2',6,6'-Tetramethoxy-4,4'-bis(diphenylphosphino)-3,3'-bipyridine(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (573718-56-6)
 $[C_{46}H_{46}N_2O_4P_2Rh]^+BF_4^-$; FW: 942.53; yellow-orange xtl.
 air sensitive
 Note: Sold in collaboration with Johnson Matthey for research purposes only.
 Patent US5886182.



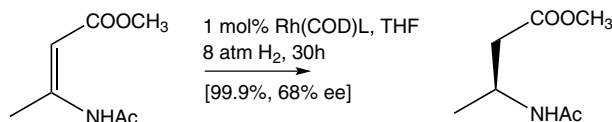
100mg

Technical Notes:

- Chiral ligand for enantioselective rhodium-catalyzed [2+2+2] carbocyclization reactions.
- Chiral ligand for the asymmetric hydrogenation of β -keto esters.
- Highly enantioselective hydrogenation of β -alkyl-substituted (E)- β -(acylamino)-acrylates



Tech. Note (1)
Ref. (1)



Tech. Note (3)
Ref. (2)

References:

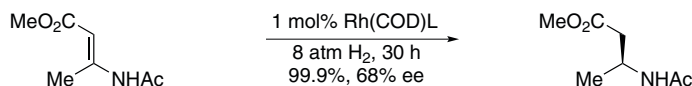
- J. Am. Chem. Soc.*, **2005**, *127*, 12466.
- J. Org. Chem.*, **2003**, *68*, 2490.

45-2111 (S)-(-)-2,2',6,6'-Tetramethoxy-4,4'-bis(diphenylphosphino)-3,3'-bipyridine(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 97% (1174131-02-2)
 $[C_{46}H_{46}N_2O_4P_2Rh]^+BF_4^-$; FW: 942.53; yellow-orange xtl.
 air sensitive
 Note: Sold in collaboration with Johnson Matthey for research purposes only.
 Patent US5886182.

100mg

Technical Note:

- Highly enantioselective hydrogenation of β -alkyl-substituted (E)- β -(acylamino)-acrylates.

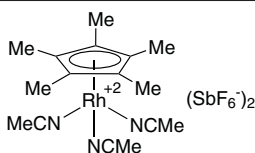


Tech. Note (1)
Ref. (1)

References:

- J. Org. Chem.*, **2003**, *68*, 2490

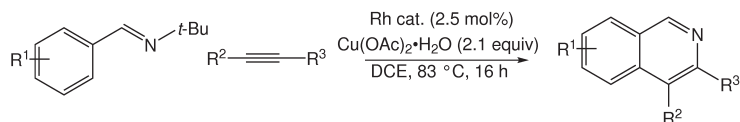
45-2160 Tris(acetonitrile)pentamethylcyclopentadienylrhodium(III) hexafluoroantimonate, min. 98% (59738-27-1)
 $[Rh(C_{10}H_{15})(CH_3CN)_3]^+(SbF_6^-)_2$; FW: 832.79; light yellow powder.



50mg
 250mg
 1g

Technical Notes:

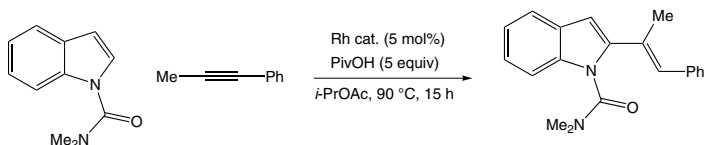
- Catalyst used for the oxidative, cross-coupling/cyclization of aryl aldimines and alkynes.
- Catalyst used for the intermolecular hydroarylation of alkynes.
- Catalyst useful for the **Fagnou Indole/Pyrrrole Synthesis**.
- Catalyst for directed C-H functionalization with enamides and isocyanates.



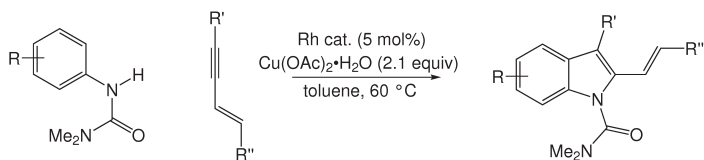
Tech. Note (1)
Ref. (1)

RHODIUM (Compounds)

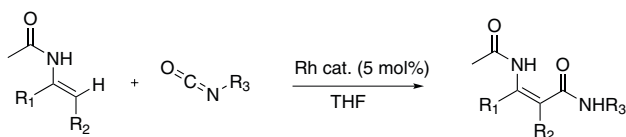
45-2160 Tris(acetonitrile)pentamethylcyclopentadienylrhodium(III) hexafluoroantimonate, min. 98%
(continued) (59738-27-1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

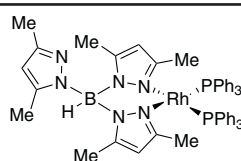


Tech. Note (4)
Ref. (4)

References:

1. *J. Am. Chem. Soc.*, **2009**, *131*, 12050
2. *J. Am. Chem. Soc.*, **2010**, *132*, 6910.
3. *Angew. Chem. Int. Ed.*, **2011**, *50*, 1338.
4. *J. Am. Chem. Soc.*, **2011**, *133*, 11430.

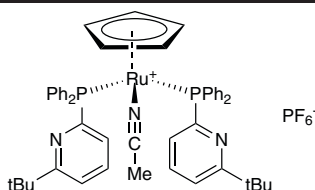
45-0275 [Tris(3,5-dimethyl-1H-pyrazolato)hydroborato] bis(triphenylphosphine)rhodium(I) toluene adduct, 99% (341483-76-9)
C₅₁H₅₂BN₆P₂Rh; FW: 924.66; red xtl.



50mg
250mg

RUTHENIUM (Compounds)

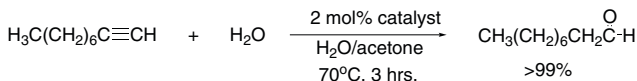
44-0015 Acetonitrilebis[2-diphenylphosphino-6-t-butylpyridine]cyclopentadienyl-ruthenium(II) hexafluorophosphate, min. 98% (776230-17-2)
Ru(C₅H₅)(CH₃CN)[C₂₁H₂₂NP]₂·PF₆⁻; FW: 990.94; yellow microxtl.
air sensitive



250mg
1g

Technical Notes:

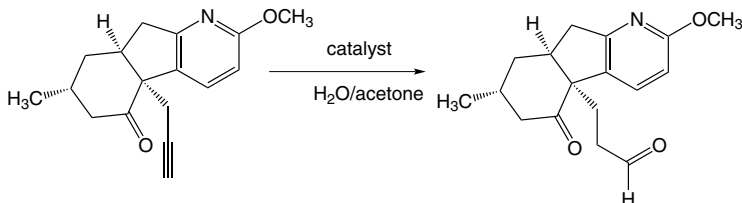
1. Catalyst used for the Anti-Markovnikov hydration of terminal alkynes to aldehydes.
2. Catalyst used for cyclization and hydration of phenyl alkynes to functionalized indoles and benzofurans.



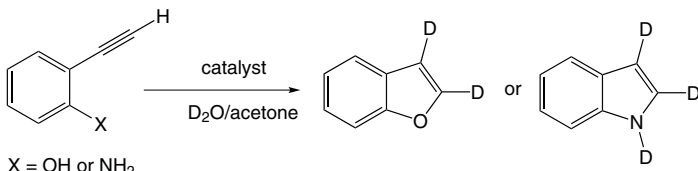
Tech. Note (1)
Ref. (1)

RUTHENIUM (Compounds)

44-0015 Acetonitrilebis[2-diphenylphosphino-6-t-butylpyridine]cyclopentadienylruthenium(II) hexafluorophosphate, min. 98% (776230-17-2)



Tech. Note (1)
Ref. (2)

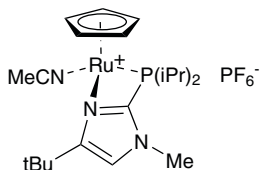


Tech. Note (2)
Ref. (3)

References:

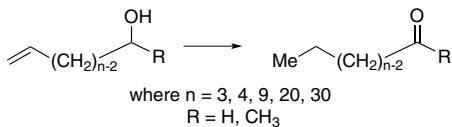
1. *J. Am. Chem. Soc.*, **2004**, *126*, 12232.
2. *Org. Lett.*, **2010**, *12*, 2551.
3. *Chem. Eur. J.*, **2010**, *16*, 7992.

44-0017 Acetonitrile(cyclopentadienyl)[2-(di-*i*-propylphosphino)-4-(*t*-butyl)-1-methyl-1H-imidazole]ruthenium(II) hexafluorophosphate, min. 98% [Alkene Zipper Catalyst] (930601-66-4)
C₂₁H₃₅F₆N₃P₂Ru; FW: 606.53; orange solid air sensitive, (store cold)

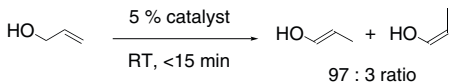


Technical Note:

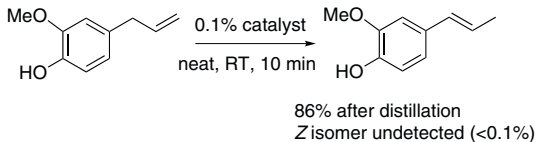
1. "Zipper" catalyst for alkene isomerization over up to 30 double bond positions (Ref. 1) Selective isomerization over one position also possible (Ref. 2,3). Depending on substrate structure, H/D exchange at accessible allylic positions can be accompanied by isomerization (Ref. 4).



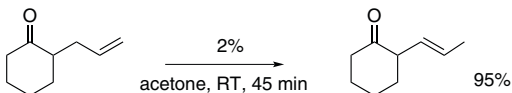
Ref. (1)



Ref. (2)



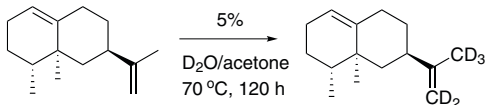
Ref. (3)



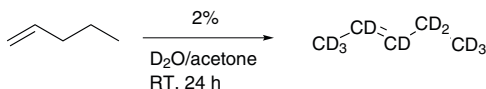
Ref. (3)

RUTHENIUM (Compounds)

44-0017 Acetonitrile(cyclopentadienyl)[2-(di-*i*-propylphosphino)-4-(*t*-butyl)-1-methyl-1H-imidazole] ruthenium(II) hexafluorophosphate, min. 98% [Alkene Zipper Catalyst] (930601-66-4)



Ref. (4)



Ref. (4)

References:

1. *J. Am. Chem. Soc.*, **2007**, *129*, 9592.
2. *Topics in Catalysis*, **2010**, *53*, 1015.
3. *J. Am. Chem. Soc.*, **2012**, *134*, 10357.
4. *J. Am. Chem. Soc.*, **2009**, *131*, 10354.

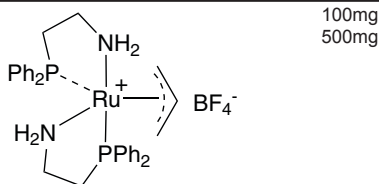
44-6085 Allylbis(2-aminoethyl)di(phenylphosphino) ruthenium(II) tetrafluoroborate, 98%
NEW (1352633-94-3)

C₃₁H₃₇BF₄N₂P₂Ru; FW: 687.46;

off-white to pale yellow solid

Note: Sold in collaboration with GreenCentre for research purposes only.

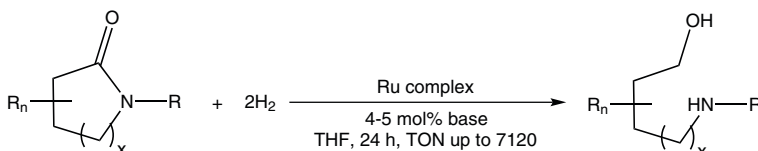
Patents: PCT/2013/010275.



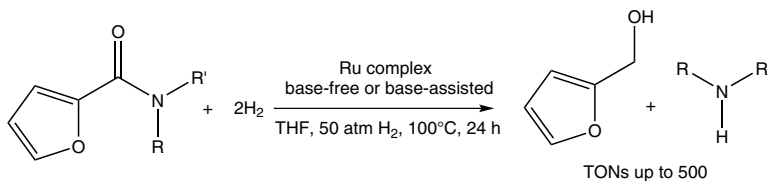
100mg
500mg

Technical Notes:

1. A highly active catalyst for the hydrogenation of amides to alcohols and amines.
2. Catalyst used for the hydrogenation of functionalized amides under basic and neutral conditions.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

1. *Angew. Chem. Int. Ed.*, **2011**, *50*, 10377.
2. *Catal. Sci. Technol.*, **2015**, *5*, 1186.

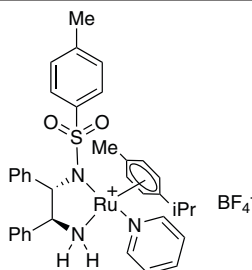
44-6078 {[[(1*R*,2*R*)-2-Amino-1,2-diphenylethyl] (4-toluenesulfonyl)amido}(p-cymene)(pyridine) ruthenium(II) tetrafluoroborate, min. 97%
(1192483-14-9)

C₃₆H₄₀BF₄N₃O₂RuS; FW: 766.70;

yellow-brown solid

air sensitive

Note: Sold under license from Kanata for research purposes only. WO 2009132443.



100mg
500mg

RUTHENIUM (Compounds)

44-6079	<p>[[[(1S,2S)-2-Amino-1,2-diphenylethyl](4-toluenesulfonyl)amido](p-cymene)(pyridine)ruthenium(II) tetrafluoroborate, min. 97% (1192483-27-4) $C_{36}H_{40}BF_4N_3O_2RuS$; FW: 766.70; yellow-brown solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only. WO 2009132443.</p>	100mg 500mg
44-6080	<p>[[[(1R,2R)-2-Amino-1,2-diphenylethyl](4-toluenesulfonyl)amido](p-cymene)(pyridine)ruthenium(II) tetrakis(pentafluorophenyl)borate, min. 97% (1192483-19-4) $C_{60}H_{40}BF_{20}N_3O_2RuS$; FW: 1358.90; yellow brown solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only. WO 2009132443.</p>	100mg 500mg
44-6081	<p>[[[(1S,2S)-2-Amino-1,2-diphenylethyl](4-toluenesulfonyl)amido](p-cymene)(pyridine)ruthenium(II) tetrakis(pentafluorophenyl)borate, min. 97% (1192483-27-4) $C_{60}H_{40}BF_{20}N_3O_2RuS$; FW: 1358.90; yellow-brown solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only. WO 2009132443.</p>	100mg 500mg
44-6075	<p>[[[(1R,2R)-2-Amino-1,2-diphenylethyl](4-toluenesulfonyl)amido](p-cymene)ruthenium(II) tetrafluoroborate, min. 97% (1192483-03-6) $C_{31}H_{35}BF_4N_2O_2RuS$; FW: 687.60; brown-purple solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only. WO 2009132443.</p>	100mg 500mg
44-6076	<p>[[[(1S,2S)-2-Amino-1,2-diphenylethyl](4-toluenesulfonyl)amido](p-cymene)ruthenium(II) tetrafluoroborate, min. 97% (1192483-26-3) $C_{31}H_{35}BF_4N_2O_2RuS$; FW: 687.60; brown-purple solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only. WO 2009132443.</p>	100mg 500mg
96-0400	<p>Apeiron Ruthenium Metathesis Catalyst Kit See page 321</p>	
44-0759	<p>(1,3-Bis(2,6-diisopropylphenyl)-4-((4-ethyl-4-methylpiperzain-1-ium-1-yl)methyl)imidazolidin-2-ylidene)(2-isopropoxybenzylidene)ruthenium(II) chloride dihydrate FixCat (1799947-97-9) $C_{46}H_{67}Cl_2N_4ORuCl\ 2(H_2O)$; FW: 887.47 (923.50); green pwdr. (store cold) Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 61/603,790; PCT/EP2013/053967</p>	100mg 500mg

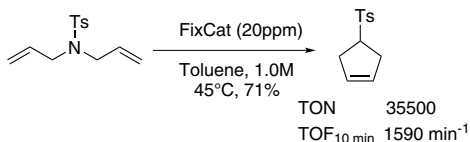
RUTHENIUM (Compounds)

44-0759 (1,3-Bis(2,6-diisopropylphenyl)-4-((4-ethyl-4-methylpiperzain-1-ium-1-yl)methyl)imidazolidin-2-ylidene)(2-isopropoxybenzylidene)ruthenium(II) chloride dihydrate FixCat (1799947-97-9)

Technical Note:

1. Fixcat is a stable olefin metathesis initiator with very good solubility in neat water. The product efficiently promotes ring-closing, cross, and enyne metathesis reactions of water soluble substrates. Suitable for homogeneous and heterogeneous in batch or flow setup.

The Fixcat structure was also optimized to serve as a versatile and very stable catalyst, easily immobilized on solid supports. In its SCA-15 supported version, it showed exceptional efficiency in promoting ring-closing and cross-metathesis reactions, in both batch and continuous flow setups. Fix Cat is also applicable as a homogeneous catalyst, where compatible solvents include alcohols and halogenated solvents.



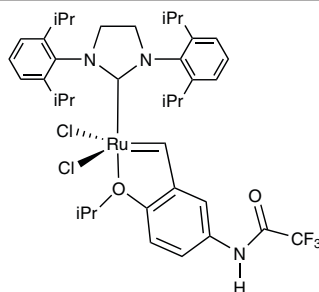
Tech. Note (1)
Ref. (1)

References:

1. *ChemSus Chem.*, 2015, 8, 4139.

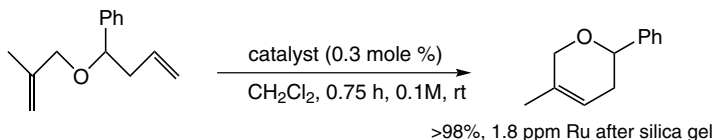
44-0055 [1,3-Bis(2,6-di-i-propylphenyl)-4,5-dihydroimidazol-2-ylidene]-[2-i-propoxy-5-(trifluoroacetamido)phenyl]methyleneruthenium(II) dichloride **M71-S1Pr** (1212008-99-5)
C₃₉H₅₀Cl₂F₃N₃O₃Ru; FW: 821.80; green powdr.
Note: Sold under license from Omega Cat System for research purposes only
WO 2008/065187, PCT/EP2008/054901, Fr n°08/05403.

100mg
500mg



Technical Note:

1. Enhanced activity ruthenium "boomerang" pre-catalyst used in the olefin metathesis, enyne metathesis, and cross metathesis reactions, that can be recycled, and leaves reduced ruthenium in the product after silica gel chromatography.



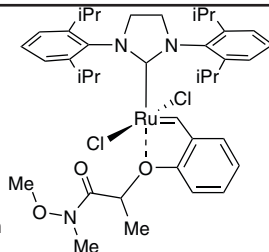
Tech. Note (1)
Ref. (1,2)

References:

1. *Eur. J. Org. Chem.*, 2009, 4254.
2. *J. Org. Chem.*, 2008, 73, 4225.

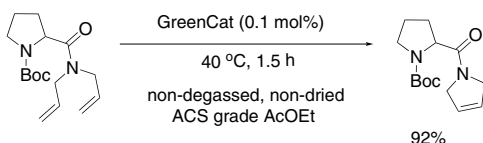
44-0750 [1,3-Bis(2,6-di-i-propylphenyl)imidazolidin-2-ylidene]{2-[[1-(methoxy(methyl)amino)-1-oxopropan-2-yl]oxy]benzylidene}ruthenium(II) dichloride **GreenCat** (1448663-06-6)
C₃₉H₅₃Cl₂N₃O₃Ru; FW: 783.33; green powdr.
Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 61/666,009, PCT/EP2013/062435. Apeiron Ruthenium Metathesis Catalyst Kit component.

100mg
500mg



Technical Note:

1. Efficient, durable and reuseable olefin metathesis catalyst with a high affinity to silica gel.

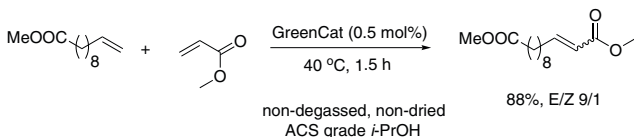


Tech. Note (1)
Ref. (1)

RUTHENIUM (Compounds)

44-0750
(continued)

[1,3-Bis(2,6-di-*i*-propylphenyl)imidazolidin-2-ylidene][2-[[1-(methoxy(methyl)amino)-1-oxopropan-2-yl]oxy]benzylidene]ruthenium(II) dichloride GreenCat (1448663-06-6)



Tech. Note (1)
Ref. (1)

References:

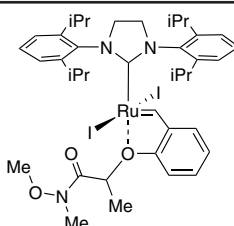
1. *Tetrahedron*, **2013**, 69, 7408

44-0748

NEW

[1,3-Bis(2,6-di-*i*-propylphenyl)imidazolidin-2-ylidene][2-((1-methoxy(methyl)amino)-1-oxopropan-2-yl)oxy]benzylidenediiodoruthenium(II) GreenCat-I2

$C_{39}H_{53}I_2N_3O_3Ru$; FW: 966.74; green solid
air sensitive, (store cold)
Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 61/666,009
PCT/EP2013/062435. Store at 2-8°C under inert atmosphere. Catalyst may be weighed in air



100mg
500mg

Technical Note:

1. Catalyst for metathesis applications.

References:

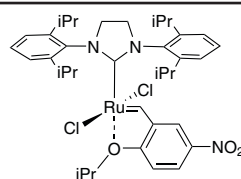
1. Rafał Gawin, Anna Kozakiewicz, Piotr A. Gunka, Paweł Dabrowski, and Krzysztof Skowerski, *Angew. Chem.* **2017**, 129, 1001–1006.

44-0770

NEW

1,3-Bis(2,6-di-*i*-propylphenyl)imidazolidin-2-ylidene(2-*i*-propoxy-5-nitrobenzylidene)ruthenium(II) dichloride Nitro-Grela SiPr (928795-51-1)

$C_{37}H_{49}Cl_2N_3O_3Ru$; FW: 755.78; green powdr.
air sensitive, (store cold)
Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 6/867,303 PCT/EP2003/01122.
Store at 2-8°C under inert atmosphere. Catalyst may be weighed in air



100mg
500mg

Technical Note:

1. Catalyst for metathesis applications.

References:

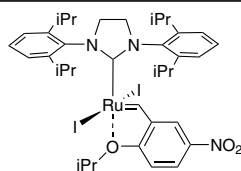
1. Gawin, Rafał; Tracz, Andrzej; Chwalba, Michał; Kozakiewicz, Anna; Trzaskowski, Bartosz; Skowerski, Krzysztof, *ACS Catalysis*, **2017**, 7(8), 5443-5449.
2. Sytniczuk, A.; Kajetanowicz, A.; Grela, K., *Catalysis Science & Technology* **2017**, 7(6), 1284-1296.
3. Rafał Gawin, Anna Kozakiewicz, Piotr A. Gunka, Paweł Dabrowski, and Krzysztof Skowerski, *Angew. Chem.* **2017**, 129, 1001–1006.

44-0782

NEW

[1,3-Bis(2,6-di-*i*-propylphenyl)imidazolidin-2-ylidene(2-*i*-propoxy-5-nitrobenzylidene)ruthenium(II) diiodide nitro-Grela I2 SiPr (1874265-00-5)

$C_{37}H_{49}I_2N_3O_3Ru$; FW: 938.68; olive brown powdr.
air sensitive, (store cold)
Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 6/867,303 PCT/EP2003/01122.
Store at 2-8°C under inert atmosphere. Catalyst may be weighed in air



100mg
500mg

Technical Note:

1. Catalyst for metathesis applications.

References:

1. Tracz, Andrzej; Matczak, Mateusz; Urbaniak, Katarzyna; Skowerski, Krzysztof, *Beilstein Journal of Organic Chemistry* **2015**, 11, 1823-1832.

RUTHENIUM (Compounds)

44-0793

NEW

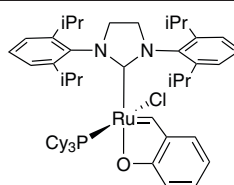
[1,3-Bis(2,6-di-*i*-propylphenyl)imidazolidin-2-ylidene](tricyclohexylphosphine)-(2-oxo-5-nitrobenzylidene)ruthenium(II) chloride

LatMet SiPr (1544328-59-7)

C₅₂H₇₇ClN₂OPRu; FW: 913.68; dark green xtl.

air sensitive, (store cold)

Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 9,328,132, PCT/EP2013/065839.



100mg
500mg

Technical Note:

1. Catalyst for metathesis applications.

References:

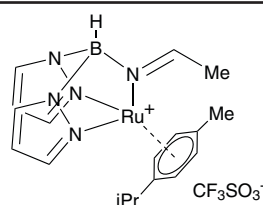
1. Skowerski, Krzysztof; Bieniek, Michal, *U.S. Pat. Appl. Publ.* **2015**, US 20150158896 A1 20150611.
2. Skowerski, Krzysztof; Bieniek, Michal, *PCT Int. Appl.* **2014**, WO 2014016422 A1 20140130.

44-0355

NEW

[Bis(pyrazol-1-yl)(acetimino)hydridoborato](*p*-cymene)ruthenium(II) trifluoromethanesulfonate (1607436-49-6)

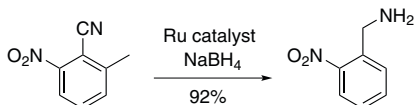
C₁₉H₂₅BF₃N₅O₃RuS; FW: 572.38; yellow powdr.
Note: Sold under license from USC for research purposes only. U.S. Patent No. 62/082,992.



100mg
500mg

Technical Note:

1. Dual site catalyst for the mild, selective nitrile reduction.



Tech. Note (1)
Ref. (1)

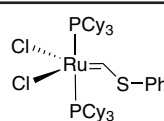
References:

1. *Chem. Comm.*, **2014**, 50(40), 5391.

44-0073

Bis(tricyclohexylphosphine)[(phenylthio)methylene]ruthenium(II) dichloride, min. 97% (219770-99-7)

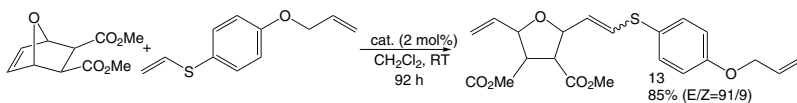
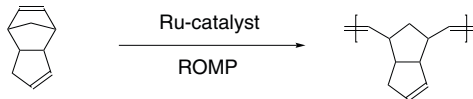
RuCl₂(CHSC₆H₅)[P(C₆H₁₁)₃]₂; FW: 855.02; purple powdr.



1g
5g

Technical Notes:

1. Metathesis catalyst, stable in air and can be used in aqueous media.
2. Catalyst of choice for the ring-opening metathesis polymerization of cycloolefins.
3. Catalyst concentration 2-3 times lower than comparable phenyl and vinyl substituted ruthenium carbenes.
4. Excellent initiator for solvent-free polymerization and control of initiation rates and gelation times.
5. Highly selective catalyst for the ring opening/cross-metathesis of norbornene derivatives.



References:

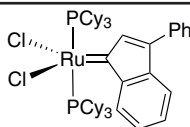
1. *J. Organomet. Chem.*, **2000**, 606, 16
2. "Ring Opening Metathesis Polymerization of Related Chemistry", NATO Science Series II, **2002**, 23.
3. *Organometallics*, **2003**, 22, 586

44-0063

Bis(tricyclohexylphosphine)-3-phenyl-1H-inden-1-ylideneruthenium(II) dichloride (250220-36-1)

RuCl₂(C₁₅H₁₀)[P(C₆H₁₁)₃]₂; FW: 923.07; brown powdr.

Note: Sold in collaboration with Umicore for research purposes only.



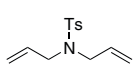
1g
5g

Technical Notes:

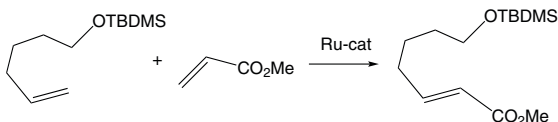
1. Highly active, air-stable catalyst used for the ring closing metathesis of dienes.
2. Used in cross-metathesis.

RUTHENIUM (Compounds)

44-0063 Bis(tricyclohexylphosphine)-3-phenyl-1H-inden-1-ylideneruthenium(II) dichloride
(continued) (250220-36-1)



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

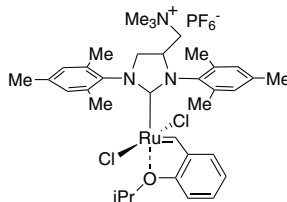
References:

1. *Angew. Chem. Int. Ed.*, **2000**, *112*, 3012. (review article)
2. *Adv. Synth. Catal.*, **2008**, *350*, 2959.

44-0755 **1,3-Bis(2,4,6-trimethylphenyl)-4-[(trimethylammonio)methyl]imidazolidin-2-ylidene)-(2-i-propoxybenzylidene) dichlororuthenium(II) hexafluorophosphate StickyCat PF6**

NEW

$C_{35}H_{48}Cl_2F_6N_3OPRu$; FW: 843.72; green powdr.
air sensitive, (store cold)
Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 61/603,790, PCT/EP2013/053967.
Store at 2-8°C under inert atmosphere. Catalyst may be weighed in air.



100mg
500mg

Technical Note:

1. Catalyst for metathesis applications.

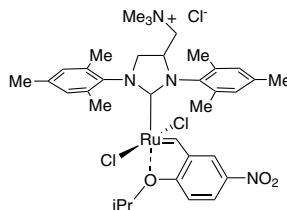
References:

1. Rafał Gawin, Anna Kozakiewicz, Piotr A. Gunka, Paweł Dabrowski, and Krzysztof Skowerski, *Angew. Chem.* **2017**, *129*, 1001–1006.

44-0795 **1,3-Bis(2,4,6-trimethylphenyl)-4-[(trimethylammonio)methyl]imidazolidin-2-ylidene)-(2-i-propoxy-5-nitrobenzylidene)dichlororuthenium(II) chloride nitro-StickyCat Cl (1415661-45-8)**

NEW

$C_{35}H_{47}Cl_2N_3O_3Ru$; FW: 779.20; green powdr.
air sensitive, (store cold)
Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 61/603,790 PCT/EP2013/053967.
Store at 2-8°C under inert atmosphere. Catalyst may be weighed in air.



100mg
500mg

Technical Note:

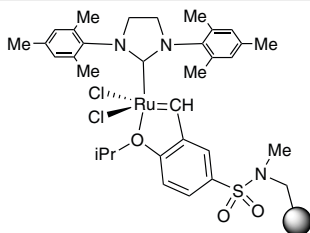
1. Catalyst for olefin metathesis applications.

References:

1. Skowerski, Krzysztof; Gulajski, Lukasz; Bieniek, Micha, *U.S. Pat. Appl. Publ.* **2013**, US 20130225807 A1 20130829.
2. Skowerski, Krzysztof; Wierzbicka, Celina; Szczepaniak, Grzegorz; Gulajski, Lukasz; Bieniek, Michal; Grela, Karol, *Green Chemistry*, **2012**, *14*(12), 3264-3268.

44-0083 **1,3-Bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene[2-(i-propoxy)-5-(N,N-dimethyl aminosulfonyl)phenyl] methyleneruthenium(II) dichloride (resin supported) Zhan Catalyst II**

FW: >1000; black solid; Loading: 0.5 mmol/g
Note: Sold under license from Zannan for research purposes only.
Patents CN1907992A, US 2007/0043180 A1, PCT WO 2007/003135 A1.



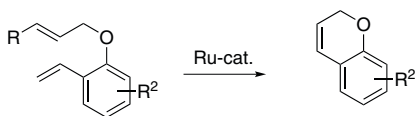
100mg
500mg
2g

Technical Notes:

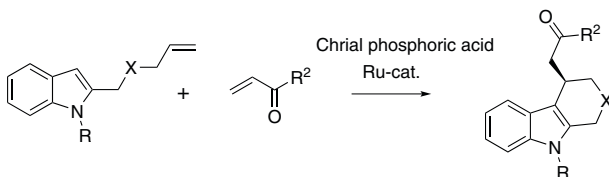
1. Efficient, air-stable metathesis catalyst.
2. Used in cross-metathesis/Friedel-Crafts Cascade reaction.

RUTHENIUM (Compounds)

44-0083 1,3-Bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene[2-(i-propoxy)-5-(N,N-dimethylaminosulfonyl)phenyl]methylen ruthenium(II) dichloride (resin supported) Zhan Catalyst II
(continued)



Tech. Note (1)

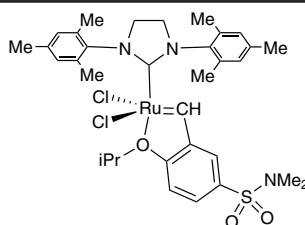


Tech. Note (2)
Ref. (1)

References:

1. *Angew. Chem. Int. Ed.*, **2009**, 48, 7428.

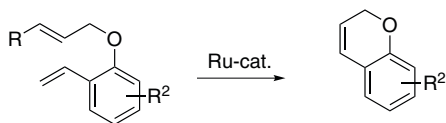
44-0082 1,3-Bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene[2-(i-propoxy)-5-(N,N-dimethylaminosulfonyl)phenyl]methylen ruthenium (II) dichloride, Zhan Catalyst-1B, min 96% (918870-76-5)
RuCl₂[C₂₁H₂₆N₂][C₁₂H₁₇NO₃S]; FW: 733.75; green solid
Note: Sold under license from Zannan for research purposes only.
Patents CN1907992A, US 2007/0043180 A1, PCT WO 2007/003135 A1.



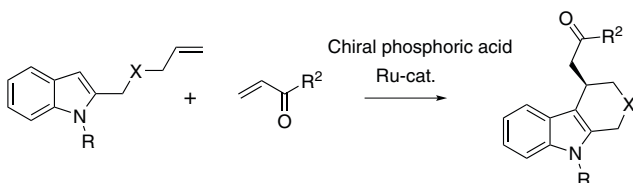
100mg
500mg
2g

Technical Notes:

1. Efficient, air-stable metathesis catalyst.
2. Used in cross-metathesis/Friedel-Crafts Cascade reaction.



Tech. Note (1)



Tech. Note (2)
Ref. (2)

References:

1. PCT Int. Appl. (2007), WO 2007003135 A1
2. *Angew. Chem. Int. Ed.*, **2009**, 48, 7428

RUTHENIUM (Compounds)

44-0768

NEW

[1,3-Bis(2,4,6-trimethylphenyl)-4-[(4-ethyl-4-methylpiperazin-1-ium-1-yl)methyl]imidazolidin-2-ylidene)-(2-i-propoxybenzylidene) dichlororuthenium(II) chloride AquaMet (1414707-08-6)

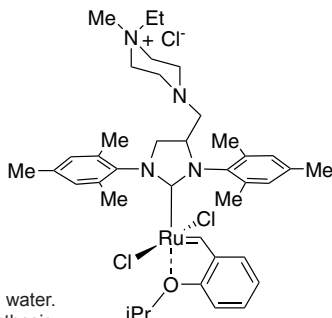
C₃₉H₅₅Cl₃N₄ORu; FW: 803.31; green powdr.

Note: Sold in collaboration with Apeiron Synthesis, Inc.

U.S. Patent 61/603,790,

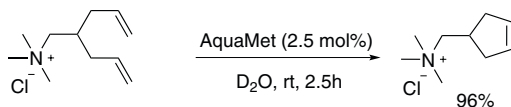
PCT/EP2013/053967. Apeiron Ruthenium Metathesis Catalyst Kit component.

100mg
500mg

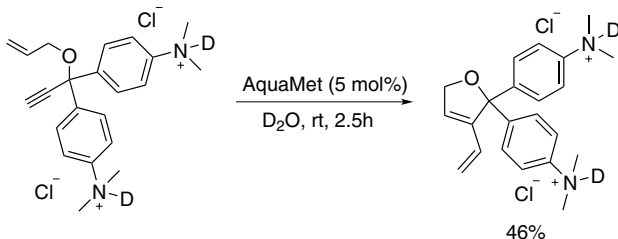


Technical Notes:

1. This is an highly active catalyst for olefin metathesis in water.
2. This catalyst is used as linker free heterogeneous metathesis catalysts after immobilization on silica or siliceous mesoporous molecular sieves. TON of ~16000 for the RCM of (-)-β-citronellene are reported. (Ref. 2)



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)

References:

1. *Catal. Sci. Technol.*, **2012**, *22*, 2424
2. *ACS Catal.*, **2014**, *4*, 3227

44-0047

[1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]-[2-[[[4-methylphenyl]imino]methyl]-4-nitrophenolyl]-[3-phenyl-1H-inden-1-ylidene]ruthenium(II) chloride (934538-04-2)

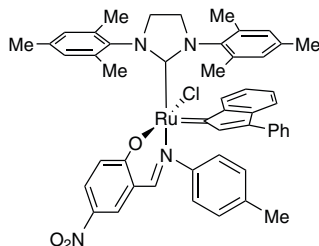
C₅₀H₄₇ClN₄O₃Ru; FW: 888.46;

orange-brown solid

Note: Sold in collaboration with Umicore for research purposes only.

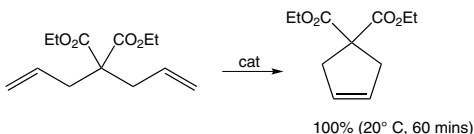
EP 1 468 004 B1, US 2002/0349956.

100mg
500mg



Technical Note:

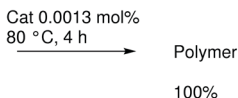
1. Highly active catalyst for ring opening and ring closing metathesis reactions.



Ref. (1-3)

RUTHENIUM (Compounds)

44-0047 [1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]-[2-[[[4-methylphenyl]imino]methyl]-4-nitrophenolyl]-[3-phenyl-1H-inden-1-ylidene]ruthenium(II) chloride (934538-04-2)

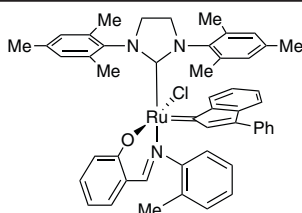


Ref. (1-3)

References:

1. WO 2003062253.
2. Eur. J. Org. Chem., 2009, 655.
3. Curr. Org. Synth., 2008, 5, 291

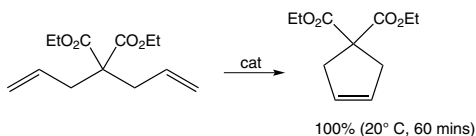
44-0049 [1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene]-[2-[[[2-methylphenyl]imino]methyl]phenolyl]-[3-phenyl-1H-inden-1-ylidene]ruthenium(II) chloride (934538-12-2)
C₅₀H₄₈ClN₃ORu; FW: 843.46; red-brown solid
Note: Sold in collaboration with Umicore for research purposes only. EP 1 468 004 B1, US 2002/0349956.



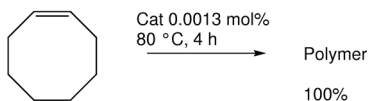
100mg
500mg

Technical Note:

1. Highly active catalyst for ring opening and ring closing metathesis reactions.



Ref. (1-3)

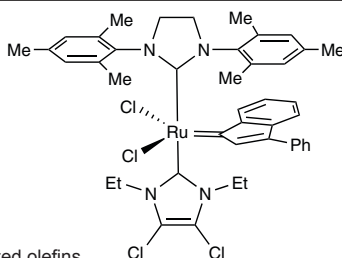


Ref. (1-3)

References:

1. WO 2003062253.
2. Eur. J. Org. Chem., 2009, 655.
3. Curr. Org. Synth., 2008, 5, 291

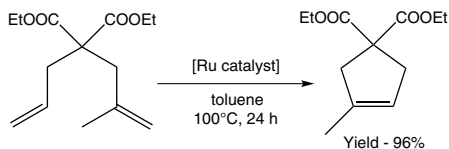
44-0026 1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene(3-phenyl-1H-inden-1-ylidene)(4,5-dichloro-1,3-diethyl-1,3-dihydro-2H-imidazol-2-ylidene)ruthenium(II) chloride (1228169-92-3)
C₄₃H₄₆Cl₂N₄Ru; FW: 861.73; orange-brown solid
Note: Sold in collaboration with Umicore for research purpose only. Patent US 10,873,026.



50mg
250mg
1g

Technical Note:

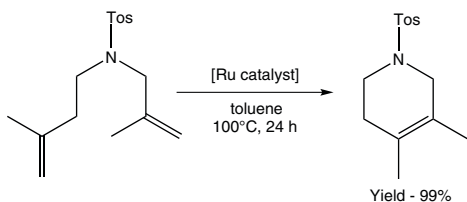
1. Catalyst used for RCM reactions leading to tetrasubstituted olefins.



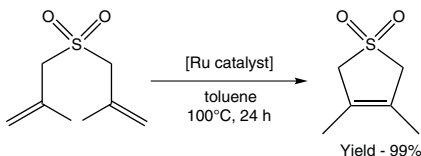
Tech. Note (1)
Ref. (1)

RUTHENIUM (Compounds)

44-0026 **1,3-Bis(2,4,6-trimethylphenyl)-2-imidazolidinylidene(3-phenyl-1H-inden-1-ylidene)(4,5-dichloro-1,3-diethyl-1,3-dihydro-2H-imidazol-2-ylidene)ruthenium(II) chloride (1228169-92-3)**
(continued)



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)

References:

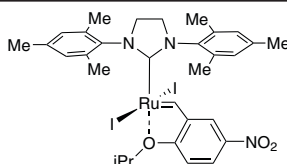
1. *Organometallics*, **2010**, *29*, 2761

44-0767 **[1,3-Bis(2,4,6-trimethylphenyl)imidazolidin-2-ylidene)-(2-i-propoxy-5-nitrobenzylidene) ruthenium(II) diiodide nitro-Grela I2 (1874264-99-9)**

NEW

$C_{31}H_{37}I_2N_3O_3Ru$; FW: 854.52; olive brown powdr.
air sensitive, (store cold)

Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 6/867,303 PCT/EP2003/01122. Store at 2-8°C under inert atmosphere. Catalyst may be weighed in air.



100mg
500mg

Technical Note:

1. Catalyst for metathesis applications.

References:

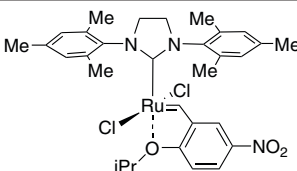
1. Tracz, Andrzej; Matczak, Mateusz; Urbaniak, Katarzyna; Skowerski, Krzyszto, *Beilstein Journal of Organic Chemistry* **2015**, *11*, 1823-1832.

44-0758 **[1,3-Bis(2,4,6-trimethylphenylimidazolidin-2-ylidene)]-(2-i-propoxy-5-nitrobenzylidene)ruthenium(II) dichloride nitro-Grela (502964-52-5)**

NEW

$C_{31}H_{37}Cl_2N_3O_3Ru$; FW: 671.62; green powdr.

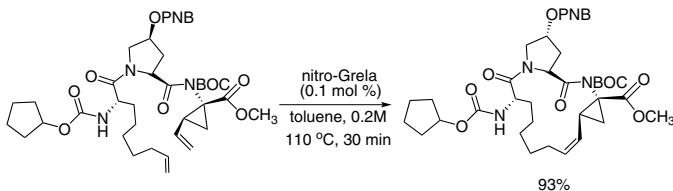
Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 6,867,303, PCT/EP2003/01122. Apeiron Ruthenium Metathesis Catalyst Kit component.



100mg
500mg

Technical Notes:

1. This catalyst is used for an efficient synthesis of HCV Protease Inhibitor, BILN 2061.
2. The nitro-Grela catalyst is a stable olefin metathesis initiator active in various ring-closing, cross, and enyne metathesis reactions. Its efficiency has been proven in numerous total syntheses of natural and biologically active compounds, and in material science (see Ref. 1-9)



Tech. Note (1)
Ref. (1,2)

RUTHENIUM (Compounds)

44-0758 [1,3-Bis(2,4,6-trimethylphenylimidazolidin-2-ylidene)]-(2-*i*-propoxy-5-nitrobenzylidene) ruthenium(II) dichloride nitro-Grela (502964-52-5)
(continued)

References:

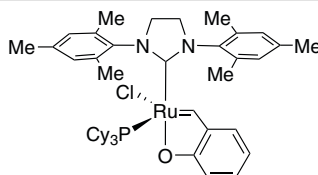
1. *Org. Lett.*, **2008**, *1*, 1303
2. *Org. Process Res. Dev.*, **2009**, *13*, 250
3. *Org. Lett.*, **2013**, *15*, 1016
4. *Chem. Eur. J.*, **2013**, *19*, 11847
5. *Org. Lett.*, **2010**, *12*, 248
6. *Angew. Chem. Int. Ed.*, **2008**, *47*, 6483
7. *Tetrahedron Lett.*, **2006**, *47*, 6351
8. *J. Am. Chem. Soc.*, **2004**, *126*, 9318
9. *Angew. Chem. Int. Ed.*, **2002**, *41*, 4038

44-0753

NEW

[1,3-Bis(2,4,6-trimethylphenylimidazolidin-2-ylidene)](tricyclohexylphosphine)-(2-oxobenzylidene)ruthenium(II) chloride LatMet (1407229-58-6)

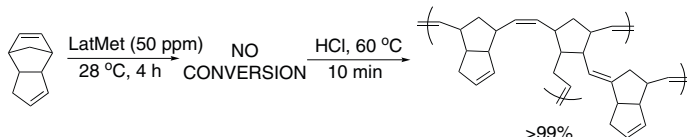
C₄₆H₆₅ClN₂OPRu; FW: 829.52; green powd.
Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 9,328,132, PCT/EP2013/065839. Apeiron Ruthenium Metathesis Catalyst Kit component.



100mg
500mg

Technical Note:

1. This catalyst is used for olefin metathesis polymerization.



Tech. Note (1)
Ref. (1,2)

References:

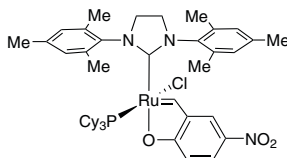
1. *Chem. Eur. J.*, **2014**, *20*, 14120
2. *Eur. J. Inorg. Chem.*, **2014**, 1131

44-0787

NEW

[1,3-Bis(2,4,6-trimethylphenylimidazolidin-2-ylidene)](tricyclohexylphosphine)-(2-oxo-5-nitrobenzylidene)ruthenium(II) chloride Nitro-LatMet (1544328-53-1)

C₄₆H₆₄ClN₂O₃PRu; FW: 874.52; brown xtl.
air sensitive, (store cold)
Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 9,328,132, PCT/EP2013/065839.



100mg
500mg

Technical Note:

1. Catalyst for metathesis applications.

References:

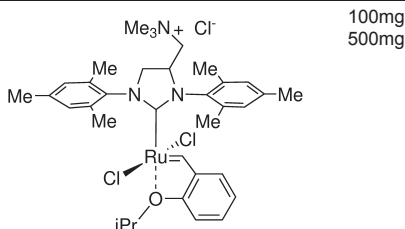
1. Rafal Gawin, Anna Kozakiewicz, Piotr A. Gunka, Paweł Dabrowski, and Krzysztof Skowerski, *Angew. Chem.* **2017**, *129*, 1001–1006.
2. Skowerski, Krzysztof; Bieniek, Michal, *U.S. Pat. Appl. Publ.* **2015**, US 20150158896 A1 20150611.
3. Kozłowska, Anna; Dranka, Maciej; Zachara, Janusz; Pump, Eva; Slugovc, Christian; Skowerski, Krzysztof; Grela, Karol, *Chemistry - A European Journal*, **2014**, *20*(43), 14120-14125.
4. Skowerski, Krzysztof; Bieniek, Michal, *PCT Int. Appl.* **2014**, WO 2014016422 A1 20140130.
5. Zak, Patrycja; Rogalski, Szymon; Kubicki, Maciej; Przybylski, Piotr; Pietraszuk, Cezary, *European Journal of Inorganic Chemistry*, **2014**, *2014*(7), 1131-1136.

RUTHENIUM (Compounds)

44-0765

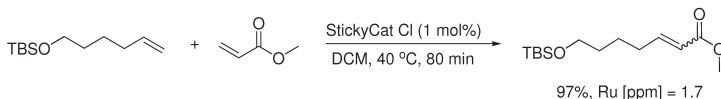
NEW

[1,3-Bis(2,4,6-trimethylphenyl)-4-[(trimethylammonio)methyl]imidazolidin-2-ylidene)-(2-*i*-propoxybenzylidene) dichlororuthenium(II) chloride StickyCat Cl (1452227-72-3)
 $C_{35}H_{48}Cl_3N_3ORu$; FW: 734.20; green powdr.
 Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 61/603,790,PCT/EP2013/053967. Apeiron Ruthenium Metathesis Catalyst Kit component.



Technical Note:

- This is an easily removable olefin metathesis catalyst. It shows high activity at 40-110°C. Residual ruthenium metal is usually below 5 ppm.



**Tech. Note (1)
Ref. (1)**

References:

- Green Chem.*, **2012**, *14*, 3264

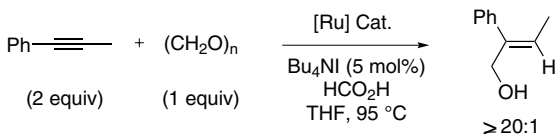
44-0090

Carbonylbis(trifluoroacetato)bis(triphenylphosphine)ruthenium(II) methanol adduct, min. 98% (38596-61-1)
 $RuCO[(C_6H_5)_3P]_2(CF_3COO)_2 \cdot XCH_3OH$; FW: 879.71; orange xtl.;
 m.p. 230° dec.

250mg
1g

Technical Notes:

- Catalyst for the dehydrogenation of alcohols into aldehydes and ketones.
- Catalyst for regioselective reductive hydroxymethylation of alkynes with paraformaldehyde.



**Tech. Note (2)
Ref. (1)**

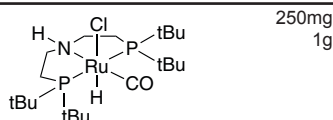
References:

- Angew. Chem. Int. Ed.*, **2011**, *50*, 5687

44-1035

NEW

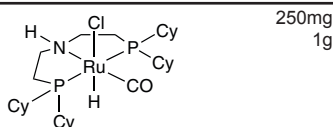
Carbonylchlorohydrido[bis(2-di-*t*-butylphosphinoethyl)amine]ruthenium(II), min. 97% (1421060-10-7)
 $C_{21}H_{46}ClNOP_2Ru$; FW: 527.07; off-white solid
air sensitive



44-1043

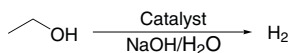
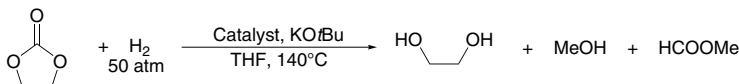
NEW

Carbonylchlorohydrido[bis(2-di-cyclohexylphosphinoethyl)amine]ruthenium(II), min. 97% (1421060-11-8)
 $C_{25}H_{54}ClNOP_2Ru$; FW: 631.22; white solid
air sensitive



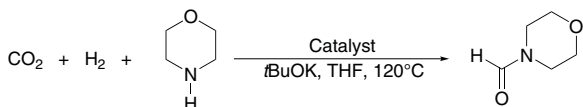
Technical Notes:

- Catalyst for the hydrogenation of ethylene carbonate to methanol.
- Catalyst for the generation of hydrogen from aqueous ethanol solution.
- Catalyst for the N-formylation of morpholine with hydrogen and carbon dioxide.



RUTHENIUM (Compounds)

44-1043 Carbonylchlorohydrido[bis(2-di-cyclohexylphosphinoethyl)amine]ruthenium(II), min. 97% (continued) (1421060-11-8)



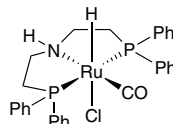
Tech. Note (3)
Ref. (3)

References:

1. *Angew. Chem. Int. Ed.*, **2012**, *51*, 13041.
2. *ChemSusChem*, **2014**, *7*, 2419.
3. *Angew. Chem. Int. Ed.*, **2015**, *54*, 6186.

44-0071 Carbonylchlorohydrido[bis(2-(diphenylphosphinoethyl)amino)ruthenium(II), min.98% Ru-MACHO™ (1295649-40-9)

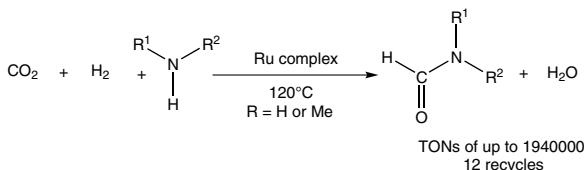
C₂₉H₃₀ClNOP₂Ru; FW: 607.03; white to yellow pwd.
air sensitive
Note: Manufactured under license of Takasago patent.
PCT/JP2010-004301.



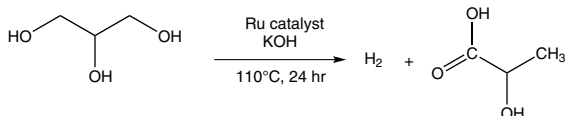
250mg
1g
5g

Technical Notes:

1. Highly efficient ruthenium-catalyzed used in the N-formylation of amines with hydrogen and carbon dioxide.
2. Ruthenium- catalyzed hydrogen generation from glycerol and selective synthesis of lactic acid.
3. See 44-0074.



Tech. Note (1)
Ref. (1)

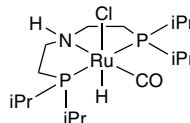


Tech. Note (2)
Ref. (2)

References:

1. *Angew. Chem., Int. Ed.*, **2015**, *54*, 6186
2. *Green Chem.*, **2015**, *17*, 193

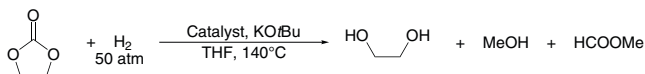
44-1032 Carbonylchlorohydrido[bis(2-di-i-propylphosphinoethyl)amine]ruthenium(II), min. 97% (1311164-69-8) (NEW)
C₁₇H₃₈ClNOP₂Ru; FW: 470.96; off-white solid
air sensitive



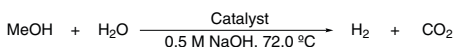
250mg
1g

Technical Notes:

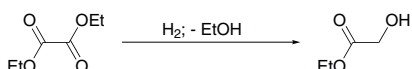
1. Catalyst for hydrogenation of ethylene carbonate to methanol.
2. Catalyst for dehydrogenation of aqueous-phase methanol to hydrogen and carbon dioxide.
3. Catalyst for hydrogenation of diethyl oxalate.
4. Catalyst for generation of hydrogen from aqueous ethanol solution.
5. Ruthenium- catalyzed hydrogen generation from glycerol and selective synthesis of lactic acid.
6. Catalyst N-formylation of morpholine with hydrogen and carbon dioxide.



Tech. Note (1)
Ref. (1)



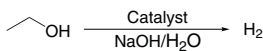
Tech. Note (2)
Ref. (2)



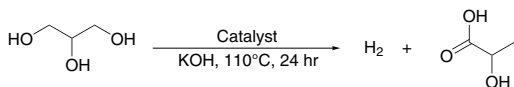
Tech. Note (3)
Ref. (3)

RUTHENIUM (Compounds)

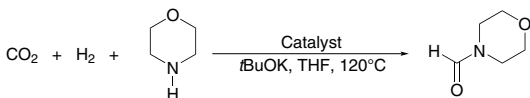
44-1032 Carbonylchlorohydrodi[bis(2-di-i-propylphosphinoethyl)amine]ruthenium(II), min. 97%
(continued) (1311164-69-8)



Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)

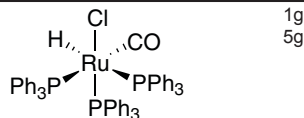


Tech. Note (6)
Ref. (6)

References:

1. *Angew. Chem. Int. Ed.*, **2012**, *51*, 13041.
2. *Nature*, **2013**, *495*, 85.
3. *ChemCatChem*, **2013**, *5*, 3228.
4. *ChemSusChem*, **2014**, *7*, 2419.
5. *Green Chem.*, **2015**, *17*, 193.
6. *Angew. Chem. Int. Ed.*, **2015**, *54*, 6186.

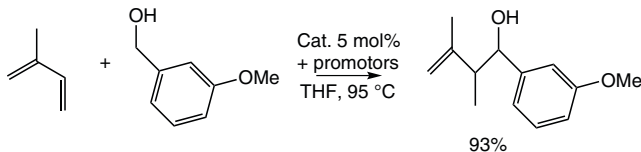
44-0085 Carbonylchlorohydrotris(triphenylphosphine) ruthenium(II), 99% (16971-33-8)
Ru(CO)ClH[P(C₆H₅)₃]₃; FW: 952.40; off-white to tan powdr.; m.p. 209-210°



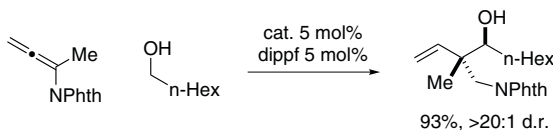
1g
5g

Technical Notes:

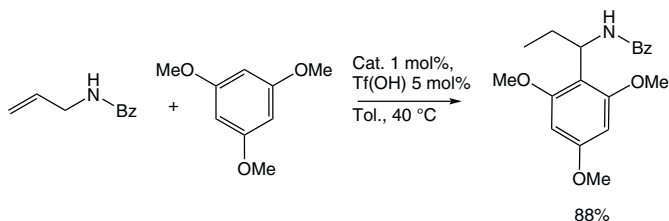
1. Catalyst for alcohol α-allylation with dienes or allenes under transfer hydrogenation conditions.
2. Catalyst for tandem isomerization (to imine), followed by Friedel Crafts alkylation.
3. Catalyst for amination of alcohols with ammonia.



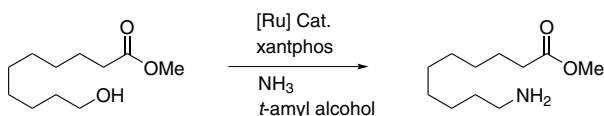
Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (2)



Tech. Note (2)
Ref. (3)



Tech. Note (3)
Ref. (4)

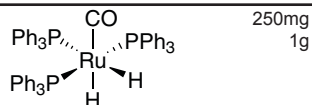
RUTHENIUM (Compounds)

44-0085 Carbonylchlorohydridotris(triphenylphosphine)ruthenium(II), 99% (16971-33-8)
(continued)

References:

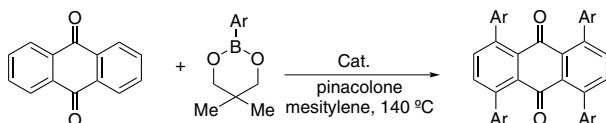
1. *J. Am. Chem. Soc.*, **2008**, *130*, 6338.
2. *J. Am. Chem. Soc.*, **2011**, *133*, 1141.
3. *J. Am. Chem. Soc.*, **2008**, *130*, 14453.
4. *Angew. Chem. Int. Ed.*, **2011**, *50*, 7599.

44-0100 Carbonyl(dihydrido)tris(triphenylphosphine) ruthenium (II), 99% (25360-32-1)
Ru(CO)(H)₂(P(C₆H₅)₃)₃; FW: 917.97;
white to off-white pwdr.

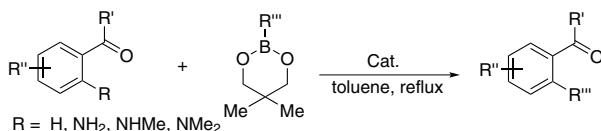


Technical Notes:

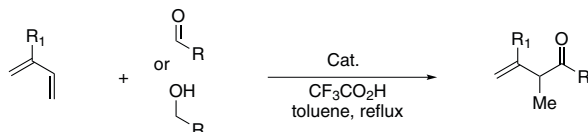
1. Catalyst for the arylation (or alkenylation) of anthraquinone and PBI.
2. Catalytic C-C bond formation.
3. Transfer hydrogenative coupling of isoprene to alcohols or aldehydes.
4. Alkanes (and alkenes) from alcohols by tandem hydrogen transfer and condensation.
5. Catalyst for the conversion of primary alcohols and aldehydes into methyl esters.
6. Precatalyst for hydrogen production by means of alcohol dehydrogenation.



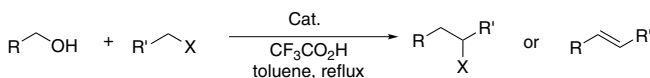
Tech. Note (1)
Ref. (1-3)



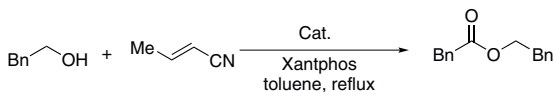
Tech. Note (2)
Ref. (4-6)



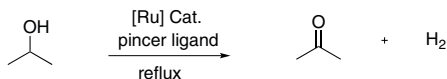
Tech. Note (3)
Ref. (7)



Tech. Note (4)
Ref. (8,9)



Tech. Note (5)
Ref. (10)



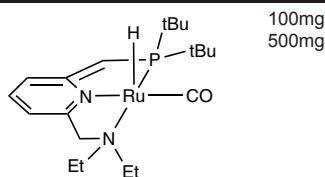
Tech. Note (6)
Ref. (11)

References:

1. *Org. Lett.*, **2009**, *11*, 1951.
2. *Org. Lett.*, **2009**, *11*, 5426.
3. *Chem. Eur. J.*, **2009**, *15*, 7530.
4. *J. Am. Chem. Soc.*, **2009**, *131*, 7238.
5. *Org. Lett.*, **2009**, *11*, 855.
6. *J. Am. Chem. Soc.*, **2007**, *129*, 6098.
7. *J. Am. Chem. Soc.*, **2008**, *130*, 14120.
8. *Dalton Trans.*, **2009**, 716.
9. *Adv. Synth. Catal.*, **2008**, *350*, 1975.
10. *Synthesis*, **2009**, *9*, 1578.
11. *Angew. Chem. Int. Ed.*, **2011**, *50*, 9593.

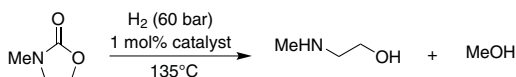
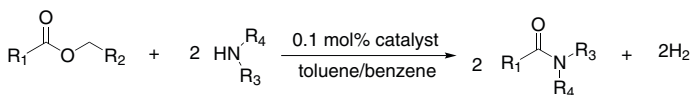
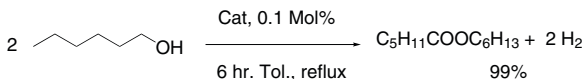
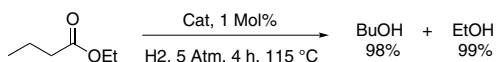
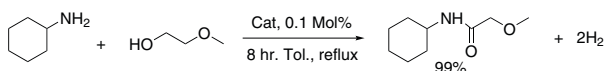
RUTHENIUM (Compounds)

44-0091 Carbonylhyrido[6-(di-*t*-butylphosphinomethylene)-2-(*N,N*-diethylaminomethyl)-1,6-dihydropyridine] ruthenium(II), min. 98% Milstein Catalyst (863971-63-5)
 $C_{20}H_{35}N_2OPRu$; FW: 451.55; red-black solid
air sensitive, (store cold)



Technical Notes:

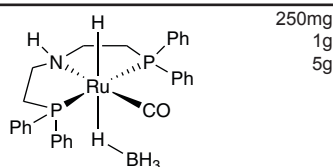
1. Ruthenium catalyst for the direct synthesis of amides from alcohols and primary amines.
2. Ruthenium catalyst for the hydrogenation of esters in high yields under mild pressure and neutral conditions.
3. Ruthenium catalyst for the dehydrogenative coupling of alcohols to form esters in high yields under neutral conditions.
4. Ruthenium catalyst for the synthesis of amides from esters and amines with liberation of hydrogen gas.
5. Ruthenium catalyst for the hydrogenation of 3-methyl-2-oxalidinone



References:

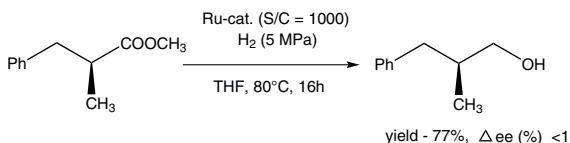
1. *Science*, **2007**, 317, 790
2. *Angew. Chem. Int. Ed.*, **2006**, 45, 1113
3. *J. Am. Chem. Soc.*, **2005**, 127, 12429
4. *J. Am. Chem. Soc.*, **2005**, 127, 10840
5. *J. Am. Chem. Soc.*, **2011**, 133, 1682
6. *ACS Catal.*, **2015**, 5, 2416

44-0074 Carbonylhyrido(tetrahydroborato)[bis(2-diphenylphosphinoethyl) amino]ruthenium(II), min.98% Ru-MACHO™-BH (1295649-41-0)
 $C_{27}H_{34}BNOP_2Ru$; FW: 586.41; white to yellow pwr.
air sensitive
 Note: Manufactured under license of Takasago patent PCT/JP2010-004301.

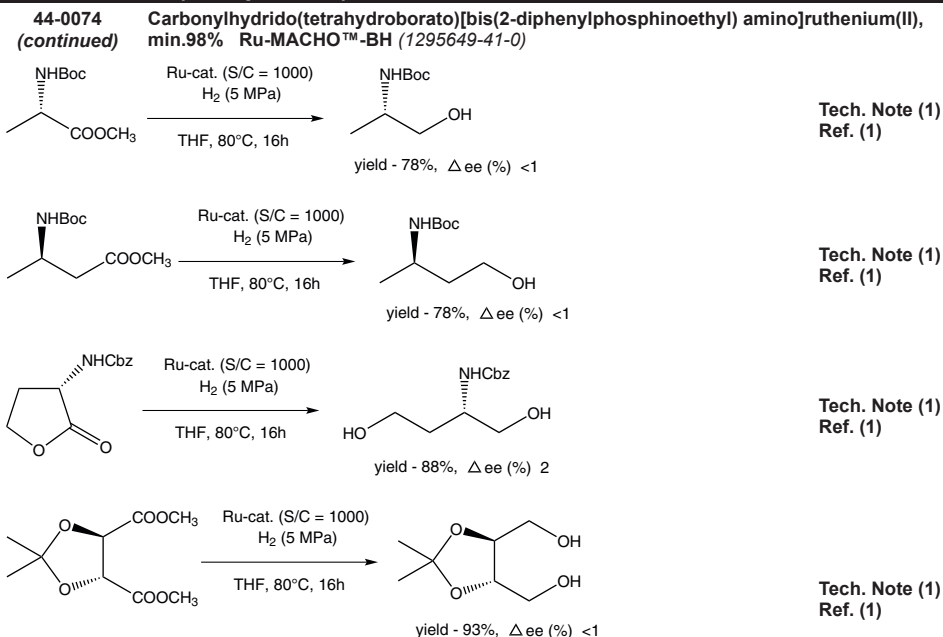


Technical Notes:

1. Catalyst used for hydrogenation of esters.
2. See 44-0071.



RUTHENIUM (Compounds)



Δee (%) = (%ee of substrate) - (%ee of product)

References:

- PCT Application No. PCT/JP2010-004301.

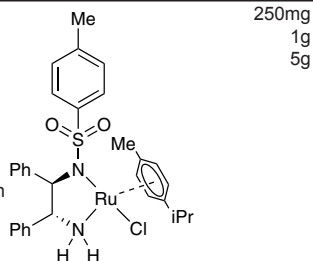
96-5900	Chiral Quest Catalyst and Ligand Toolbox Kit for Asymmetric Hydrogenation See page 333	
44-0156	Chloro{[(1R,2R)-(-)-2-amino-1,2-diphenylethyl](pentafluorophenylsulfonyl)amido}(p-cymene)ruthenium(II), min. 90% RuCl{[(R,R)-Fsdpen]}(p-cymene) (1026995-71-0) $C_{30}H_{28}ClF_5N_2O_2RuS$; FW: 712.14; orange to brown powdr. <i>air sensitive</i> Note: Manufactured under license of Takasago patent US7129367B2.	250mg 1g 5g
Technical Note:	1. Catalyst used in the asymmetric transfer hydrogenation of ketones using formic acid-triethylamine mixture.	
References:	1. <i>J. Am. Chem. Soc.</i> , 1996 , <i>118</i> , 2521.	Tech. Note (1) Ref. (1)
44-0157	Chloro{[(1S,2S)-(+)-2-amino-1,2-diphenylethyl](pentafluorophenylsulfonyl)amido}(p-cymene)ruthenium(II), min. 90% RuCl{[(S,S)-Fsdpen]}(p-cymene) (1026995-72-1) $C_{30}H_{28}ClF_5N_2O_2RuS$; FW: 712.14; orange to brown powdr. <i>air sensitive</i> Note: Manufactured under license of Takasago patent US7129367B2. Takasago ATH Catalyst Kit component.	250mg 1g 5g

RUTHENIUM (Compounds)

44-0149 Chloro{[(1*S*,2*S*)-(+)-2-amino-1,2-diphenylethyl](4-toluenesulfonyl)amido}(p-cymene)ruthenium(II), min. 90% RuCl[(*S,S*)-Tsdpen](p-cymene) (192139-90-5)
 C₃₁H₃₅ClN₂O₂RuS; FW: 636.21; yellow to dark brown solid
air sensitive
 Note: Manufactured under license of Takasago patent US7129367B2.
 Takasago ATH Catalyst Kit component.

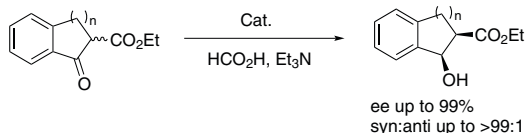
250mg
 1g
 5g

44-0148 Chloro{[(1*R*,2*R*)-(-)-2-amino-1,2-diphenylethyl](4-toluenesulfonyl)amido}(p-cymene)ruthenium(II), min. 95% RuCl[(*R,R*)-Tsdpen](p-cymene) (192139-92-7)
 C₃₁H₃₅ClN₂O₂RuS; FW: 636.21; yellow to dark brown solid
air sensitive
 Note: Manufactured under license of Takasago patent US7129367B2. Takasago ATH Catalyst Kit component.

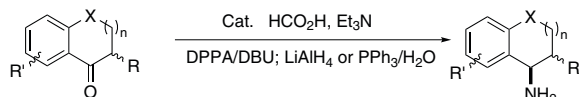


Technical Note:

- This catalyst has shown to effect highly enantioselective hydrogenation of functionalized ketones where the substituents are dialkylamino, hydroxy, siloxy, carbonyl, ester, amide or thioester.

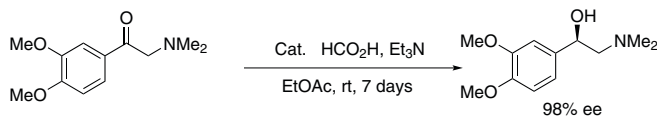


Tech. Note (1)
 Ref. (1)

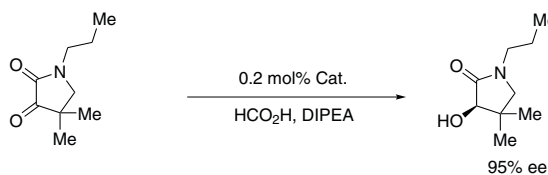


Tech. Note (1)
 Ref. (2)

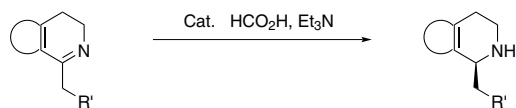
n = 0,1; R = alkyl, F, OAc; X = CH₂, O



Tech. Note (1)
 Ref. (3)



Tech. Note (1)
 Ref. (4-6)



Tech. Note (1)
 Ref. (7,8)

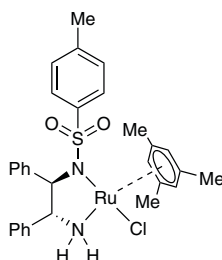
References:

- Tetrahedron*, **2007**, 63, 7532
- Tetrahedron*, **2007**, 63, 6755
- Tetrahedron: Asymmetry*, **2009**, 20, 1138
- J. Org. Chem.*, **2009**, 74, 1411
- Org. Lett.*, **2007**, 9, 2461
- Org. Lett.*, **2009**, 11, 935
- Angew. Chem. Int. Ed.*, **2009**, 48, 7616
- Bioorg. Med. Chem. Lett.*, **2008**, 18, 4110

RUTHENIUM (Compounds)

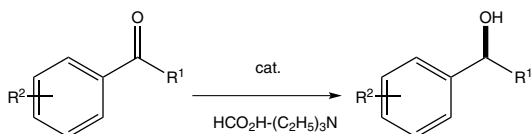
44-0154 Chloro{[(1*R*,2*R*)-(-)-2-amino-1,2-diphenylethyl] (4-toluenesulfonylamido)(mesitylene) ruthenium(II), min. 90% RuCl{[(*R,R*)-Tsdpen(mesitylene)] (174813-82-2) C₃₀H₃₃ClN₂O₂RuS; FW: 622.18; orange powdr. *air sensitive*
Note: Manufactured under license of Takasago patent US7129367B2. Takasago ATH Catalyst Kit component.

250mg
1g
5g



Technical Note:

1. Catalyst used in the asymmetric transfer hydrogenation of ketones using formic acid-triethylamine mixture.



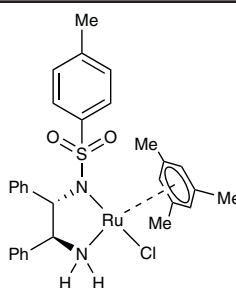
Tech. Note (1)
Ref. (1)

References:

1. *J. Am. Chem. Soc.*, **1996**, *118*, 2521.

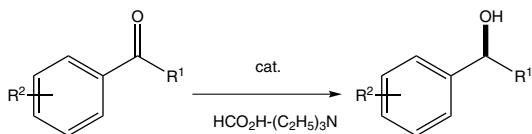
44-0155 Chloro{[(1*S*,2*S*)-(+)-2-amino-1,2-diphenylethyl] (4-toluenesulfonylamido)(mesitylene) ruthenium(II), min. 90% RuCl{[(*S,S*)-Tsdpen] (mesitylene)] (174813-81-1) C₃₀H₃₃ClN₂O₂RuS; FW: 622.18; yellow to dark brown solid *air sensitive*
Note: Manufactured under license of Takasago patent US7129367B2. Takasago ATH Catalyst Kit component.

250mg
1g
5g



Technical Note:

1. Catalyst used in the asymmetric transfer hydrogenation of ketones using formic acid-triethylamine mixture.



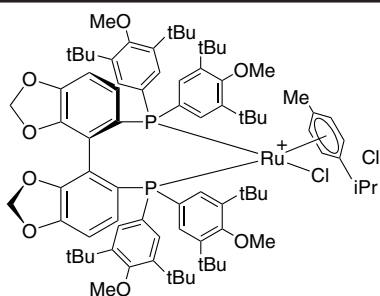
Tech. Note (1)
Ref. (1)

References:

1. *J. Am. Chem. Soc.*, **1996**, *118*, 2521.

44-0102 Chloro{(*R*)-(-)-5,5'-bis[di(3,5-di-*t*-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene) ruthenium(II) chloride [RuCl(p-cymene)((*R*)-dtbm-segphos®)]Cl (944451-32-5) [C₈₄H₁₁₄ClO₈P₂Ru]⁺Cl⁻; FW: 1485.72; yellow to dark brown powdr.; m.p. >100° dec. *air sensitive*
Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

250mg
1g
5g

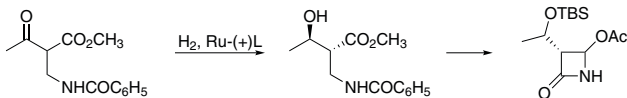


Technical Notes:

1. See 15-0066.
2. Biaryl bisphosphine ligand with narrow dihedral angle. The DTBM SEGPHOS ligand, as the ruthenium complex, gives superior enantioselectivity and diastereoselectivity through dynamic kinetic resolution in the asymmetric hydrogenation of α -substituted- β -ketoesters useful in the synthesis of carbapenem antibiotics.

RUTHENIUM (Compounds)

44-0102 Chloro{*(R)*-(-)-5,5'-bis[di(3,5-di-*t*-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene){(*R*)-dtbm-segphos®}]Cl (944451-32-5)



Tech. Note (2)
Ref. (1)

References:

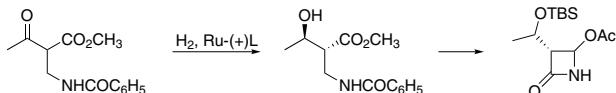
1. *Adv. Synth. Cat.*, **2001**, 343, 264

44-0103 Chloro{*(S)*-(+)-5,5'-bis[di(3,5-di-*t*-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene){(*S*)-dtbm-segphos®}]Cl (944451-33-6) 250mg
1g
5g
[C₈₄H₁₁₄ClO₈P₂Ru]⁺Cl⁻; FW: 1485.72; orange to brown powdr.; m.p. >100° dec.
air sensitive

Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

Technical Notes:

1. See 15-0066.
2. Biaryl bisphosphine ligand with narrow dihedral angle. The DTBM SEGPHOS ligand, as the ruthenium complex, gives superior enantioselectivity and diastereoselectivity through dynamic kinetic resolution in the asymmetric hydrogenation of α -substituted β -ketoesters useful in the synthesis of carbapenem antibiotics.



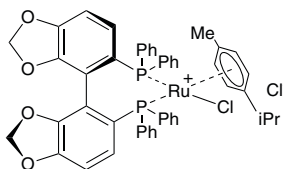
Tech. Note (2)
Ref. (1)

References:

1. *Adv. Synth. Cat.*, **2001**, 343, 264

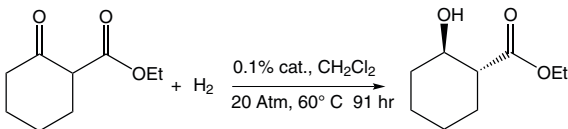
44-0096 Chloro{*(R)*-(+)-5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene){(*R*)-segphos®}]Cl (944451-28-9) 250mg
1g
5g
[C₄₈H₄₂ClO₄P₂Ru]⁺Cl⁻; FW: 916.77; yellow powdr.; m.p. >100° dec.
air sensitive

Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.



Technical Notes:

1. Highly active highly enantioselective catalyst for hydrogenation of functionalized ketones. Slightly higher temperature is necessary to activate the cymene complexes. See 15-0136.
2. Asymmetric hydrogenation of α -substituted β -alkyl- β -ketoesters accompanied by dynamic kinetic resolution.



Tech. Note (1)
Ref. (1)

98%, 98% ee, 88% de

References:

1. U.S. Pat. 7038087.

44-0097 Chloro{*(S)*-(-)-5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene){(*S*)-segphos®}]Cl (944451-29-0) 250mg
1g
5g
[C₄₈H₄₂ClO₄P₂Ru]⁺Cl⁻; FW: 916.77; ocher to dark brown powdr.; m.p. >100° dec.
air sensitive

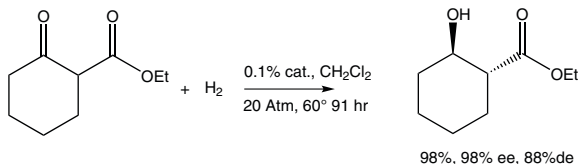
Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

RUTHENIUM (Compounds)

44-0097 Chloro[(S)-(-)-5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole](p-cymene) (continued) ruthenium(II) chloride [RuCl(p-cymene)((S)-segphos®)]Cl (944451-29-0)

Technical Notes:

- Highly active highly enantioselective catalyst for hydrogenation of functionalized ketones. Slightly higher temperature is necessary to activate the cymene complexes. See 15-0136.
- Asymmetric hydrogenation of α -substituted- β -alkyl- β -ketoesters accompanied by dynamic kinetic resolution.



Tech. Note (1)
Ref. (1)

References:

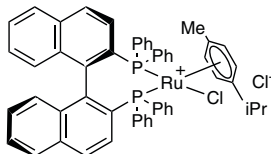
- U.S. Pat. 7038087.

44-6063	<p>Chloro[(S)-(-)-2,2'-bis[diphenylphosphino]-1,1'-binaphthyl][(S)-1,1-bis(4-methoxyphenyl)-3-methylbutane-1,2-diamine]ruthenium(II) tetrafluoroborate, min. 97% (1150112-86-9) $C_{63}H_{58}BClF_4N_2O_2P_2Ru$; FW: 1160.40; orange-red solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only. WO 2009055912.</p>		100mg 500mg
44-6066	<p>Chloro[(S)-(-)-2,2'-bis[diphenylphosphino]-1,1'-binaphthyl][(S)-1,1-bis(4-methoxyphenyl)-3-methylbutane-1,2-diamine]ruthenium(II) tetrakis(pentafluorophenyl)borate, min. 97% (1150112-87-0) $C_{87}H_{58}BClF_{20}N_2O_2P_2Ru$; FW: 1752.70; orange-red solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only. WO 2009055912.</p>		100mg 500mg
44-6053	<p>Chloro[(S)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(1S,2S)-cyclohexane-1,2-diamine]ruthenium(II) tetrafluoroborate, min. 97% $C_{50}H_{46}BClF_4N_2P_2Ru$; FW: 960.19; yellow solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only. WO 2009055912.</p>		100mg 500mg
44-6054	<p>Chloro[(R)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(1R,2R)-cyclohexane-1,2-diamine]ruthenium(II) tetrakis(pentafluorophenyl) borate, min. 97% (1150112-55-2) $C_{74}H_{46}BClF_{20}N_2P_2Ru$; FW: 1552.42; yellow solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only. WO 2009055912.</p>		100mg 500mg

RUTHENIUM (Compounds)

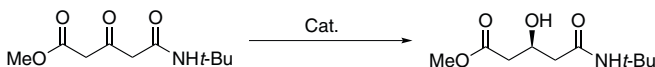
44-6055 Chloro[(S)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(1S,2S)-cyclohexane-1,2-diamine]ruthenium(II) tetrakis(pentafluorophenyl) borate, min. 97%
 $C_{74}H_{46}BClF_{20}N_2P_2Ru$; FW: 1552.42; yellow solid
air sensitive
 Note: Sold under license from Kanata for research purposes only.
 WO 2009055912.

44-0084 Chloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl](p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-binap)]Cl (145926-28-9)
 $[C_{54}H_{46}ClP_2Ru]^+Cl^-$; FW: 928.87; orange powdr.; m.p. >100° dec.
air sensitive
 Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Cymene Catalyst Kit component.



Technical Note:

1. An efficient catalytic asymmetric synthesis of a β^2 -amino acid on a multikilogram scale.



Tech. Note (2)
 Ref. (1)

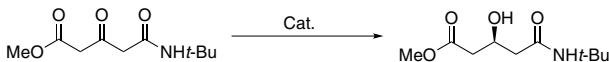
References:

1. *Org. Process Res. & Devel.* **2014**, *18*, 135.

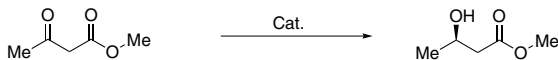
44-0086 Chloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl](p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((S)-binap)]Cl (130004-33-0)
 $[C_{54}H_{46}ClP_2Ru]^+Cl^-$; FW: 928.87; orange powdr.; m.p. >100° dec.
air sensitive
 Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Cymene Catalyst Kit component.

Technical Notes:

1. See 15-0151.
2. This catalyst has shown to effect the highly enantioselective hydrogenation of functionalized ketones where the substituents are dialkylamino, hydroxy, siloxy, carbonyl, ester, amide or thioester.



Tech. Note (2)
 Ref. (1)

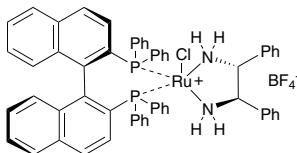


Tech. Note (2)
 Ref. (2)

References:

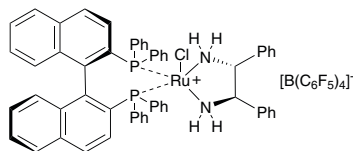
1. *Tetrahedron Lett.*, **2008**, *49*, 4836
2. *Appl. Catal. A.*, **2009**, *366*, 160

44-6057 Chloro[(R)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(1R,2R)-2-(diphenylphosphino)-1,2-diphenylethanamine]ruthenium(II) tetrafluoroborate, min. 97% (1150112-54-1)
 $C_{70}H_{56}BClF_4NP_3Ru$; FW: 1227.45; orange to brown solid
air sensitive
 Note: Sold under license from Kanata for research purposes only. WO 2009055912.



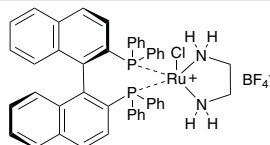
RUTHENIUM (Compounds)

44-6070 Chloro[(R)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(1R,2R)-2-(diphenylphosphino)-1,2-diphenylethanamine]ruthenium(II), tetrakis(pentafluorophenyl)borate, min. 97% (1150112-53-0)
 $C_{94}H_{56}BClF_{20}NP_3Ru$; FW: 1819.68; orange to brown solid
air sensitive
 Note: Sold under license from Kanata for research purposes only. WO 2009055912.



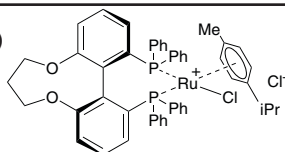
100mg
500mg

44-6056 Chloro[(R)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][2-(diphenylphosphino)ethanamine]ruthenium(II) tetrafluoroborate, min. 97% (1150112-44-9)
 $C_{58}H_{48}BClF_4NP_3Ru$; FW: 1075.26; yellow solid
air sensitive
 Note: Sold under license from Kanata for research purposes only. WO 2009055912.



100mg
500mg

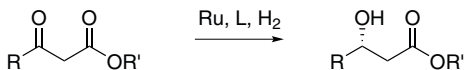
44-0109 Chloro[(R)-(-)-1,13-bis(diphenylphosphino)-7,8-dihydro-6H-dibenzof[h,h][1,5]dioxonin](p-cymene) ruthenium(II) chloride (R)-C₃-TUNEPHOS-Ru [RuCl(C₃₈H₃₂O₂P₂)(C₁₀H₁₄)⁺Cl⁻]; FW: 900.81; orange to brown powd.
air sensitive
 Note: Sold in collaboration with Chiral Quest for research purposes only. Patent US 6,521,769.
 Chiral Quest Catalyst and Ligand Toolbox Kit component.



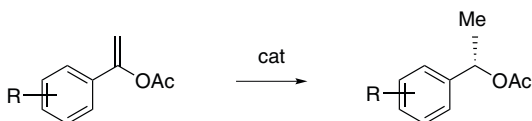
100mg
500mg

Technical Notes:

1. New generation of chiral biaryl phosphine ligands with tunable dihedral angles. The ability to modify the dihedral angle allows for the fine tuning of the catalyst system and optimization of enantioselectivity. See 15-0175.
2. Ru-C₃-TUNEPHOS complexes are used for asymmetric hydrogenation of β-ketoesters¹, enol acetates², cyclic β-amino acids³, α-phthalimide ketones⁴, and α-keto esters⁵.



Tech. Note (2)
Ref. (1)

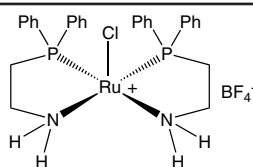


Tech. Note (2)
Ref. (2)

References:

1. *J. Org. Chem.*, **2000**, *65*, 6223.
2. *Org. Lett.*, **2002**, *4*, 4495.
3. *J. Am. Chem. Soc.*, **2003**, *125*, 9570.
4. *J. Am. Chem. Soc.*, **2004**, *126*, 1626.
5. *Synlett.*, **2006**, *126*, 1169.

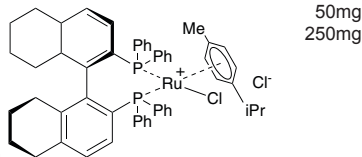
44-6060 Chlorobis[2-(diphenylphosphino)ethanamine] ruthenium(II) tetrafluoroborate, min. 97% (1150112-46-1)
 $C_{28}H_{32}BClF_4N_2P_2Ru$; FW: 681.84; yellow solid
air sensitive
 Note: Sold under license from Kanata for research purposes only. WO 2009055912.



100mg
500mg

RUTHENIUM (Compounds)

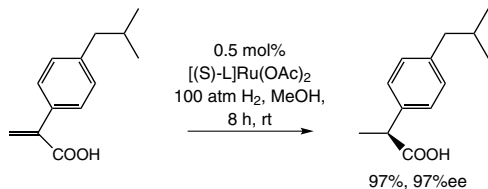
44-0094 Chloro[(R)-(+)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl](p-cymene)ruthenium(II) chloride
[RuCl(p-cymene)((R)-H₈-binap)]Cl (944451-26-7)
 [C₅₄H₅₄ClP₂Ru]⁺Cl⁻; FW: 936.93;
 pale yellow powdr.; m.p. >100° dec.
air sensitive
 Note: Manufactured under license of Takasago patent.



50mg
250mg

Technical Notes:

1. Biaryl bisphosphine ligand. The H₈-BINAP ligand, as the ruthenium complex, catalyzes hydrogenation of unsaturated carboxylic acids to a higher ee than does BINAP. (Ref. 1,2)
2. The ruthenium catalyzed hydrogenation of aryl propenoic acid to produce the drug Ibuprofen.



Tech. Note (1,2)
Ref. (1,2)

References:

1. *J. Org. Chem.*, **1996**, 61, 5510
2. *Topics Organometal. Chem.* **2004**, 6, 63, review

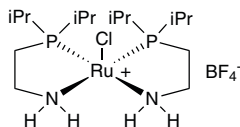
44-0095 Chloro[(S)-(-)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl](p-cymene)ruthenium(II) chloride
[RuCl(p-cymene)((S)-H₈-binap)]Cl (944451-27-8)
 [C₅₄H₅₄ClP₂Ru]⁺Cl⁻; FW: 936.93; pale yellow powdr.; m.p. >100° dec.
air sensitive
 Note: Manufactured under license of Takasago patent.

50mg
250mg

Technical Note:

1. See 44-0094 (page 246)

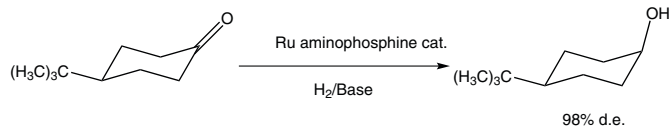
44-6068 Chlorobis[2-(di-i-propylphosphino)ethanamine]ruthenium(II) tetrafluoroborate, min. 97%
 C₁₆H₄₀BClF₄N₂P₂Ru; FW: 546.14; red-brown solid
air sensitive
 Note: Sold under license from Kanata for research purposes only. WO 2009055912.



100mg
500mg

Technical Note:

1. Excellent catalyst for the hydrogenation of ketones and imines.

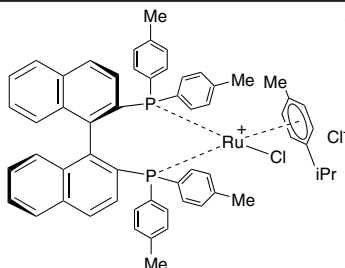


Tech. Note (1)
Ref. (1)

References:

1. *J. Chem. Soc., Dalton Trans.*, **2009**, 8301

44-0088 Chloro[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl](p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-tolbinap)]Cl (131614-43-2)
 [C₅₈H₅₈ClP₂Ru]⁺Cl⁻; FW: 984.97;
 brown powdr.; m.p. >100° dec.
air sensitive
 Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Cymene Catalyst Kit component.
 For detailed technical note visit strem.com.



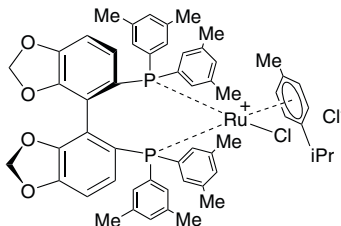
250mg
1g
5g

RUTHENIUM (Compounds)

44-0089 Chloro{[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl](p-cymene) ruthenium(II) chloride [RuCl(p-cymene)((S)-tolbinap)]Cl (228120-95-4) [C₅₈H₅₈ClP₂Ru]⁺Cl⁻; FW: 984.97; yellow to dark brown solid; m.p. >100° dec. 250mg
5g
air sensitive

Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Cymene Catalyst Kit component.
For detailed technical note visit strem.com.

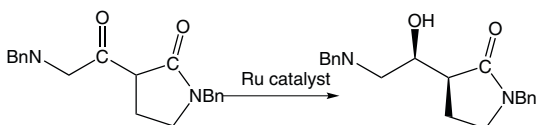
44-0098 Chloro{(R)-(+)-5,5'-bis[di(3,5-xylyl) phosphino]-4,4'-bi-1,3-benzodioxole} (p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-dm-segphos®)]Cl (944451-30-3) 250mg
1g
5g
[C₅₆H₅₆ClO₄P₂Ru]⁺Cl⁻; FW: 1028.98; orange to brown powder; m.p. >100° dec. *air sensitive*



Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

Technical Note:

1. Ruthenium catalyst used for the asymmetric hydrogenation of β-ketoimides.



Tech. Note (1)
Ref. (1)

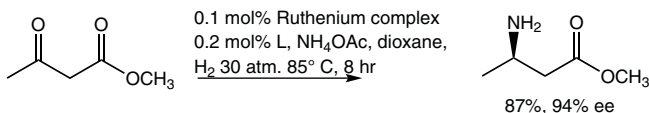
References:

1. *J. Org. Chem.*, **2012**, *77*, 4732

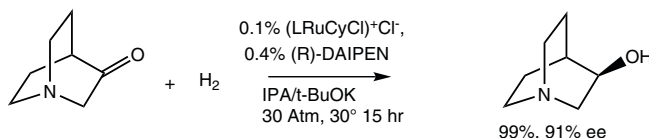
44-0099 Chloro{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole} (p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((S)-dm-segphos®)]Cl (944451-31-4) 250mg
1g
5g
[C₅₆H₅₆ClO₄P₂Ru]⁺Cl⁻; FW: 1028.98; orange to brown powder; m.p. >100° dec. *air sensitive*
Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

Technical Notes:

1. Biaryl bisphosphine ligand with narrow dihedral angle. The DM-SEGPHOS ligand, as the ruthenium complex, gives superior enantioselectivity and diastereoselectivity in the asymmetric hydrogenation of α-substituted-β-ketoesters. See 15-0066.
2. Ruthenium catalyzed enantioselective synthesis of β amino acids by hydrogenation.
3. Ruthenium catalyzed asymmetric hydrogenation of 3-quinuclidinone.



Tech. Note (2)
Ref. (1, 2)



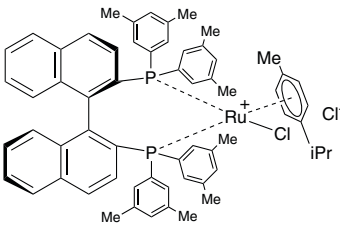
Tech. Note (3)
Ref. (3)

References:

1. *WIPO Pat.* WO2005028419
2. *J. Am. Chem. Soc.*, **2009**, *131*, 11316
3. *U.S. Patent* US7462722.

RUTHENIUM (Compounds)

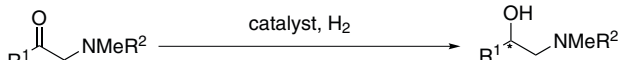
44-0092 Chloro((R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl)(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-xylinap)]Cl (944451-24-5)
 $[C_{62}H_{62}ClP_2Ru] \cdot Cl$; FW: 1041.08; orange to brown powdr.; m.p. >100° dec. *air sensitive*
 Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Cymene Catalyst Kit component.



250mg
1g
5g

Technical Notes:

- See 15-0150.
- Ligand used in the asymmetric hydrogenation of amino ketones.



Tech. Note (1)
Ref. (1)

References:

- J. Am. Chem. Soc., 2000, 122, 6510
- World Patent WO2005/028419

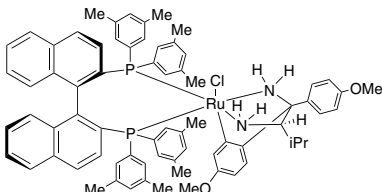
44-0093 Chloro((S)-(-)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl)(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((S)-xylinap)]Cl (944451-25-6)
 $[C_{62}H_{62}ClP_2Ru] \cdot Cl$; FW: 1041.08; orange to brown powdr.; m.p. >100° dec. *air sensitive*
 Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Cymene Catalyst Kit component.

250mg
1g
5g

Technical Note:

- See 44-0092 (page 248)

44-0217 Chloro((R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl)[(2R)-(-)-1-(4-methoxyphenyl)-1'-(4-methoxyphenyl)-kC]-3-methyl-1,2-butanediamine]ruthenium(II) (R)-RUCY™-XyIBINAP (1384974-38-2)
 $C_{71}H_{73}ClN_2O_2P_2Ru$; FW: 1184.82; yellow to dark brown/green solid *air sensitive*

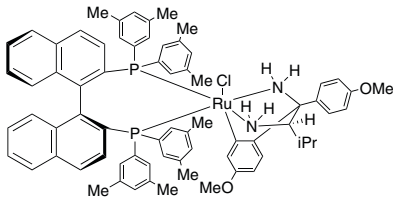


100mg
250mg
1g
5g

Technical Note:

- See 44-0218 (page 248)

44-0218 Chloro((S)-(-)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl)[(2S)-(+)-1-(4-methoxyphenyl)-1'-(4-methoxyphenyl)-kC]-3-methyl-1,2-butanediamine]ruthenium(II) (S)-RUCY™-XyIBINAP (1312713-89-5)
 $C_{71}H_{73}ClN_2O_2P_2Ru$; FW: 1184.82; yellow to dark brown/green solid *air sensitive*
 Note: Manufactured under license of Takasago patent application no. JP2010-104552. Takasago BINAP Ru Diamine Catalyst Kit component. Takasago ATH Catalyst Kit component.



250mg
1g
5g

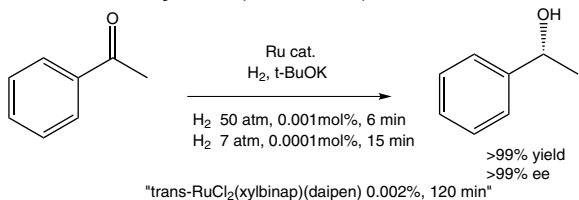
Technical Note:

- Catalyst used for the rapid, and highly selective hydrogenation of ketones.

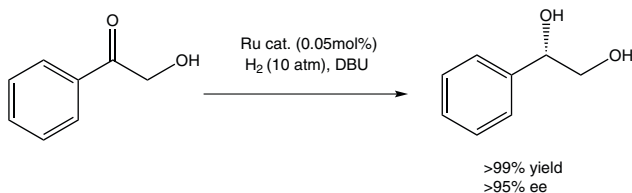
RUTHENIUM (Compounds)

44-0218
(continued)

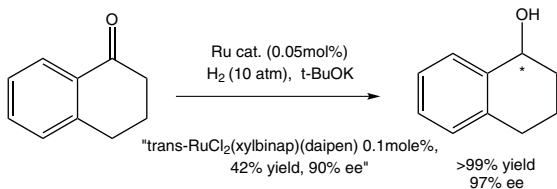
Chloro{(S)-(-)-2,2'-bis[di(3,5-xylyl) phosphino]-1,1'-binaphthyl}[(2S)- (+)-1-(4-methoxyphenyl)-1'-(4-methoxyphenyl-kC)-3-methyl-1,2-butanediamine]ruthenium(II) (S)-RUCY™-XyIBINAP (1312713-89-5)



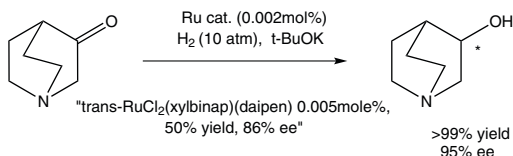
Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



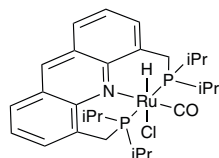
Tech. Note (1)
Ref. (1)

References:

1. Patent Application No. JP2010-104552

44-0525

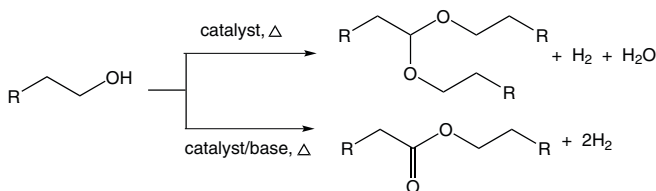
Chlorocarbonylhydrido[4,5-bis-(di-*i*-propylphosphinomethyl) acridine] ruthenium(II), min.98% Milstein Acridine Catalyst (1101230-25-4)
C₂₈H₄₀ClN₂OP₂Ru; FW: 605.09; orange solid
air sensitive
Note: Patents: US provisional 61/087,708, PCT/IL2009/000778.



25mg
100mg

Technical Notes:

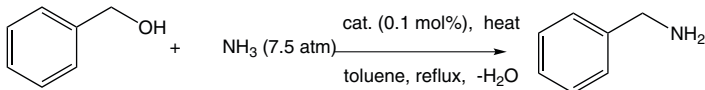
1. Useful ruthenium catalyst for the direct conversion of alcohols to acetals and esters.
2. Useful ruthenium catalyst for the selective synthesis of amines directly from alcohols and ammonia.
3. Catalyst used in the direct amination of primary amines by water to produce alcohols.



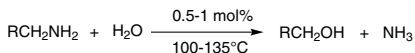
Tech. Note (1)
Ref. (1)

RUTHENIUM (Compounds)

44-0525 Chlorocarbonylhydrido[4,5-bis-(di-*i*-propylphosphinomethyl) acridine] ruthenium(II),
(continued) min.98% Milstein Acridine Catalyst (1101230-25-4)



Tech. Note (2)
Ref. (2)

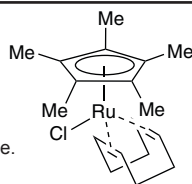


Tech. Note (3)
Ref. (3)

References:

1. *J. Am. Chem. Soc.*, **2009**, 131, 3146
2. *Angew. Chem. Int. Ed.*, **2008**, 47, 8661
3. *Angew. Chem. Int. Ed.*, **2013**, 52, 6269

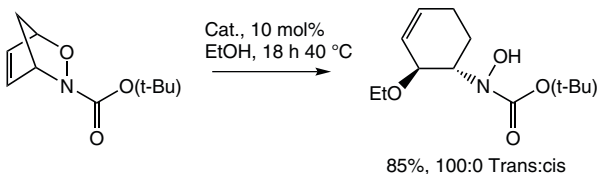
44-0113 Chloro(1,5-cyclooctadiene)
(pentamethylcyclopentadienyl)ruthenium(II), 98%
(92390-26-6)
 $\text{RuCl}(\text{C}_8\text{H}_{12})(\text{C}_{10}\text{H}_{15})$; FW: 379.93; brown microxtls.
(store cold)



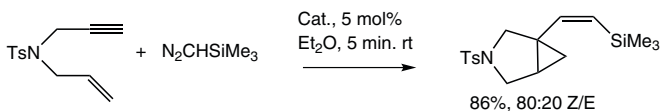
250mg
1g

Technical Notes:

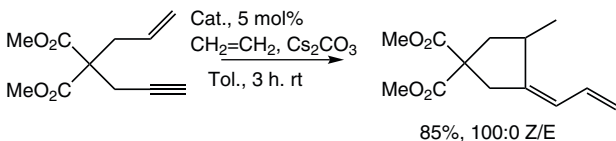
1. Catalyst for regio and stereo-specific ring opening via N-O bond cleavage.
2. Catalyst for transformation of 1,6-enynes and diazoalkanes into alkenylbicyclo[3.1.0]hexane derivatives.
3. Catalyst for ring closing enyne metathesis.
4. Catalyst for [2 + 2 + 2] cocyclization of diene-yne, and cyclodimerization of allenynes.
5. Catalyst for hydrovinylation of ynamides with ethylene.
6. Catalyst for C-H insertion reactions of carbenes.



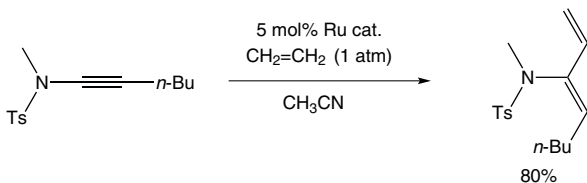
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



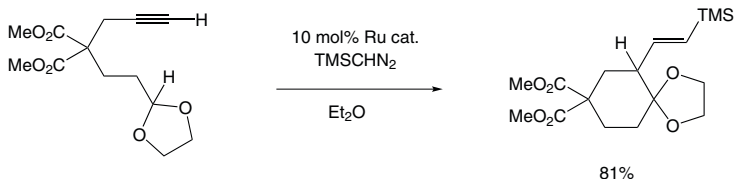
Tech. Note (3)
Ref. (3)



Tech. Note (5)
Ref. (6)

RUTHENIUM (Compounds)

44-0113 Chloro(1,5-cyclooctadiene)(pentamethylcyclopentadienyl)ruthenium(II), 98% (92390-26-6)
(continued)



Tech. Note (6)
Ref. (7)

References:

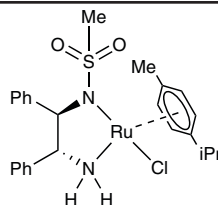
1. *Org. Lett.*, **2009**, *11*, 2077.
2. *J. Am. Chem. Soc.*, **2007**, *129*, 6037.
3. *Organometallics*, **2008**, *27*, 6313.
4. *J. Am. Chem. Soc.*, **2007**, *129*, 7730.
5. *Organometallics*, **2009**, *28*, 669.
6. *Org. Lett.*, **2011**, *13*, 2718.
7. *Angew. Chem. Int. Ed.*, **2012**, *51*, 723.

44-2319 Chloro(*p*-cymene)[(1*R*,2*R*)-(-)-2-amino-1,2-diphenylethyl(methylsulfonylamido)]ruthenium(II)

RuCl(*p*-cymene)[(R,R)-MsDpen] (1097730-63-6)

C₂₅H₃₁ClN₂O₂RuS; FW: 560.10; yellow-orange solid
air sensitive

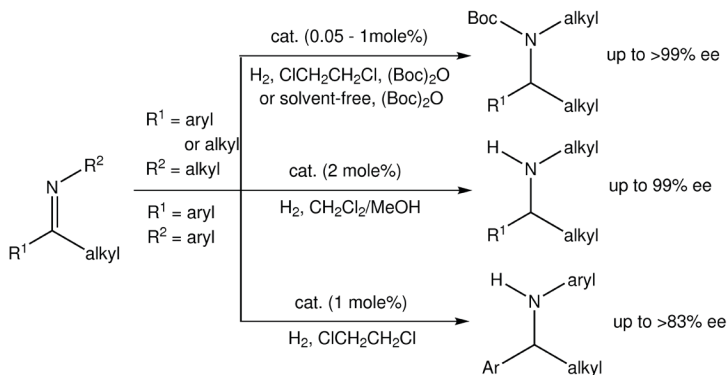
Note: Sold in collaboration with JM for research purposes only.



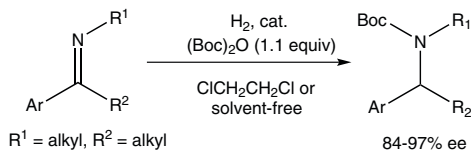
250mg
1g

Technical Note:

1. Catalyst used in the asymmetric hydrogenation of N-alkyl and N-aryl ketimines.



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (2)

References:

1. *Tetrahedron*, **2012**, *68*, 5248.
2. *Chem. Eur. J.*, **2011**, *17*, 1109.

44-2320 Chloro(*p*-cymene)[(1*S*,2*S*)-(-)-2-amino-1,2-diphenylethyl(methylsulfonylamido)]ruthenium(II) **RuCl(*p*-cymene)[(S,S)-MsDpen]** (329371-25-7)

C₂₅H₃₁ClN₂O₂RuS; FW: 560.10; orange solid

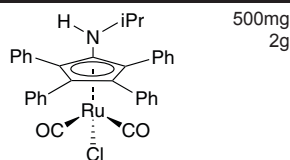
air sensitive

Note: Sold in collaboration with JM for research purposes only.

250mg
1g

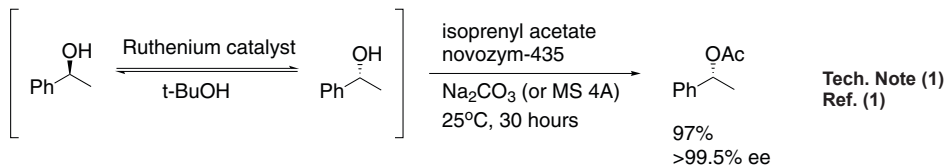
RUTHENIUM (Compounds)

44-0123 Chlorodicarbonyl[1-(i-propylamino)-2,3,4,5-tetraphenyl-cyclopentadienyl]ruthenium(II), min. 95% (470688-18-7)
 RuCl(CO)₂(C₃₂H₂₈N); FW: 619.11; yellow xtl.; m.p. 197° dec.
air sensitive



Technical Note:

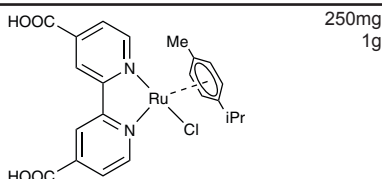
1. Metal catalyst used in conjunction with enzymes for enantioselective transformations via dynamic kinetic resolution.



References:

1. *Current Opinion in Biotechnology*, **2002**, 13, 578
2. *Angew. Chem. Int. Ed.*, **2002**, 41, 2373
3. *J. Am. Chem. Soc.*, **2003**, 125, 11494

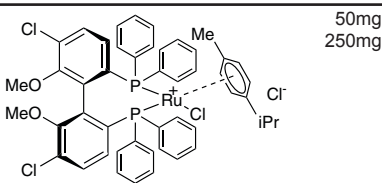
44-0128 Chloro(4,4'-dicarboxy-2,2'-bipyridine) (p-cymene)ruthenium(II) chloride, min. 98%
 [RuCl(C₁₂H₈N₂O₄)(C₁₀H₁₄)]⁺Cl⁻; FW: 550.40;
 orange powdr.



Technical Note:

1. Product used as a dye to sensitize solar cells.

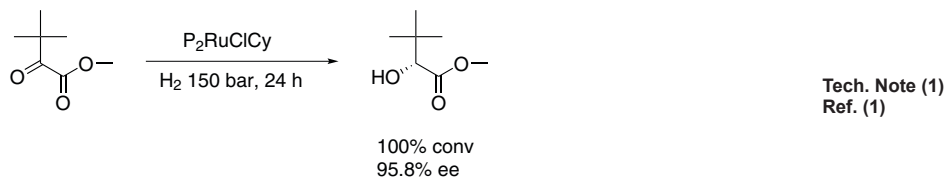
44-0121 Chloro[(R)-(+)-5,5'-dichloro-6,6'-dimethoxy-2,2'-bis(diphenylphosphino)-1,1'-biphenyl] (p-cymene)ruthenium(II) chloride CH₂Cl₂ adduct (821793-33-3)
 RuCl[(C₃₈H₃₀Cl₂O₂P₂)(C₁₀H₁₄)]⁺Cl⁻·CH₂Cl₂;
 FW: 957.69 (1042.62); orange-brown powdr.
air sensitive



Note: Sold in collaboration with Lanxess for research purposes only. The product and its uses fall within the scope of US patents 5,710,339 and 5,801,261 and is sold with the right to use such product for research only.

Technical Notes:

1. Catalyst for asymmetric hydrogenation of α and β-keto esters.
2. Catalyst for asymmetric hydrogenation of α,β unsaturated acids.²



References:

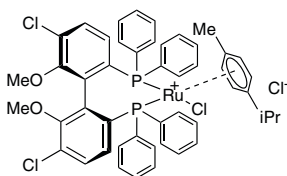
1. EP1160237 (2001).
2. US5801261 (1998).

RUTHENIUM (Compounds)

44-0122 Chloro[(S)-(-)-5,5'-dichloro-6,6'-dimethoxy-2,2'-bis(diphenylphosphino)-1,1'-biphenyl] (p-cymene)ruthenium(II) chloride CH₂Cl₂ adduct (821793-35-5)

[RuCl(C₃₈H₃₀Cl₂O₂P₂)(C₁₀H₁₄)]⁺Cl⁻·CH₂Cl₂;
FW: 957.69 (1042.62); orange-brown powder.
air sensitive

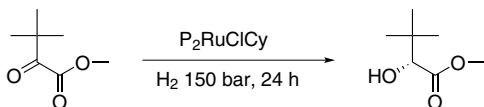
Note: Sold in collaboration with Lanxess for research purposes only. The product and its uses fall within the scope of US patents 5,710,339 and 5,801,261 and is sold with the right to use such product for research only.



50mg
250mg

Technical Notes:

1. Catalyst for asymmetric hydrogenation of α and β-keto esters.
2. Catalyst for asymmetric hydrogenation of α,β unsaturated acids.²



100% conv
95.8% ee

Tech. Note (1)
Ref. (1)

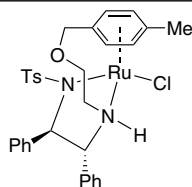
References:

1. EP1160237 (2001).
2. US5801261 (1998).

44-0185 Chloro[N-[(1R,2R)-1,2-diphenyl-2-(2-(4-methylbenzyloxy)ethylamino)-ethyl]-4-methylbenzene sulfonamide(chloro)ruthenium(II) (R,R)-Ts-DENEB™ (1333981-84-2)

C₃₁H₃₃ClN₂O₃RuS; FW: 650.19; gray to brown solid
air sensitive

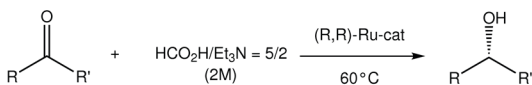
Note: Manufactured under license of Takasago patent application PCT/JP2011/064490.



250mg
1g
5g

Technical Notes:

1. Catalyst used for asymmetric -transfer hydrogenation.
2. Catalyst used for asymmetric H₂ - hydrogenation.
3. Catalyst used for dynamic kinetic resolution.



(S/C=30,000, 96h)
95% conv. 97% ee

(S/C=1,000, 5h)
>99% conv. 97% ee
(>95% select.)

(S/C=500, 24h)
>99% conv. 95% ee

(S/C=1,000, 5h)
>99% conv. 95% ee

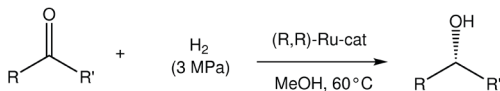
(S/C=1,000, 24h)
>99% conv. 93% ee

(S/C=1,000, 5h)
98% conv. 96% ee

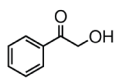
Tech. Note (1)
Ref. (1)

RUTHENIUM (Compounds)

44-0185 Chloro{N-[(1R,2R)-1,2-diphenyl-2-(2-(4-methylbenzyloxy)ethylamino)-ethyl]-4-methylbenzene sulfonamide(chloro)ruthenium(II) (R,R)-Ts-DENEb™ (1333981-84-2)

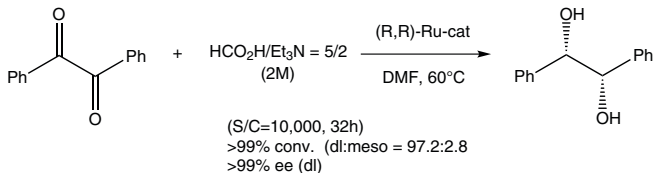


(S/C=1,000, 20h)
>99% conv. 99% ee



(S/C=5,000, 18h)
>99% conv. 93% ee

Tech. Note (2)
Ref. (1)



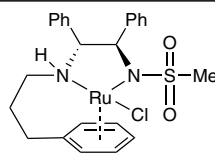
(S/C=10,000, 32h)
>99% conv. (dl:meso = 97.2:2.8)
>99% ee (dl)

Tech. Note (3)
Ref. (1)

References:

1. *J. Am. Chem.Soc.*, **2011**, 133, 14960

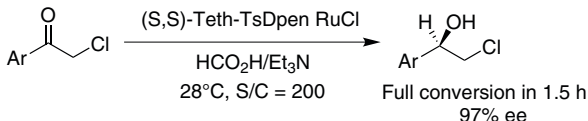
44-3020 Chloro{(1R,2R)-1,2-diphenyl-1-[(3-(η⁶-phenyl)propyl)amino]-2-(methylsulfonylamido)}ruthenium(II) RuCl[(R,R)-teth-MsDpen] (1361415-88-4)
C₂₄H₂₇ClN₂O₂RuS; FW: 544.07; brown powdr.
air sensitive
Note: Sold in collaboration with JM for research purposes only.



100mg
500mg

Technical Note:

1. Catalyst used for asymmetric -transfer hydrogenation.



Tech. Note (1)
Ref. (1)

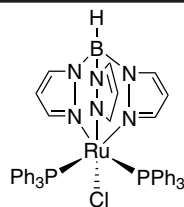
References:

1. *J. Org. Chem.*, **2006**, 71, 7035.
2. *Adv. Synth. Catal.*, **2012**, 354, 2545.

44-3021 Chloro{(1S,2S)-1,2-diphenyl-1-[(3-(η⁶-phenyl)propyl)amino]-2-(methylsulfonylamido)}ruthenium(II) RuCl[(S,S)-teth-MsDpen] (1437326-26-5)
C₂₄H₂₇ClN₂O₂RuS; FW: 544.07; brown powdr.
air sensitive
Note: Sold in collaboration with JM for research purposes only.

100mg
500mg

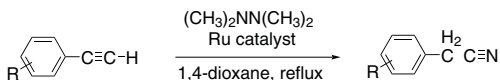
44-0124 Chloro[hydrotris(pyrazol-1-yl)borato]bis(triphenylphosphine)ruthenium(II) ethanol adduct (141686-21-7)
RuCl[(C₆H₅)₃P]₂(C₅H₁₀BN₆):0.5CH₃CH₂OH;
FW: 874.12 (897.16); yellow powdr.



250mg
1g

Technical Note:

1. Catalyst used with hydrazines for the transformation of terminal alkynes to nitriles.

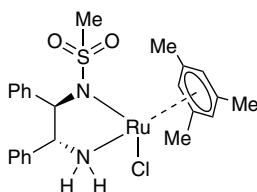


References:

1. *Organometallics*, **2002**, 21, 3845

RUTHENIUM (Compounds)

44-2325 Chloro(mesitylene)[(1R,2R)-(-)-2-amino-1,2-diphenylethyl(methylsulfonylamido)]ruthenium(II) RuCl(mesitylene)[(R,R)-MsDpen] (1160707-20-9)
 $C_{24}H_{29}ClN_2O_2RuS$; FW: 546.10; brown powdr.
air sensitive
 Note: Sold in collaboration with JM for research purposes only.



250mg
1g

Technical Note:

1. Catalyst used for producing optically active aliphatic fluoroalcohols.

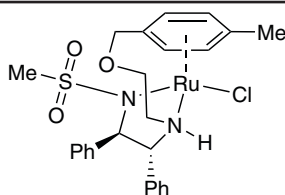
References:

1. *Eur. Pat. Appl.*, 2011, EP2399895 A2 20111228

44-2326 Chloro(mesitylene)[(1S,2S)-(+)-2-amino-1,2-diphenylethyl(methylsulfonylamido)]ruthenium(II) RuCl(mesitylene)[(S,S)-MsDpen] (865488-44-4)
 $C_{24}H_{29}ClN_2O_2RuS$; FW: 546.10; brown powdr.
air sensitive
 Note: Sold in collaboration with JM for research purposes only.

250mg
1g

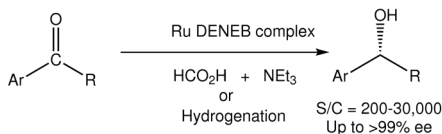
44-0255 Chloro[N-[(1R,2R)-2-[(S)-[2-[[1,2,3,4,5,6-η]-4-methylphenyl]methoxy]ethyl]amino]-1,2-diphenylethylmethanesulfonamidato]ruthenium(II) Ru-(R,R)-Ms-DENEB (1333981-86-4)
 $C_{25}H_{29}ClN_2O_3RuS$; FW: 574.10;
 light to dark brown powdr.
 Note: Manufactured under license of Takasago patent application PCT/JP2011/064490. Takasago ATH Catalyst Kit component.



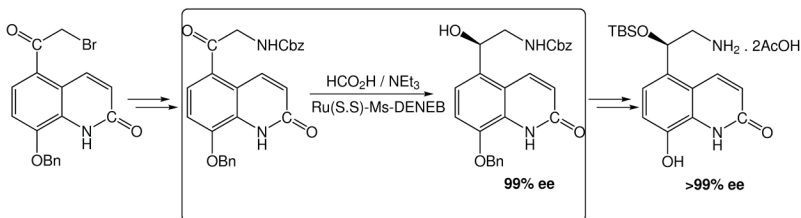
250mg
1g
5g

Technical Notes:

1. Catalyst used for both hydrogenation and asymmetric transfer hydrogenation.
2. Ruthenium catalyst used as a key intermediate in a synthesis of a receptor agonist.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

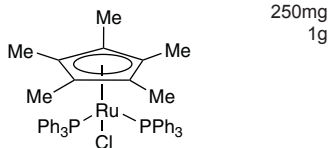
1. *J. Am. Chem. Soc.*, 2011, 133, 14960
2. *Org. Process Res. Dev.*, 2015, 19, 315

44-0256 Chloro[N-[(1S,2S)-2-[(R)-[2-[[1,2,3,4,5,6-η]-4-methylphenyl]methoxy]ethyl]amino]-1,2-diphenylethylmethanesulfonamidato]ruthenium(II) Ru-(S,S)-Ms-DENEb (1361318-83-3)
 $C_{25}H_{29}ClN_2O_3RuS$; FW: 574.10; light to dark brown powdr.
 Note: Manufactured under license of Takasago patent application PCT/JP2011/064490. Takasago ATH Catalyst Kit component.

250mg
1g
5g

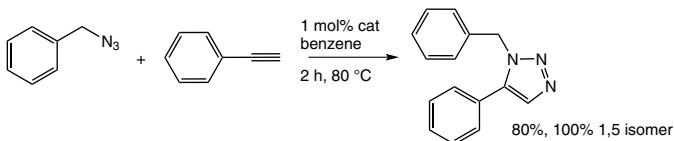
RUTHENIUM (Compounds)

44-0117 Chloro(pentamethylcyclopentadienyl) bis(triphenylphosphine)ruthenium(II), 99% (92361-49-4)
 $\text{RuCl}(\text{C}_{10}\text{H}_{15})[\text{P}(\text{C}_6\text{H}_5)_3]_2$; FW: 796.32; orange powdr. (store cold)

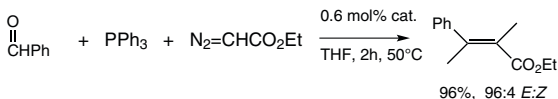


Technical Notes:

1. Effective catalyst for the regioselective cycloaddition of organic azides and terminal alkynes, producing 1,5-substituted triazoles. This "click" reaction complements the related copper catalyzed cycloaddition which favors the 1,4 substituted product.
2. One step catalytic alternative to the classic Wittig reaction.
3. Ruthenium catalyzed stereospecific living radical gradient copolymerization of acrylate monomer pairs.



Tech. Note (1)
Ref. (1,2)

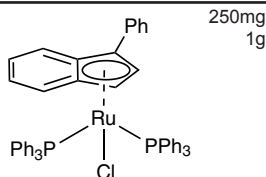


Tech. Note (2)
Ref. (3)

References:

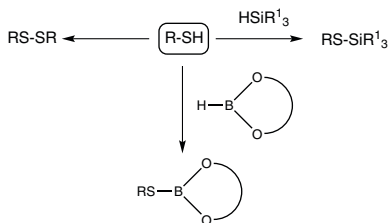
1. *J. Am. Chem. Soc.*, **2005**, 127, 15998
2. *J. Am. Chem. Soc.*, **2008**, 130, 8923
3. *Organometallics*, **2007**, 26, 302

44-0138 Chloro(1-phenylindenyl)bis(triphenylphosphine) ruthenium(II), min. 98% (1360949-97-8)
 $\text{C}_{51}\text{H}_{41}\text{ClP}_2\text{Ru}$; FW: 852.34; red-brown solid

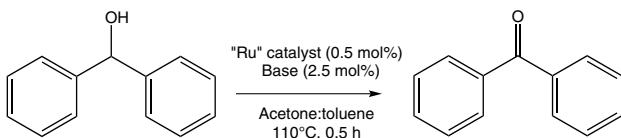


Technical Notes:

1. Efficient, ruthenium-catalyzed S-S, S-Si and S-B bond forming reactions.
2. Chemoselective oxidation of secondary alcohols to ketones.
3. Ruthenium complex used as an efficient transfer hydrogenation catalyst.
4. Catalyst for the racemization of chiral alcohols.



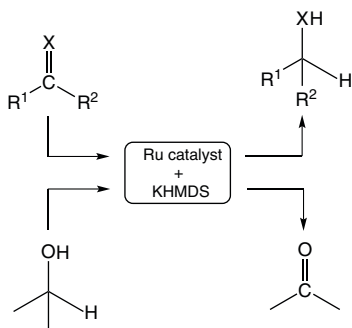
Tech. Note (1)
Ref. (1)



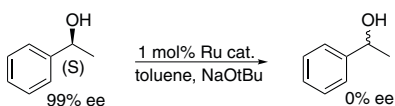
Tech. Note (2)
Ref. (2)

RUTHENIUM (Compounds)

44-0138 Chloro(1-phenylindenyl)bis(triphenylphosphine)ruthenium(II), min. 98% (1360949-97-8)
(continued)



Tech. Note (3)
Ref. (3)



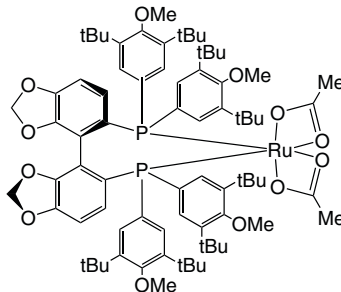
Tech. Note (4)
Ref. (4)

References:

1. *Chem. Commun.*, **2013**, 49, 5829.
2. *Organometallics*, **2013**, 32, 660.
3. *Adv. Synth. Catal.*, **2012**, 354, 3036.
4. *Angew. Chem. Int. Ed.*, **2012**, 51, 1042.

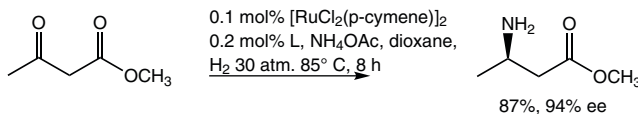
44-0180 Diacetato{(R)-(-)-5,5'-bis[di(3,5-di-*t*-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) **Ru(OAc)₂[(R)-dtbm-segphos]** (1025477-38-6)
C₇₈H₁₀₆O₁₂P₂Ru; FW: 1398.69;
yellow to brownish-red to dark green solid
air sensitive
Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

250mg
1g
5g

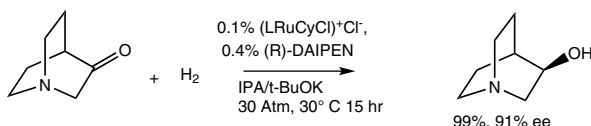


Technical Notes:

1. Biaryl bisphosphine ligand with narrow dihedral angle. The DM-SEGPHOS ligand, as the ruthenium complex, gives superior enantioselectivity and diastereoselectivity in the asymmetric hydrogenation of α -substituted- β -ketoesters. See 15-0066.
2. Ruthenium catalyzed enantioselective synthesis of β amino acids by hydrogenation.
3. Ruthenium catalyzed asymmetric hydrogenation of 3-quinuclidinone. See 44-0098 for Ru catalyst.



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (2)

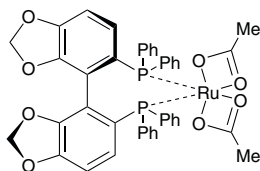
References:

1. *WIPO Pat.* WO2005028419
2. *U.S. Pat. App.* 2006047122.

RUTHENIUM (Compounds)

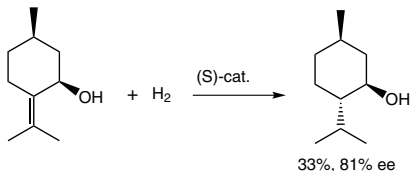
44-0181 **Diacetato((S)-(+)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole)ruthenium(II) Ru(OAc)₂[(S)-dtbm-segphos®]** (1025476-84-9)
 C₇₈H₁₀₆O₁₂P₂Ru; FW: 1398.69; yellow to brownish-red to dark green solid
 250mg
 1g
 5g
air sensitive
 Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

44-0168 **Diacetato((R)-(+)-5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole)ruthenium(II) Ru(OAc)₂[(R)-segphos®]** (944450-48-0)
 C₄₂H₃₄O₈P₂Ru; FW: 829.73; dark yellow pwdr.; m.p. >100° dec.
 250mg
 1g
 5g
air sensitive
 Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.



Technical Notes:

- Highly active highly enantioselective catalyst for hydrogenation of functionalized ketones. The acetate salts are frequently used for hydrogenation of allyl alcohols, unsaturated carboxylic acids and reductive amination. See 15-0136.
- Asymmetric hydrogenation of substituted allyl alcohols.



Tech. Note (1)
Ref. (1)

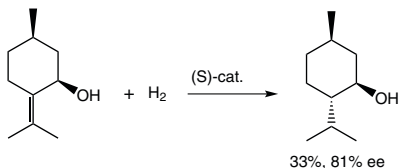
References:

- U.S. Pat. 6342644.

44-0169 **Diacetato((S)-(-)-5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole)ruthenium(II) Ru(OAc)₂[(S)-segphos®]** (373650-12-5)
 C₄₂H₃₄O₈P₂Ru; FW: 829.73; yellow to black solid; m.p. >100° dec.
 250mg
 1g
 5g
air sensitive
 Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

Technical Notes:

- Highly active highly enantioselective catalyst for hydrogenation of functionalized ketones. The acetate salts are frequently used for hydrogenation of allyl alcohols, unsaturated carboxylic acids and reductive amination. See 15-0136.
- Asymmetric hydrogenation of substituted allyl alcohols.

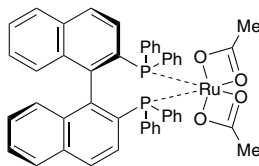


Tech. Note (1)
Ref. (1)

References:

- U.S. Pat. 6342644.

44-0152 **Diacetato((R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl)ruthenium(II) Ru(OAc)₂[(R)-binap]** (325146-81-4)
 C₄₈H₃₈O₈P₂Ru; FW: 841.83; ocher to green pwdr.; m.p. >100° dec.
 250mg
 1g
 5g
air sensitive
 Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Acetate Catalyst Kit component.

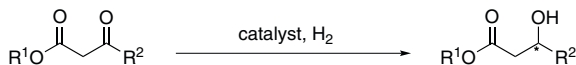


RUTHENIUM (Compounds)

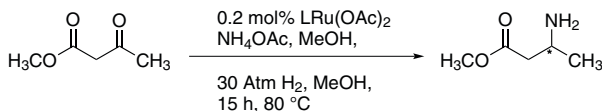
44-0152 Diacetato[(R)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]ruthenium(II)
(continued) Ru(OAc)₂[(R)-binap] (325146-81-4)

Technical Notes:

- Catalyst system that exhibits very high catalytic activity and enantioselectivity in the hydrogenation of a wide range of substrates.
- Catalyst used in the synthesis of β-amino acids by hydrogenation.



Tech. Note (1)
Ref. (2)



Tech. Note (2)
Ref. (5)

References:

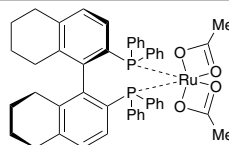
- Asymmetric Catalysis in Organic Synthesis*, **1993**, 61
- J. Am. Chem. Soc.*, **1988**, 110, 629
- Science*, **1990**, 248, 1194
- Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol. 1, 509
- World Patent WO2005/028419

44-0153 Diacetato[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]ruthenium(II) 250mg
Ru(OAc)₂[(S)-binap] (261948-85-0) 1g
C₄₈H₃₈O₄P₂Ru; FW: 841.83; pale yellow powdr.; m.p. >100° dec. 5g
air sensitive
Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Acetate Catalyst Kit component.

Technical Note:

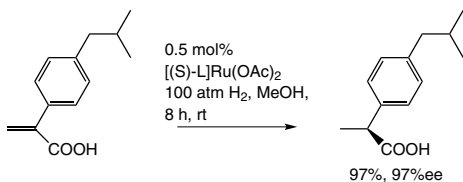
- See 44-0152 (page 258)

44-0166 Diacetato[(R)-(+)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl]ruthenium(II) Ru(OAc)₂[(R)-H₈-binap] (374067-51-3) 50mg
C₄₈H₄₆O₄P₂Ru; FW: 849.89; other to olive solid; 250mg
m.p. >100° dec.
air sensitive
Note: Manufactured under license of Takasago patent.



Technical Notes:

- Biaryl bisphosphine ligand. The H8-BINAP ligand, as the ruthenium complex, catalyzes hydrogenation of unsaturated carboxylic acids to a higher ee than does BINAP. (Ref. 1,2)
- The ruthenium catalyzed hydrogenation of aryl propenoic acid to produce the drug Ibuprofen.



Tech. Note (1,2)
Ref. (1,2)

References:

- J. Org. Chem.*, **1996**, 61, 5510
- Topics Organometal. Chem.* **2004**, 6, 63, review

44-0167 Diacetato[(S)-(-)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl]ruthenium(II) Ru(OAc)₂[(S)-H₈-binap] (142962-95-6) 50mg
C₄₈H₄₆O₄P₂Ru; FW: 849.89; yellow to dark brown solid; m.p. >100° dec. 250mg
air sensitive
Note: Manufactured under license of Takasago patent.

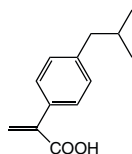
Technical Notes:

- Biaryl bisphosphine ligand. The H8-BINAP ligand, as the ruthenium complex, catalyzes hydrogenation of unsaturated carboxylic acids to a higher ee than does BINAP. (Ref. 1,2)
- The ruthenium catalyzed hydrogenation of aryl propenoic acid to produce the drug Ibuprofen.

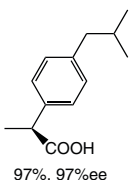
RUTHENIUM (Compounds)

44-0167 Diacetato{(S)-(-)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl]} ruthenium(II) Ru(OAc)₂[(S)-H₈-binap] (142962-95-6)

(continued)



0.5 mol%
[(S)-L]Ru(OAc)₂
100 atm H₂, MeOH,
8 h, rt



Tech. Note (1,2)
Ref. (1,2)

References:

1. *J. Org. Chem.*, **1996**, 61, 5510
2. *Topics Organometal. Chem.* **2004**, 6, 63, review

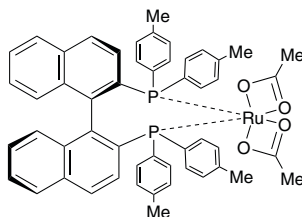
44-0162 Diacetato{(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl]}ruthenium(II)

Ru(OAc)₂[(R)-tolbinap] (116128-29-1)

C₅₂H₄₆O₄P₂Ru; FW: 897.94; brown powdr.;
m.p. >100° dec.

air sensitive

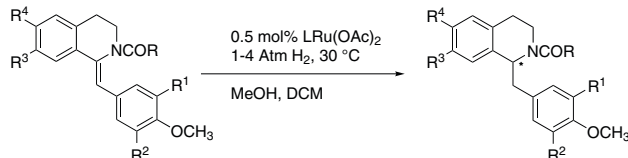
Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Acetate Catalyst Kit component.



250mg
1g
5g

Technical Note:

1. Catalyst system that exhibits high catalytic activity and enantioselectivity in the hydrogenation of enamines.



References:

1. *J. Org. Chem.*, **1994**, 59, 297

44-0163 Diacetato{(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl]}ruthenium(II)

Ru(OAc)₂[(S)-tolbinap] (106681-15-6)

C₅₂H₄₆O₄P₂Ru; FW: 897.94; brown powdr.; m.p. >100° dec.

air sensitive

Note: Manufactured under license of Takasago patent. Takasago BINAP Ru

Acetate Catalyst Kit component.

250mg
1g
5g

Technical Note:

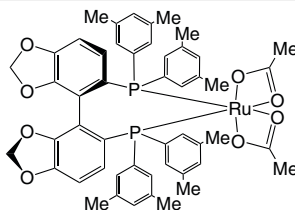
1. See 44-0162 (page 260)

44-0174 Diacetato{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole} ruthenium(II) Ru(OAc)₂[(R)-dm-segphos®] (944450-49-1)

C₅₀H₅₀O₈P₂Ru; FW: 941.95; yellow to brownish-red to dark green solid;
m.p. >100° dec.

air sensitive

Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.



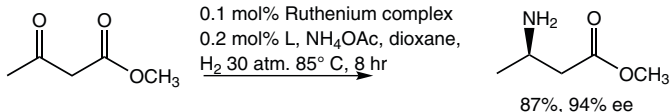
250mg
1g
5g

Technical Notes:

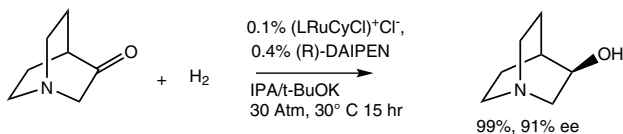
1. Biaryl bisphosphine ligand with narrow dihedral angle. The DM-SEGPHOS ligand, as the ruthenium complex, gives superior enantioselectivity and diastereoselectivity in the asymmetric hydrogenation of α-substituted-β-ketoesters. See 15-0066.
2. Ruthenium catalyzed enantioselective synthesis of β amino acids by hydrogenation.
3. Ruthenium catalyzed asymmetric hydrogenation of 3-quinuclidinone. See 44-0098 for Ru catalyst.

RUTHENIUM (Compounds)

44-0174 Diacetato{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II)
(continued) Ru(OAc)₂[(R)-dm-segphos®] (944450-49-1)



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (2)

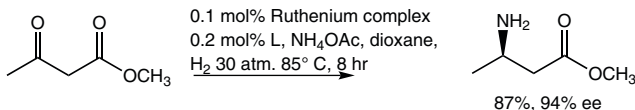
References:

1. WIPO Pat. WO2005028419
2. U.S. Pat. App. 2006047122.

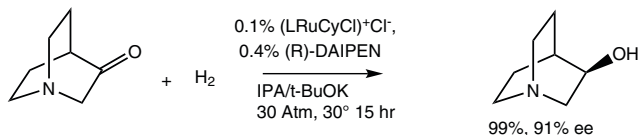
44-0176	Diacetato{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole} ruthenium(II) Ru(OAc) ₂ [(S)-dm-segphos®] (944450-50-4) C ₅₀ H ₅₀ O ₈ P ₂ Ru; FW: 941.95; yellow to brownish-red to dark green solid; m.p. >100° dec. <i>air sensitive</i> Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.	250mg 1g 5g
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Technical Notes:

1. Biaryl bisphosphine ligand with narrow dihedral angle. The DM-SEGPHOS ligand, as the ruthenium complex, gives superior enantioselectivity and diastereoselectivity in the asymmetric hydrogenation of α -substituted- β -ketoesters. See 15-0066.
2. Ruthenium catalyzed enantioselective synthesis of β amino acids by hydrogenation.
3. Ruthenium catalyzed asymmetric hydrogenation of 3-quinuclidinone. See 44-0098 for Ru catalyst.



Tech. Note (2)
Ref. (1)

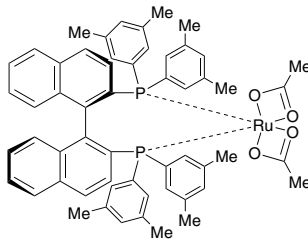


Tech. Note (3)
Ref. (2)

References:

1. WIPO Pat. WO2005028419
2. U.S. Pat. App. 2006047122.

44-0164	Diacetato{(R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl}ruthenium(II) Ru(OAc) ₂ [(R)-xybinap] (374067-50-2) C ₅₆ H ₅₄ O ₄ P ₂ Ru; FW: 954.04; dark brown powder.; m.p. >100° dec. <i>air sensitive</i> Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Acetate Catalyst Kit component.	250mg 1g 5g
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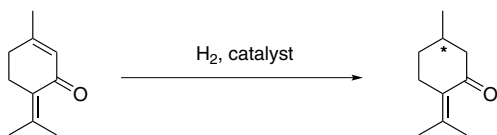


Technical Note:

1. Catalyst system used for asymmetric hydrogenation.

RUTHENIUM (Compounds)

44-0164 **Diacetato{(R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl}ruthenium(II)**
 (continued) **Ru(OAc)₂[(R)-xybinap]** (374067-50-2)



References:

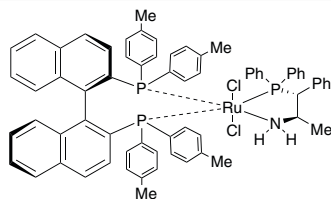
1. European Patent EP1153908A2, 11/14/2001.

44-0165 **Diacetato{(S)-(-)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl} ruthenium(II) Ru(OAc)₂[(S)-xybinap]** (374067-49-9) 250mg
 C₅₆H₅₄O₄P₂Ru; FW: 954.04; dark brown powdr.; m.p. >100° dec. 1g
air sensitive 5g
 Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Acetate Catalyst Kit component.

Technical Note:

1. See 44-0164 (page 261)

44-0232 **Dichloro{(R)-2,2'-bis[bis(4-methyl-phenyl)-1,1'-binaphthyl][(1R,2R)-2-amino-1-phenylpropyl]diphenylphosphine} ruthenium(II), min. 97%** (1150113-55-5) 100mg
 C₆₉H₆₂Cl₂NP₂Ru; FW: 1170.13; orange solid 500mg
air sensitive
 Note: Sold under license from Kanata for research purposes only.
 US Patents 7,579,295 and 7,317,131.



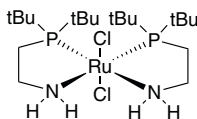
Technical Note:

1. Precursor to cationic hydrogenation catalyst for synthesis of chiral alcohols from ketones.

References:

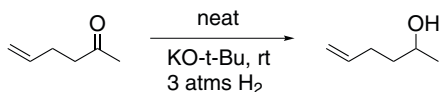
1. WO2009055912 A1.

44-0260 **Dichlorobis[2-(di-t-butylphosphino)ethylamine] ruthenium(II), min. 97%** (1092372-91-2) 250mg
 RuCl₂(C₁₀H₂₄NP₂)₂; FW: 550.53; orange powdr. 1g
 Note: Sold under license from Kanata for research purposes only. Patent WO0222526, EP1366004, US2004063966.



Technical Note:

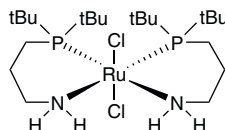
1. Exceptionally active catalyst for the hydrogenation of ketones and imines under mild conditions. Selective hydrogenation of C = O bonds over C = C bonds.



References:

1. *Adv. Synth. Catal.*, 2005, 347, 571

44-6050 **Dichlorobis[3-(di-t-butylphosphino)propylamine] ruthenium(II), min. 97%** (1196147-60-0) 250mg
 C₂₂H₅₂Cl₂N₂P₂Ru; FW: 578.58; brown solid 1g
air sensitive
 Note: Sold under license from Kanata for research purposes only. US 7317131 and US 7579295.

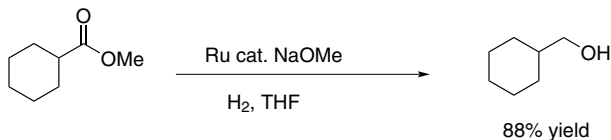


RUTHENIUM (Compounds)

44-6015	<p>Dichloro{1,2-bis[(2R,5R)-2,5 dimethylphospholanobenzene]} [2-(diphenylphosphino)ethylamine] ruthenium(II), min. 97% $C_{32}H_{44}Cl_2NP_3Ru$; FW: 707.60; yellow solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only.</p>		100mg 500mg
44-6018	<p>Dichloro{(1R,2R)-N,N-bis[2-(diphenylphosphino)benzyl]cyclohexane-1,2-diamine}ruthenium(II), min. 97% (429678-11-5) $C_{44}H_{44}Cl_2N_2P_2Ru$; FW: 834.76; orange solid <i>air sensitive</i></p>		100mg 500mg
44-6019	<p>Dichloro{(1S,2S)-N,N-bis[2-(diphenylphosphino)benzyl]cyclohexane-1,2-diamine}ruthenium(II), min. 97% (302924-37-4) $C_{44}H_{44}Cl_2N_2P_2Ru$; FW: 834.76; orange solid <i>air sensitive</i></p>		100mg 500mg
44-0263	<p>Dichlorobis[2-(diphenylphosphino)ethylamine] ruthenium(II), min. 95% (mixture of isomers) (506417-41-0) $RuCl_2(C_{14}H_{32}NP)_2$; FW: 630.49; yellow powdr. Note: Sold under license from Kanata for research purposes only. Patent WO0222526, EP1366004, US2004063966.</p>		250mg 1g

Technical Note:

- Efficient catalyst for the dihydrogen reduction of carboxylic esters and amides to alcohols.



Tech. Note (1)
Ref. (1)

References:

- Angew. Chem. Int. Ed.*, **2007**, *46*, 7473.
- Angew. Chem. Int. Ed.*, **2011**, *50*, 10377.

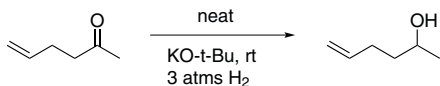
44-6040	<p>Dichlorobis[3-(diphenylphosphino)propylamine] ruthenium(II), min. 97% (1196467-26-1) $C_{30}H_{36}Cl_2N_2P_2Ru$; FW: 658.54; yellow-brown solid <i>air sensitive</i> Note: Sold under license from Kanata for research purposes only. US 7317131 and US 7579295.</p>		250mg 1g
44-0265	<p>Dichlorobis[2-(di-i-propylphosphino)ethylamine] ruthenium(II), min. 97% (1092372-90-1) $RuCl_2(C_8H_{20}NP)_2$; FW: 494.43; orange powdr. Note: Sold under license from Kanata for research purposes only. Patent WO0222526, EP1366004, US2004063966.</p>		250mg 1g

Technical Note:

- Exceptionally active catalyst for the hydrogenation of ketones and imines under mild conditions. Selective hydrogenation of C = O bonds over C = C bonds.

RUTHENIUM (Compounds)

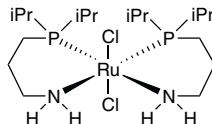
44-0265 Dichlorobis[2-(di-*i*-propylphosphino)ethylamine]ruthenium(II), min. 97% (1092372-90-1)
(continued)



References:

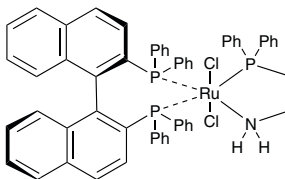
1. *Adv. Synth. Catal.*, **2005**, 347, 571

44-6043 Dichlorobis[3-(di-*i*-propylphosphino)propylamine]ruthenium(II), min. 97% (1196147-57-5)
C₁₁₆H₄₄Cl₂N₂P₂Ru; FW: 522.48; yellow-orange solid
air sensitive
Note: Sold under license from Kanata for research purposes only. US 7317131 and US 7579295.



250mg
1g

44-6025 Dichloro[(*R*)-bis(diphenylphosphino)-1,1-binaphthyl][2-(diphenylphosphino)ethylamine]ruthenium(II), min. 97% (1097731-98-0)
C₅₈H₄₈Cl₂NP₃Ru; FW: 1023.91; yellow solid
air sensitive
Note: Sold under license from Kanata for research purposes only. US 7317131 and US 7579295.

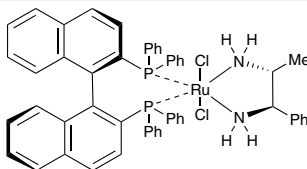


100mg
500mg

44-6026 Dichloro[(*S*)-bis(diphenylphosphino)-1,1-binaphthyl][2-(diphenylphosphino)ethylamine]ruthenium(II), min. 97%
C₅₈H₄₈Cl₂NP₃Ru; FW: 1023.91; yellow solid
air sensitive
Note: Sold under license from Kanata for research purposes only. US 7317131 and US 7579295.

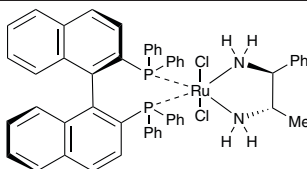
100mg
500mg

44-6022 Dichloro[(*R*)-bis(diphenylphosphino)-1,1-binaphthyl][(1*R*,2*R*)-2-amino-1-phenylpropyldiphenylphosphine]ruthenium(II), min. 97%
C₆₅H₅₄Cl₂NP₃Ru; FW: 1114.03; yellow solid
air sensitive
Note: Sold under license from Kanata for research purposes only. US 7317131 and US 7579295.



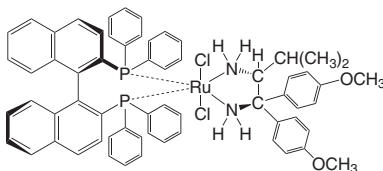
100mg
500mg

44-6023 Dichloro[(*R*)-bis(diphenylphosphino)-1,1-binaphthyl][(1*S*,2*S*)-2-amino-1-phenylpropyldiphenylphosphine]ruthenium(II), min. 97%
C₆₅H₅₄Cl₂NP₃Ru; FW: 1114.03; yellow solid
air sensitive
Note: Sold under license from Kanata for research purposes only. US 7317131 and US 7579295.



100mg
500mg

44-0210 Dichloro[(*R*)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(2*R*)-(-)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) dichloromethane adduct, min. 97% (329735-86-6)
C₆₅H₅₅Cl₂N₂O₂P₂Ru; FW: 1109.10; white to pale yellow pwd.; m.p. >100° dec.
air sensitive, (store cold)



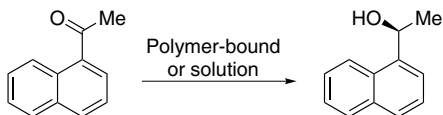
10mg
50mg
250mg

Technical Note:

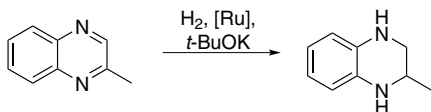
1. The NOYORI catalysts are a ruthenium-based system containing a phosphine and 1,2-diamine ligand. The catalysts are used in the highly-efficient, enantio and diastereoselective hydrogenation of simple ketones, usually under the mild conditions of room temperature and 1-10 atm of hydrogen pressure.

RUTHENIUM (Compounds)

44-0210 Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(2R)-(-)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) dichloromethane adduct, min. 97% (329735-86-6)



Ref. (1)



Ref. (2,3)



Ref. (4)

References:

1. *J. Org. Chem.*, **1996**, 61, 4872
2. *Angew. Chem. Int. Ed.*, **2001**, 40, 40 (review article).
3. *J. Am. Chem. Soc.*, **1998**, 120, 13529.
4. *Angew. Chem. Int. Ed.*, **1999**, 38, 495.

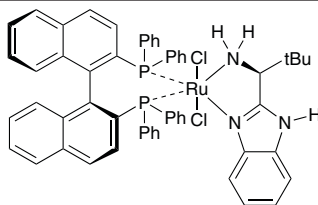
44-0211 Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(2S)-(+)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) dichloromethane adduct, min. 97% (212143-24-3)
 C₆₃H₅₈Cl₂N₂O₂P₂Ru; FW: 1109.10; white to pale yellow powdr.; m.p. >100° dec. *air sensitive, (store cold)*

10mg
50mg
250mg

Technical Note:

1. See 44-0210 (page 264)

44-0925 Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(α-(t-butyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95%
 C₅₆H₄₉Cl₂N₃P₂Ru; FW: 997.93; yellow-brown powdr. *air sensitive*

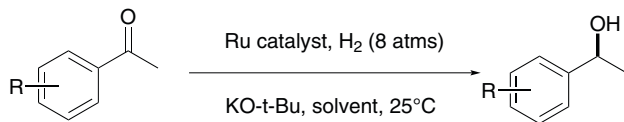


100mg
500mg

Note: Sold under license from Enantiotech for research purposes only. PCT/CN2008/073648, CN 200810038929. Enantiotech BIMAH Ru BINAP Catalyst Kit component.

Technical Note:

1. Efficient ruthenium catalyst for the hydrogenation of aryl ketones.



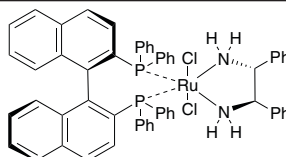
Tech. Note (1)
Ref. (1,2)

References:

1. *Adv. Synth. Catal.*, **2011**, 353, 495
2. *Org. Lett.*, **2009**, 11, 907

44-0220 Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II), min. 90% (212143-23-2)

C₅₈H₄₈Cl₂N₂P₂Ru; FW: 1006.96; white to pale yellow powdr.; m.p. >100° dec. *air sensitive, (store cold)*



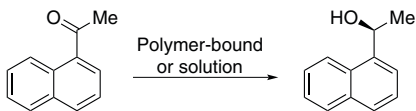
10mg
50mg
250mg

RUTHENIUM (Compounds)

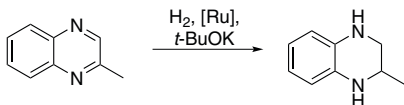
44-0220 Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][[(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II), min. 90% (212143-23-2)

Technical Notes:

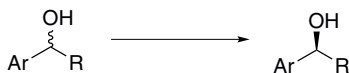
1. See 44-0210 .
2. Sequential asymmetric hydrogenation reactions with solution or polymer-bound BINAP/Diamine complexes.
3. Asymmetric hydrogenation of imines.
4. Catalysts for deracemization of benzylic alcohols.



Tech. Note (2)
Ref. (1,2)



Tech. Note (3)
Ref. (3)

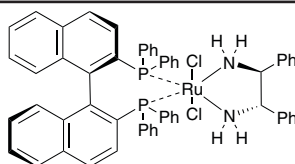


Tech. Note (4)
Ref. (4)

References:

1. *Angew. Chem. Int. Ed.*, **2001**, 40, 40, review
2. *Adv. Synth. Catal.*, **2001**, 343, 369
3. *Adv. Synth. Catal.*, **2003**, 345, 195
4. *Chem. Commun.*, **2007**, 2608

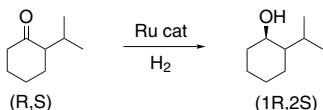
44-0221 Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][[(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II), min. 90% (212210-87-2)
C₅₈H₄₈Cl₂N₂P₂Ru; FW: 1006.96;
white to pale yellow powdr.; m.p. >100° dec.
air sensitive, (store cold)



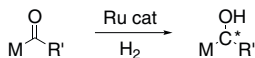
10mg
50mg
250mg

Technical Note:

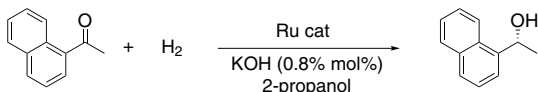
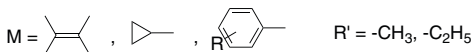
1. The NOYORI catalysts are a ruthenium-based system containing a phosphine and 1,2-diamine ligand. The catalysts are used in the highly-efficient, enantio and diastereoselective hydrogenation of simple ketones, usually under the mild conditions of room temperature and 1-10 atm of hydrogen pressure.



Ref. (1)



Ref. (2,3)



Ref. (4)

References:

1. *J. Org. Chem.*, **1996**, 61, 4872
2. *Angew. Chem. Int. Ed.*, **2001**, 40, 40, review, article
3. *J. Am. Chem. Soc.*, **1998**, 120, 13529
4. *Angew. Chem. Int. Ed.*, **1999**, 38, 495

RUTHENIUM (Compounds)

44-0222	Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl] [(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II), min. 98% (329735-87-7) C ₅₈ H ₄₈ Cl ₂ N ₂ P ₂ Ru; FW: 1006.96; white to pale yellow powdr.; m.p. >100° dec. <i>air sensitive, (store cold)</i>	10mg 50mg 250mg
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Technical Note:

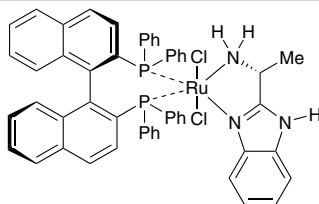
- See 44-0221 (page 266)

44-0223	Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl] [(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II), min. 98% (329736-05-2) C ₅₈ H ₄₈ Cl ₂ N ₂ P ₂ Ru; FW: 1006.96; white to pale yellow powdr.; m.p. >100° dec. <i>air sensitive, (store cold)</i>	10mg 50mg 250mg
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Technical Note:

- See 44-0221 (page 266)

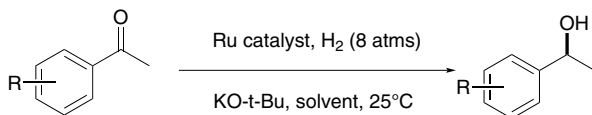
44-0910	Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl] [(S)-(+)-2-(α-methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95% C ₅₃ H ₄₃ Cl ₂ N ₃ P ₂ Ru; FW: 955.85; yellow-brown powdr. <i>air sensitive</i>	100mg 500mg
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Note: Sold under license from EnantioTech for research purposes only.
PCT/CN2008/073648, CN 200810038929.
EnantioTech BIMAH Ru BINAP Catalyst Kit component.

Technical Note:

- Efficient ruthenium catalyst for asymmetric hydrogenation of aryl ketones.



**Tech. Note (1)
Ref. (1,2)**

References:

- Adv. Synth. Catal.*, **2011**, 353, 495
- Org. Lett.*, **2009**, 11, 907

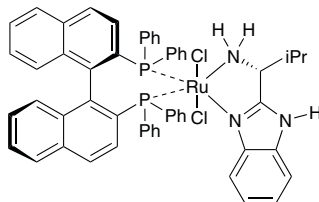
44-0905	Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl] [(S)-(-)-2-(α-methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95% (1443051-87-3) C ₅₃ H ₄₃ Cl ₂ N ₃ P ₂ Ru; FW: 955.85; yellow-brown powdr. <i>air sensitive</i>	100mg 500mg
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Note: Sold under license from EnantioTech for research purposes only.
PCT/CN2008/073648, CN 200810038929. EnantioTech BIMAH Ru BINAP Catalyst Kit component.

Technical Note:

- See 44-0910 (page 267)

44-0920	Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(R)-(+)-2-(α-(i-propyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95% C ₅₅ H ₄₇ Cl ₂ N ₃ P ₂ Ru; FW: 983.90; yellow-brown powdr. <i>air sensitive</i>	100mg 500mg
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Note: Sold under license from EnantioTech for research purposes only.
PCT/CN2008/073648, CN 200810038929. EnantioTech BIMAH Ru BINAP Catalyst Kit component.

Technical Note:

- See 44-0910 (page 267)

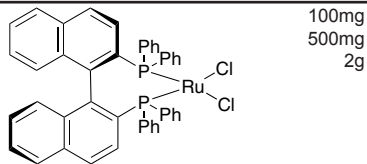
RUTHENIUM (Compounds)

44-0915 Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(α -(i-propyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95%
 $C_{55}H_{47}Cl_2N_3P_2Ru$; FW: 983.90; yellow-brown powdr.
air sensitive
 Note: Sold under license from EnantioTech for research purposes only.
 PCT/CN2008/073648, CN 200810038929. EnantioTech BIMAH Ru BINAP Catalyst Kit component.

Technical Note:

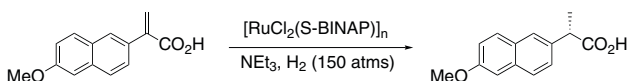
- See 44-0910 (page 267)

44-0248 Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]ruthenium(II), min. 95% (132071-87-5)
 $[RuCl_2(C_{44}H_{32}P_2)]_n$; FW: 794.67; orange powdr.
air sensitive

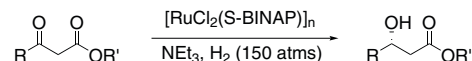


Technical Notes:

- Enantioselective catalyst for the asymmetric hydrogenation of α,β -unsaturated olefins.
- Efficient catalyst for the asymmetric reduction of carbonyl groups, such as β -ketoesters.



Tech. Note (1)
 Ref. (1)



Tech. Note (2)
 Ref. (2)

References:

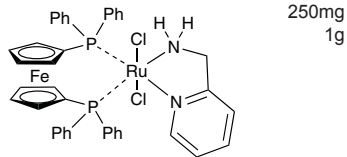
- A.S.C. Chan and S.A. Laneman, *U.S. Patent* 5,198,561.
- Tetrahedron Asymmetry*, **1997**, 8, 20, 3327

44-0249 Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]ruthenium(II), min. 95% (134524-84-8)
 $[RuCl_2(C_{44}H_{32}P_2)]_n$; FW: 794.67; orange powdr.
air sensitive

Technical Note:

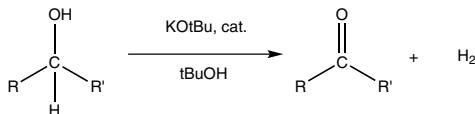
- See 44-0248 (page 268)

44-2310 Dichloro[1,1'-bis(diphenylphosphino)ferrocene] (2-aminomethylpyridine)ruthenium(II) $RuCl_2(AMPY)(DPPF)$ (1287255-62-2)
 $C_{40}H_{36}Cl_2FeN_2P_2Ru$; FW: 834.49; yellow powdr.
air sensitive
 Note: Sold in collaboration with JM for research purposes only.



Technical Note:

- Efficient catalyst used in the dehydrogenation of alcohols to ketones.

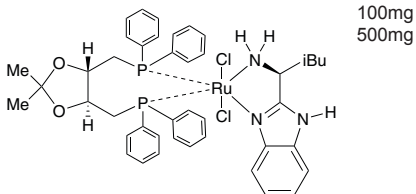


Tech. Note (1)
 Ref. (1)

References:

- Chem. Eur. J.*, **2011**, 17(12), 3474.

44-0975 Dichloro[(4S,5S)-(+)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(S)-(-)-2-(i-butyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95% (1574321-76-8)
 $C_{45}H_{48}Cl_2N_3O_2P_2Ru$; FW: 873.79; yellow-brown powdr.
air sensitive
 Note: Sold under license from EnantioTech for research purposes only. PCT/CN2008/073648, CN 200810038929. EnantioTech BIMAH Ru DIOP Catalyst Kit component.

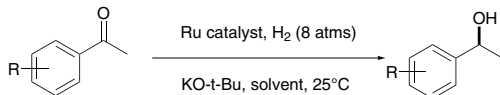


RUTHENIUM (Compounds)

44-0975 Dichloro[(4S,5S)-(+)-4,5-bis(diphenyl-phosphinomethyl)-2,2-dimethyl-1,3-dioxolane][[(S)-(-)-2-(i-butyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95% (1574321-76-8)

Technical Note:

1. Efficient ruthenium catalyst for asymmetric hydrogenation of aryl ketones.



Tech. Note (1)
Ref. (1,2)

References:

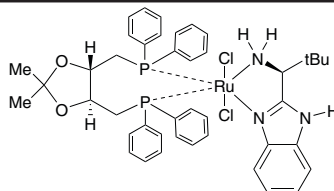
1. *Adv. Synth. Catal.*, **2011**, 353, 495
2. *Org. Lett.*, **2009**, 11, 907

44-0980 Dichloro[(4S,5S)-(+)-4,5-bis(diphenyl-phosphinomethyl)-2,2-dimethyl-1,3-dioxolane][[(S)-(-)-2-(t-butyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 97% (1443051-98-6)

$C_{43}H_{48}Cl_2N_3O_2P_2Ru$; FW: 873.79;
yellow-brown powdr.

air sensitive

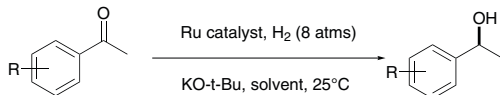
Note: Sold under license from Enantitech for research purposes only. PCT/CN2008/073648, CN 200810038929. Enantitech BIMAH Ru DIOP Catalyst Kit component.



100mg
500mg

Technical Note:

1. Efficient ruthenium catalyst for asymmetric hydrogenation of aryl ketones.



Tech. Note (1)
Ref. (1,2)

References:

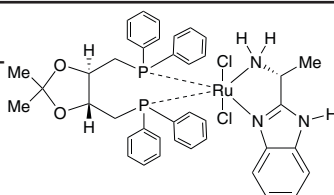
1. *Adv. Synth. Catal.*, **2011**, 353, 495
2. *Org. Lett.*, **2009**, 11, 907

44-0960 Dichloro[(4R,5R)-(-)-4,5-bis(diphenyl-phosphinomethyl)-2,2-dimethyl-1,3-dioxolane][[(R)-(+)-2-(α-methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95% (1280732-29-7)

$C_{40}H_{43}Cl_2N_3O_2P_2Ru$; FW: 831.71;
yellow-brown powdr.

air sensitive

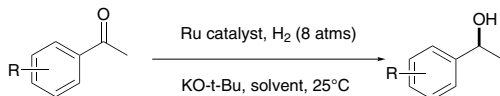
Note: Sold under license from Enantitech for research purposes only. PCT/CN2008/073648, CN 200810038929. Enantitech BIMAH Ru DIOP Catalyst Kit component.



100mg
500mg

Technical Note:

1. Efficient ruthenium catalyst for asymmetric hydrogenation of aryl ketones.



Tech. Note (1)
Ref. (1,2)

References:

1. *Adv. Synth. Catal.*, **2011**, 353, 495
2. *Org. Lett.*, **2009**, 11, 907

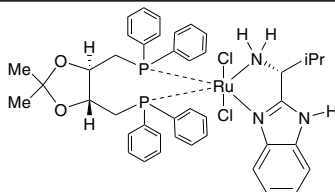
RUTHENIUM (Compounds)

- 44-0955** Dichloro[(4*S*,5*S*)-(+)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(S)-(-)-2-(α -methylmethanamine)-1*H*-benzimidazole]ruthenium(II), min. 98% (1280730-21-3)
 $C_{40}H_{43}Cl_2N_3O_2P_2Ru$; FW: 831.71; yellow-brown powdr.
air sensitive
 Note: Sold under license from EnantioTech for research purposes only.
 PCT/CN2008/073648, CN 200810038929.
 EnantioTech BIMAH Ru DIOP Catalyst Kit component.

Technical Note:

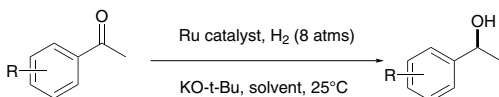
- See 44-0960 (page 269)

- 44-0970** Dichloro[(4*R*,5*R*)-(-)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(R)-(+)-2-(*i*-propyl)methanamine]-1*H*-benzimidazole]ruthenium(II), min. 95%
 $C_{42}H_{47}Cl_2N_3O_2P_2Ru$; FW: 859.76; yellow-brown powdr.
air sensitive
 Note: Sold under license from EnantioTech for research purposes only. PCT/CN2008/073648, CN 200810038929.
 EnantioTech BIMAH Ru DIOP Catalyst Kit component.



Technical Note:

- Efficient ruthenium catalyst for the hydrogenation of aryl ketones.



Tech. Note (1)
Ref. (1,2)

References:

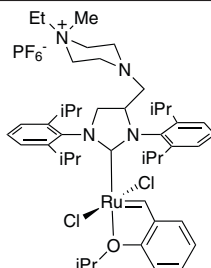
- Adv. Synth. Catal.*, **2011**, 353, 495
- Org. Lett.*, **2009**, 11, 907

- 44-0965** Dichloro[(4*S*,5*S*)-(+)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(S)-(-)-2-(*i*-propyl)methanamine)-1*H*-benzimidazole]ruthenium(II), min. 95% (1443051-97-5)
 $C_{42}H_{47}Cl_2N_3O_2P_2Ru$; FW: 859.76; yellow-brown powdr.
air sensitive
 Note: Sold under license from EnantioTech for research purposes only.
 PCT/CN2008/073648, CN 200810038929. EnantioTech BIMAH Ru DIOP Catalyst Kit component.

Technical Note:

- See 44-0970 (page 270)

- 44-0797** Dichloro(1,3-Bis(2,6-di-*i*-propylphenyl)-4-((4-ethyl-4-methylpiperzain-1-ium-1-yl)methyl)imidazolidin-2-ylidene)(2-isopropoxybenzylidene)ruthenium(II) hexafluorophosphate FixCat PF6
 $C_{45}H_{67}Cl_2F_6N_4OPRu$; FW: 996.98; green powdr.
air sensitive, (store cold)
 Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 61/603,790 PCT/EP2013/053967. Store at 2-8°C under inert atmosphere. Catalyst may be weighed in air.



Technical Note:

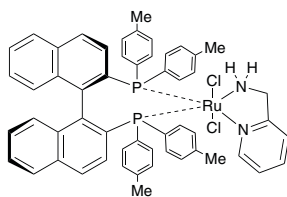
- Catalyst for metathesis applications.

References:

- Rafał Gawin, Anna Kozakiewicz, Piotr A. Gunka, Paweł Dabrowski, and Krzysztof Skowerski, *Angew. Chem.* **2017**, 129, 1001–1006.

RUTHENIUM (Compounds)

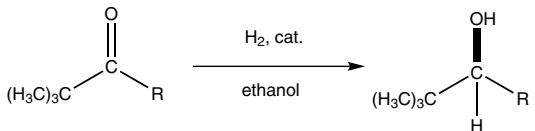
44-2314 Dichloro[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl](2-aminomethylpyridine) ruthenium(II) RuCl₂(AMPY)[(R)-Tol-Binap] (858116-31-1)
C₅₄H₄₈Cl₂N₂P₂Ru; FW: 958.89; yellow powdr.
air sensitive
Note: Sold in collaboration with JM for research purposes only.



250mg
1g

Technical Note:

- Efficient catalyst used in the asymmetric hydrogenation of tert-alkyl ketones



up to 100,000 TON
up to 98% ee

Tech. Note (1)
Ref. (1)

References:

- J. Am. Chem. Soc.*, **2005**, *127*, 8288

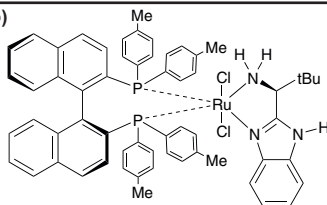
44-2315 Dichloro[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl](2-aminomethylpyridine)ruthenium(II) RuCl₂(AMPY)[(S)-Tol-Binap] (857678-55-8)
C₅₄H₄₈Cl₂N₂P₂Ru; FW: 958.89; yellow powdr.
air sensitive
Note: Sold in collaboration with JM for research purposes only.

250mg
1g

Technical Note:

- See 44-2314 (page 271)

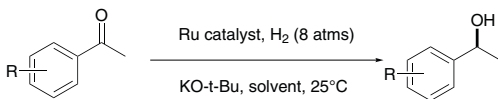
44-0950 Dichloro[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(α-(t-butyl)methanamine)-1H-benzimidazole] ruthenium(II), min. 97%
C₆₀H₅₇Cl₂N₃P₂Ru; FW: 1054.04;
yellow-brown powdr.
air sensitive
Note: Sold under license from EnantioTech for research purposes only.
PCT/CN2008/073648, CN 200810038929.
EnantioTech BIMAH Ru Tol-BINAP Catalyst Kit component.



100mg
500mg

Technical Note:

- Efficient ruthenium catalyst for asymmetric hydrogenation of aryl ketones.

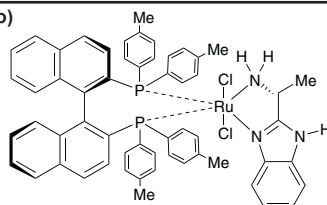


Tech. Note (1)
Ref. (1,2)

References:

- Adv. Synth. Catal.*, **2011**, *353*, 495
- Org. Lett.*, **2009**, *11*, 907

44-0935 Dichloro[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(R)-(+)-2-(α-methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95%
C₅₇H₅₁Cl₂N₃P₂Ru; FW: 1011.96;
yellow-brown powdr.
air sensitive
Note: Sold under license from EnantioTech for research purposes only.
PCT/CN2008/073648, CN 200810038929.
EnantioTech BIMAH Ru Tol-BINAP Catalyst Kit component.



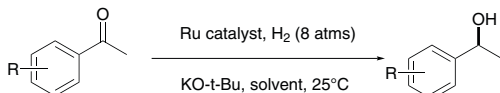
100mg
500mg

RUTHENIUM (Compounds)

44-0935 Dichloro[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(R)-(+)-2-(α -methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95%
(continued)

Technical Note:

1. Efficient ruthenium catalyst for the hydrogenation of aryl ketones.



Tech. Note (1)
Ref. (1,2)

References:

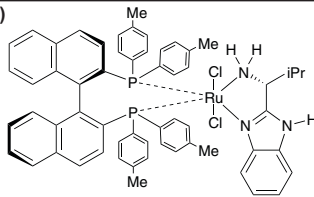
1. *Adv. Synth. Catal.*, **2011**, 353, 495
2. *Org. Lett.*, **2009**, 11, 907

44-0930 Dichloro[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(α -methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 97% 100mg
500mg
 $C_{57}H_{51}Cl_2N_3P_2Ru$; FW: 1011.96; yellow-brown powdr.
air sensitive
Note: Sold under license from Enantitech for research purposes only.
PCT/CN2008/073648, CN 200810038929.
Enantitech BIMAH Ru Tol-BINAP Catalyst Kit component.

Technical Note:

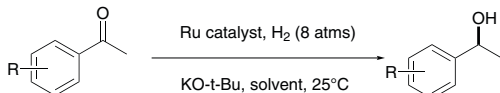
1. See 44-0935 (page 271)

44-0945 Dichloro[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(R)-(+)-2-(α -i-propyl) methanamine)-1H-benzimidazole] ruthenium(II), min. 95% 100mg
500mg
 $C_{58}H_{55}Cl_2N_3P_2Ru$; FW: 1040.01;
yellow-brown powdr.
air sensitive
Note: Sold under license from Enantitech for research purposes only. PCT/CN2008/073648, CN 200810038929. Enantitech BIMAH Ru Tol-BINAP Catalyst Kit component.



Technical Note:

1. Efficient ruthenium catalyst for asymmetric hydrogenation of aryl ketones.



Tech. Note (1)
Ref. (1,2)

References:

1. *Adv. Synth. Catal.*, **2011**, 353, 495
2. *Org. Lett.*, **2009**, 11, 907

44-0940 Dichloro[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(α -i-propyl) methanamine)-1H-benzimidazole]ruthenium(II), min. 95% 100mg
500mg
 $C_{58}H_{55}Cl_2N_3P_2Ru$; FW: 1040.01; yellow-brown powdr.
air sensitive
Note: Sold under license from Enantitech for research purposes only.
PCT/CN2008/073648, CN 200810038929.
Enantitech BIMAH Ru Tol-BINAP Catalyst Kit component.

Technical Note:

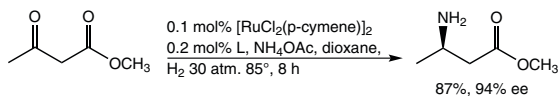
1. See 44-0945 (page 272)

RUTHENIUM (Compounds)

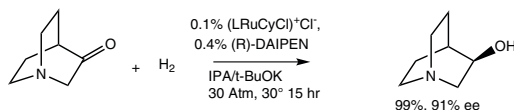
<p>44-0214 Dichloro{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}[(2R)-(-)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) RuCl₂[(R)-dm-segphos®] [(R)-daipen] (944450-43-5) C₆₅H₇₀Cl₂N₂O₆P₂Ru; FW: 1209.18; yellow powd. <i>air sensitive</i> Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.</p>		<p>250mg 1g 5g</p>
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Technical Notes:

1. Biaryl phosphine ligand with narrow dihedral angle. The DM-SEGPHOS ligand, as the ruthenium complex, gives superior enantioselectivity and diastereoselectivity in the asymmetric hydrogenation of α -substituted- β -ketoesters. See 15-0066.
2. Ruthenium catalyzed enantioselective synthesis of β amino acids by hydrogenation.
3. Ruthenium catalyzed asymmetric hydrogenation of 3-quinuclidinone. See 44-0098 for Ru catalyst.



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (2)

References:

1. WIPO Pat. WO2005028419
2. U.S. Pat. App. 2006047122.

<p>44-0215 Dichloro{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole} [(2S)-(+)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) RuCl₂[(S)-dm-segphos®] [(S)-daipen] (944450-44-6) C₆₅H₇₀Cl₂N₂O₆P₂Ru; FW: 1209.18; yellow powd. <i>air sensitive</i> Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.</p>	<p>250mg 1g 5g</p>
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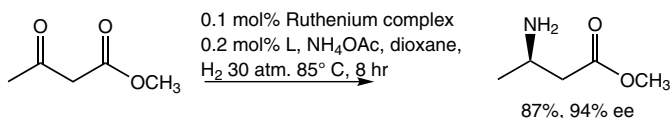
Technical Note:

1. See 44-0214 (page 273)

<p>44-0228 Dichloro{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}[(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II) RuCl₂[(R)-dm-segphos®] [(R,R)-dpn] (944450-45-7) C₆₀H₆₀Cl₂N₂O₆P₂Ru; FW: 1075.04; yellow powd. <i>air sensitive</i> Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.</p>		<p>250mg 1g 5g</p>
--	--	----------------------------

Technical Notes:

1. Biaryl phosphine ligand with narrow dihedral angle. The DM-SEGPHOS ligand, as the ruthenium complex, gives superior enantioselectivity and diastereoselectivity in the asymmetric hydrogenation of α -substituted- β -ketoesters. See 15-0066.
2. Ruthenium catalyzed enantioselective synthesis of β amino acids by hydrogenation.
3. Ruthenium catalyzed asymmetric hydrogenation of 3-quinuclidinone. See 44-0098 for Ru catalyst.

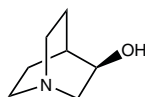
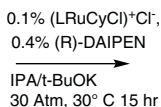
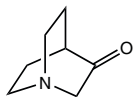


Tech. Note (2)
Ref. (1)

RUTHENIUM (Compounds)

44-0228
(continued)

Dichloro{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}[(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II) RuCl₂[(R)-dm-segphos®][(R,R)-dpem] (944450-45-7)



99%, 91% ee

Tech. Note (3)
Ref. (2)

References:

1. WIPO Pat. WO2005028419
2. U.S. Pat. App. 2006047122.

44-0229

Dichloro{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole} [(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II) RuCl₂[(S)-dm-segphos®][(S,S)-dpem] (944450-46-8)

C₆₀H₆₀Cl₂N₂O₄P₂Ru; FW: 1075.04; yellow powdr.
air sensitive

Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

250mg
1g
5g

Technical Note:

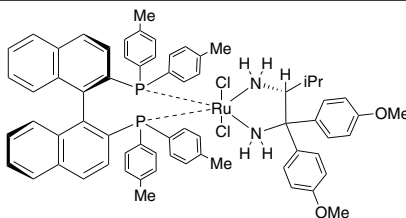
1. See 44-0228 (page 273)

44-0212

Dichloro{(R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl}[(2R)-(-)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) RuCl₂[(R)-xylbinap][(R)-daipen] (220114-32-9)

C₇₁H₇₄Cl₂N₂O₂P₂Ru; FW: 1221.28;
yellow to dark brown or green solid
air sensitive

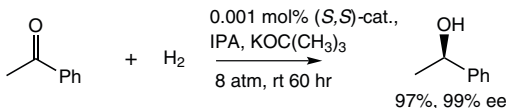
Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Diamine Catalyst Kit component.



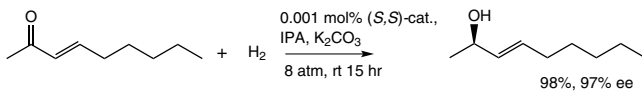
250mg
1g
5g

Technical Notes:

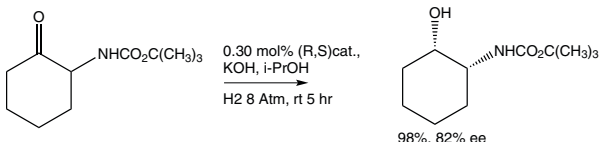
1. Highly active catalyst for hydrogenation of simple ketones giving high enantioselectivity when sterically unsymmetrical ketones such as acetophenone, heteroaryl ketones, benzophenones, cyclopropyl ketones, and cyclohexyl ketones are substrates. Ee's are enhanced with XylBINAP relative to BINAP. The otherwise poorly bonded ketone is held in the transition state by hydrogen bonding to the protic bidentate amine.
2. Carbonyl groups are selectively reduced even when olefins exist in the same molecule.
3. In the presence of strong base, and catalyst, simple ketones, having substituents at the α-position, may be induced to undergo dynamic kinetic resolution during their hydrogenation to produce two chiral carbon centers in high yield.



Tech. Note (1)
Ref. (1-4)



Tech. Note (2)
Ref. (4)



Tech. Note (3)
Ref. (5)

References:

1. *Angew Chem. Int. Ed.*, **2001**, 40, 40, review, article
2. *Org. Lett.*, **2000**, 2, 1749
3. *Org. Lett.*, **2000**, 2, 659
4. *J. Am. Chem. Soc.*, **1998**, 120, 13529
5. *J. Am. Chem. Soc.*, **2000**, 122, 6510

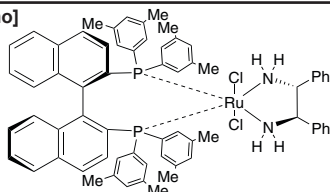
RUTHENIUM (Compounds)

44-0213 Dichloro((S)-(-)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl)[(2S)-(+)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) 250mg
RuCl₂[(S)-xylbinap][(S)-daipen] (220114-01-2) 1g
 C₇₇H₇₄Cl₂N₂O₂P₂Ru; FW: 1221.28; orange pwdr. 5g
air sensitive
 Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Diamine Catalyst Kit component.

Technical Note:

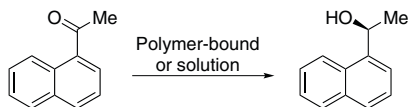
1. See 44-0212 (page 274)

44-0226 Dichloro((R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl)[(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II) 250mg
RuCl₂[(R)-xylbinap][(R,R)-dpen] (220114-38-5) 1g
 C₆₆H₆₄Cl₂N₂P₂Ru; FW: 1119.15; yellow pwdr. 5g
air sensitive
 Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Diamine Catalyst Kit component.

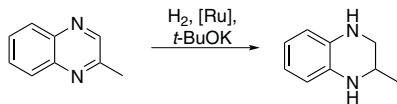


Technical Notes:

1. See 44-0210.
2. Sequential asymmetric hydrogenation reactions with solution or polymer-bound BINAP/Diamine complexes.
3. Asymmetric hydrogenation of imines.
4. Catalysts for deracemization of benzylic alcohols.



Tech. Note (2)
Ref. (1,2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)

References:

1. *Angew. Chem. Int. Ed.*, **2001**, 40, 40 (review)
2. *Adv. Synth. Catal.*, **2001**, 343, 369.
3. *Adv. Synth. Catal.*, **2003**, 345, 195.
4. *Chem. Commun.*, **2007**, 2608.

44-0224 Dichloro((S)-(-)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl)[(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II) 250mg
RuCl₂[(S)-xylbinap][(S,S)-dpen] (220114-03-4) 1g
 C₆₆H₆₄Cl₂N₂P₂Ru; FW: 1119.15; yellow pwdr. 5g
air sensitive
 Note: Manufactured under license of Takasago patent.
 Takasago BINAP Ru Diamine Catalyst Kit component.

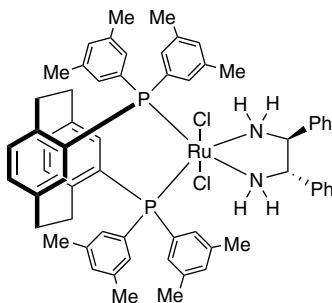
Technical Note:

1. See 44-0226 (page 275)

RUTHENIUM (Compounds)

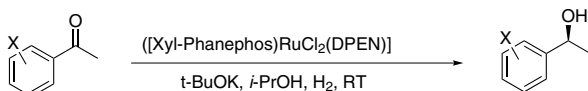
44-0380 Dichloro[(R)-(-)-4,12-bis(di(3,5-xylyl)phosphino)-[2.2]-paracyclophane] [(1S,2S)-(-)-1,2-diphenylethylenediamine] ruthenium(II), min. 95% (325150-57-0)
 $\text{RuCl}_2[\text{C}_{48}\text{H}_{50}\text{P}_2][\text{C}_{14}\text{H}_{16}\text{N}_2]$; FW: 1073.12; cream colored powdr.
air sensitive
 Note: *Limited quantities available*
 Sold in collaboration with Chirotech for research purposes only.
 US Patent nos. 5874629 and 6486337.

10mg
50mg

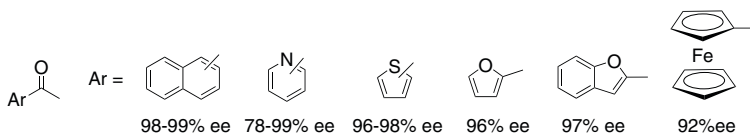


Technical Notes:

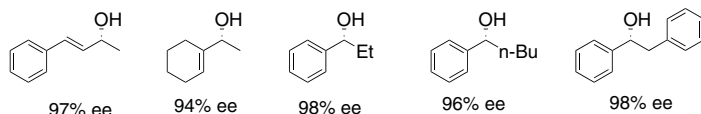
1. The Noyori [(diphosphine) RuCl₂ (diamine)] catalysts containing the chiral ligand Xylyl-Phanephos display exceptional activity and enantioselectivity in the asymmetric hydrogenation of a wide range of aromatic, heteroaromatic and α,β-unsaturated ketones.
2. Reactions are performed under mild conditions at room temperature and typically at low H₂ pressures of 2-10 bar. High substrate concentrations of up to 40% w/v are tolerated.
3. Molar substrate/catalyst ratios of up to 100,000/1 are achieved with excellent reactivity and enantioselectivity using commercial grade substrates and solvents.



X = p-CF₃, p-Br, p-F, p-OMe, m-CF₃, o-CF₃, o-CH₃, o-Br, o-OMe, p-NH₂



Other Examples



References:

1. *Org. Lett.*, **2000**, 2, 4173
2. Burk, M.J.; Hems, W.; Zanotti-Gerosa, A. PCT WO/0174829 A1, **2001**
3. *Org. Proc. Res. Dev.*, **2003**, 7, 89

44-0381 Dichloro[(S)-(+)-4,12-bis(di(3,5-xylyl)phosphino)-[2.2]-paracyclophane][(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II), min. 95% (364795-64-2)
 $\text{RuCl}_2[\text{C}_{48}\text{H}_{50}\text{P}_2][\text{C}_{14}\text{H}_{16}\text{N}_2]$; FW: 1073.12; cream colored powdr.
air sensitive

10mg
50mg

Note: ** Limited quantities available ** Sold in collaboration with Chirotech for research purposes only. US Patent nos. 5874629 and 6486337.

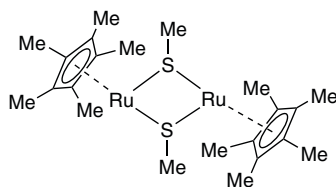
Technical Note:

1. See 44-0380 (page 276)

RUTHENIUM (Compounds)

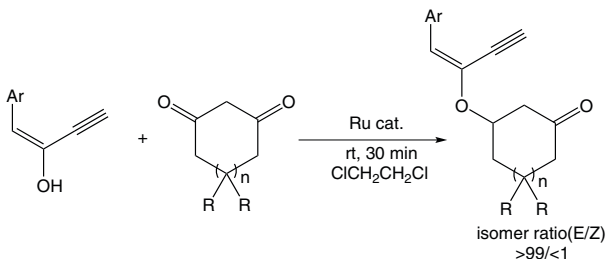
44-0645 Dichlorobis(μ -methanethioato) bis(pentamethylcyclopentadienyl) diruthenium(III), 99% (minimum 90% syn isomer) (216064-20-9)
 $C_{22}H_{36}Cl_2Ru_2S_2$; FW: 637.70; black xtl.

100mg
 500mg
 2g

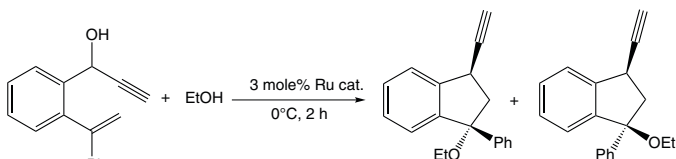


Technical Notes:

1. Ruthenium-catalyzed vinylic substitution reactions.
2. Ruthenium-catalyzed oxypropargylation of alkenes.



Tech. Note (1)
 Ref. (1)



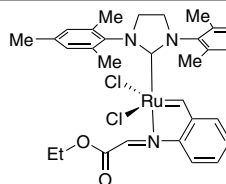
Tech. Note (2)
 Ref. (2)

References:

1. *J. Am. Chem. Soc.*, **2008**, *130*, 2908.
2. *Organometallics*, **2009**, *28*, 48.

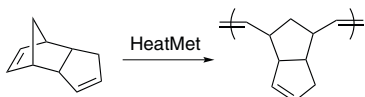
44-0760 Dichloro(1,3-bis(2,4,6-trimethylphenyl)imidazolidin-2-ylidene){2-[(ethoxy-2-oxoethylidene)amino]benzylidene}ruthenium(II) HeatMet
 $C_{32}H_{37}Cl_2N_3O_2Ru$; FW: 667.63; dark purple xtls. (store cold)
 Note: Sold in collaboration with Apeiron Synthesis, Inc. U.S. Patent 14/443,034; PCT/IN2013/002543.

100mg
 500mg



Technical Note:

1. HeatMet catalyst is a highly efficient latent catalyst, requiring thermal activation to initiate catalytic activity. Its characteristics are especially suitable to mold polymerization of reactive monomers such as dicyclopentadiene (DCPD). The product is soluble in toluene and dichloromethane.



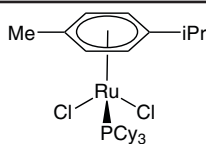
Tech. Note (1)
 Ref. (1)

References:

1. *ChemSus Chem.*, **2015**, *8*, 4139.

44-0430 Dichloro(p-cymene)tricyclohexylphosphineruthenium(II), min. 97% (145381-23-3)
 $RuCl_2(C_{10}H_{14})(C_6H_{11})_3P$; FW: 586.62; orange powdr.

250mg
 1g



Technical Notes:

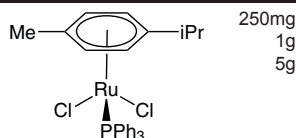
1. Noels metathesis catalyst component with (trimethylsilyl)diazomethane for ring opening polymerization reactions (Ref. 1,2).
2. Catalyst for the controlled atom transfer radical polymerization of acrylates (Ref. 3).

References:

1. *Macromolecules*, **1997**, *30*, 3127
2. *Adv. Synth. & Cat.*, **2007**, *349*, 1587
3. *Angew. Chem., Int. Ed.*, **1999**, *38*, 538

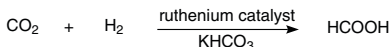
RUTHENIUM (Compounds)

44-0433 Dichloro(*p*-cymene)triphenylphosphineruthenium(II) dichloromethane adduct, min. 98% (52490-94-5)
 $C_{28}H_{29}Cl_2PRu \cdot CH_2Cl_2$; FW: 568.48 (653.41); orange to red powdr.

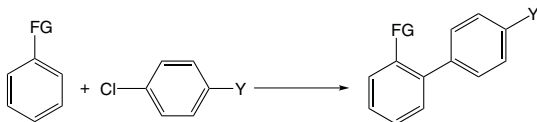


Technical Notes:

1. Ruthenium catalyst used for the hydrogenation of carbon dioxide.
2. Ruthenium catalyst used for a selective monoarylation reaction in water.



Tech. Note (1)
Ref. (1)

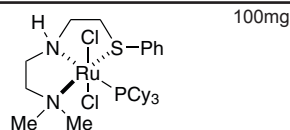


Tech. Note (2)
Ref. (2)

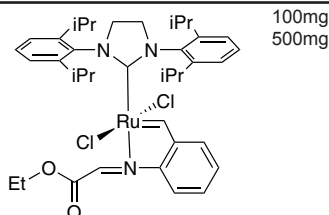
References:

1. *Organometallics*, **2013**, 32, 6891
2. *Green Chem.*, **2013**, 15, 67

44-0580 Dichloro[N1,N1-dimethyl-N2-[2-(phenylthio-κS)ethyl]-1,2-ethanediamine-κN1,κN2](tricyclohexylphosphine) ruthenium(II) (1839552-39-4)
 $C_{30}H_{53}Cl_2N_2PRuS$; FW: 676.77; brown powdr.
 Note: U.S. Patent: PCT/US2015/034793.



44-0792 NEW Dichloro(1,3-di-*i*-propylimidazolidin-2-ylidene){2-[(ethoxy-2-oxoethylidene)amino]benzylidene} ruthenium(II) HeatMet SiPr (2097273-88-4)
 $C_{38}H_{49}Cl_2N_3O_2Ru$; FW: 751.79; dark violet powdr.
air sensitive, (store cold)
 Note: Sold in collaboration with Apeiron Synthesis, Inc.
 U.S. Patent 14/443,034.



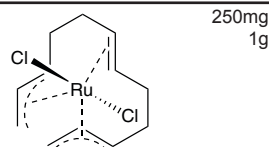
Technical Note:

1. Catalyst for metathesis applications.

References:

1. *ACS Catalysis*, **2017**, 7(6), 4115-4121.

44-0172 Dichloro(2,6,10-dodecatriene-1,12-diyl)ruthenium(IV), 99% (12170-97-7)
 $RuCl_2(C_{12}H_{18})$; FW: 334.24; orange xtl.; m.p. 192° (dec.)



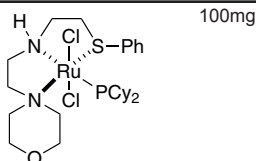
Technical Notes:

1. An efficient catalyst used for the isomerization of allylic alcohols into carbonyl compounds in organic or aqueous media.
2. An efficient catalyst used for the deprotection of N-allylic amines.

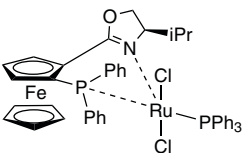
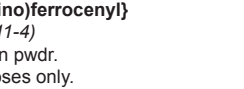
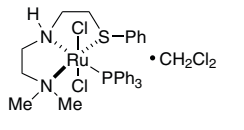
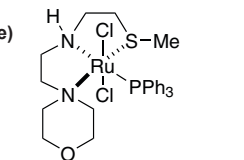
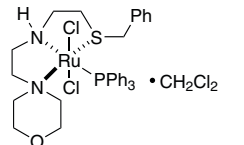
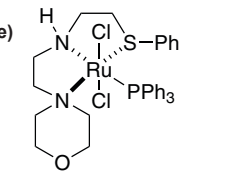
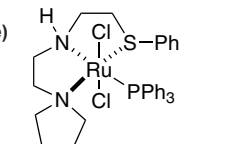
References:

1. *Chemical Commun.*, **2004**, 232.
2. *Chemical Commun.*, **2005**, 4086.

44-0565 Dichloro[N-2-(phenylthio-κS)ethyl]-[4-morpholineethanamine-κNN1,κN1](tricyclohexylphosphine) ruthenium(II) (1799787-22-6)
 $C_{37}H_{55}Cl_2N_3OPRuS$; FW: 718.81; brown powdr.
 Note: U.S. Patent: PCT/US2015/034793.

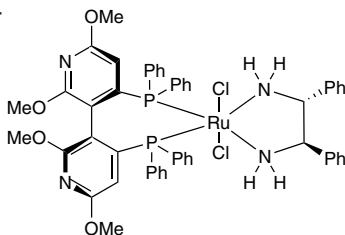


RUTHENIUM (Compounds)

44-0442	<p>(+)-Dichloro[(4R)-4-(i-propyl)-2-((R)-2-(diphenylphosphino)ferrocenyl)oxazoline](triphenylphosphine)ruthenium(II) (1312582-16-3) $\text{RuCl}_2[(\text{C}_6\text{H}_5)_3\text{P}](\text{C}_{28}\text{H}_{28}\text{FeNOP})$; FW: 915.70; orange-brown powdr. Note: Sold in collaboration with Solvias for research purposes only.</p>		<p>100mg 500mg 2g 10g</p>
Technical Notes:			
<ol style="list-style-type: none"> Catalyst used for the oxidative kinetic resolution of racemic alcohols. Catalyst used for the extremely high enantioselective transfer hydrogenation of ketones and the oxidative kinetic resolution of alcohols. Catalyst used for the asymmetric hydrosilylation of ketones and imine. 			
References:			
<ol style="list-style-type: none"> <i>J. Org. Chem.</i>, 2003, <i>68</i>, 5875 <i>Organometallics</i>, 1999, <i>18</i>, 2291 <i>Organometallics</i>, 1998, <i>17</i>, 3420 			
44-0443	<p>(-)-Dichloro[(4S)-4-(i-propyl)-2-((S)-2-(diphenylphosphino)ferrocenyl)oxazoline](triphenylphosphine)ruthenium(II) (212133-11-4) $\text{RuCl}_2[(\text{C}_6\text{H}_5)_3\text{P}](\text{C}_{28}\text{H}_{28}\text{FeNOP})$; FW: 915.70; orange-brown powdr. Note: Sold in collaboration with Solvias for research purposes only.</p>		<p>100mg 500mg 2g 10g</p>
Technical Note:			
1. See 44-0442 (page 279)			
44-0575	<p>Dichloro[rel-[N2(S)]-N1,N1-dimethyl-N2-[2-((R)-phenylthio-κS)ethyl]-1,2-ethanediamine-κNN1,κN2](triphenylphosphine)ruthenium(II), compd. with dichloromethane (1799787-31-7) $\text{C}_{30}\text{H}_{35}\text{Cl}_2\text{N}_2\text{PRuS} \cdot 1\text{CH}_2\text{Cl}_2$; FW: 658.63; burgundy xtl. Note: U.S. Patent: PCT/US2015/034793.</p>		100mg
44-0560	<p>Dichloro[rel-[N(S)]-N-[2-((R)-methylthio-κS)ethyl]-4-morpholineethanamine-κNN4,κN4](triphenylphosphine)ruthenium(II) (1799824-01-3) $\text{C}_{27}\text{H}_{35}\text{Cl}_2\text{N}_2\text{OPRuS}$; FW: 638.59; red xtl. Note: U.S. Patent: PCT/US2015/034793.</p>		100mg
44-0555	<p>Dichloro[rel-[N(R)]-N-[2-((R)-(phenylmethyl)thio-κS)ethyl]-4-morpholineethanamine-κNN4,κN4](triphenylphosphine)ruthenium(II) (1799787-29-3) $\text{C}_{33}\text{H}_{39}\text{Cl}_2\text{N}_2\text{OPRuS} \cdot 0.5(\text{CH}_2\text{Cl}_2)$; FW: 799.62; red xtl. Note: U.S. Patent: PCT/US2015/034793.</p>		50mg
44-0550	<p>Dichloro[rel-[N(S)]-N-[2-((R)-phenylthio-κS)ethyl]-4-morpholineethanamine-κNN4,κN4](triphenylphosphine)ruthenium(II) (1799787-13-5) $\text{C}_{32}\text{H}_{37}\text{Cl}_2\text{N}_2\text{OPRuS}$; FW: 700.66; pink powdr. Note: U.S. Patent: PCT/US2015/034793.</p>		100mg
44-0570	<p>Dichloro[rel-[N(S)]-N-[2-((R)-phenylthio-κS)ethyl]-[1-pyrrolidineethanamine-κNN1,κN1](triphenylphosphine)ruthenium(II) (1799787-20-4) $\text{C}_{32}\text{H}_{37}\text{Cl}_2\text{N}_2\text{PRuS}$; FW: 684.67; pink powdr. Note: U.S. Patent: PCT/US2015/034793.</p>		100mg

RUTHENIUM (Compounds)

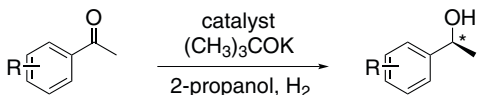
44-0385 Dichloro[(R)-(+)-2,2',6,6'-tetramethoxy-4,4'-bis(diphenylphosphino)-3,3'-bipyridine][(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II), min. 95% (478308-91-7)
 $RuCl_2[C_{38}H_{34}N_2O_4P_2][C_{14}H_{16}N_2]$; FW: 1028.90; yellow solid
air sensitive
 Note: Sold in collaboration with Johnson Matthey for research purposes only. US patent Application No US Patent 5 886 182, 1999 and patents arising therefrom. PCT/JP96/03573.



100mg
500mg

Technical Note:

1. Effective catalyst for the highly enantioselective hydrogenation of a diverse range of simple aromatic ketones.



Tech. Note (1)
Ref. (1)

References:

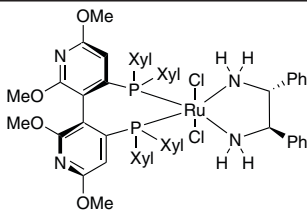
1. *J. Org. Chem.*, **2002**, 67, 7908.
2. *Chem. Eur. J.*, **2003**, 9, 2963.
2. *Chem. Eur. J.*, **2003**, 9, 2963.

44-0386 Dichloro[(S)-(-)-2,2',6,6'-tetramethoxy-4,4'-bis(diphenylphosphino)-3,3'-bipyridine][(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II), min. 95% (821793-36-6)
 $RuCl_2[C_{38}H_{34}N_2O_4P_2][C_{14}H_{16}N_2]$; FW: 1028.90; yellow solid
air sensitive
 Note: Sold in collaboration with Johnson Matthey for research purposes only. US patent Application No US Patent 5 886 182, 1999 and patents arising therefrom. PCT/JP96/03573.

Technical Note:

1. See 44-0385 (page 280)

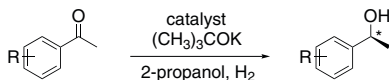
44-0390 Dichloro[(R)-(+)-2,2',6,6'-tetramethoxy-4,4'-bis(di(3,5-xylyl)phosphino)-3,3'-bipyridine][(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II), min. 95% (478308-93-9)
 $RuCl_2[C_{46}H_{50}N_2O_4P_2][C_{14}H_{16}N_2]$; FW: 1141.11; yellow solid
air sensitive
 Note: Sold in collaboration with Johnson Matthey for research purposes only. US patent Application No US Patent 5 886 182, 1999 and patents arising therefrom.



100mg
500mg

Technical Note:

1. Effective catalyst for the highly enantioselective hydrogenation of a diverse range of simple aromatic ketones.



Tech. Note (1)
Ref. (1)

References:

1. *J. Org. Chem.*, **2002**, 67, 7908.
2. *Chem. Eur. J.*, **2003**, 9, 2963.

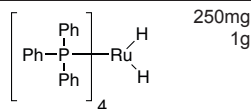
44-0391 Dichloro[(S)-(-)-2,2',6,6'-tetramethoxy-4,4'-bis(di(3,5-xylyl)phosphino)-3,3'-bipyridine][(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II), min. 95% (821793-37-7)
 $RuCl_2[C_{46}H_{50}N_2O_4P_2][C_{14}H_{16}N_2]$; FW: 1141.11; yellow solid
air sensitive
 Note: Sold in collaboration with Johnson Matthey for research purposes only. US patent Application No US Patent 5 886 182, 1999 and patents arising therefrom.

Technical Note:

1. See 44-0390 (page 280)

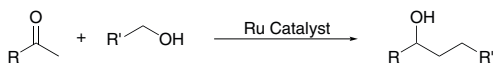
RUTHENIUM (Compounds)

44-0460 **Dihydrotetrakis(triphenylphosphine)ruthenium(II), 95%**
 (19529-00-1)
 $C_{72}H_{62}P_4Ru$; FW: 1152.23; yellow to green powder; m.p. 181-183°
air sensitive

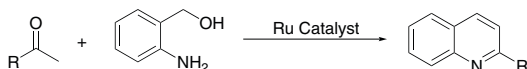


Technical Notes:

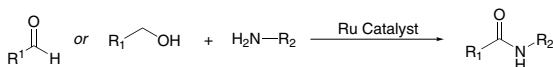
1. Catalyst for transfer hydrogenation of ketones with alcohols involving carbon-carbon bond formation.
2. Catalyst for oxidative cyclization of 2-aminobenzyl alcohol with ketones.
3. Amidation catalyst of alcohols or aldehydes with amines.
4. Stereoselective semireduction of internal alkynes to Z-olefins under transfer hydrogenation conditions.
5. Catalyst for synthesis of cyclic imides from nitriles and diols via hydrogen transfer mechanism.
6. Catalyst for direct hydrogenation of carboxylic acids using triphos-type ligands.



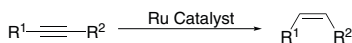
Tech. Note (1)
Ref. (1)



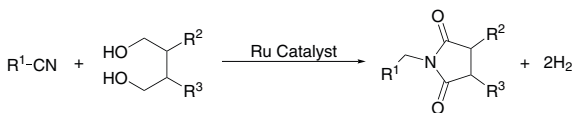
Tech. Note (2)
Ref. (2)



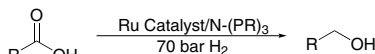
Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (6)

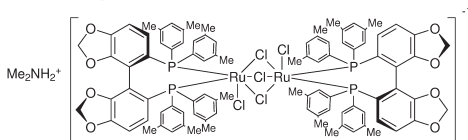
References:

1. *J. Org. Chem.*, **2001**, 66, 9020.
2. *Chem. Commun.*, **2001**, 2576.
3. *J. Org. Chem.*, **2010**, 75, 3002.
4. *Chem. Eur. J.*, **2010**, 16, 12214.
5. *Org. Lett.*, **2014**, 16, 4404.
6. *ChemSusChem*, **2016**, 9, 177.

44-0520 **Dimethylammonium dichlorotri(μ-chloro)bis{(R)-(+)-5,5'-bis(di(3,5-xylyl)phosphino)-4,4'-bi-1,3-benzodioxole}diruthenate(II)**
 $[NH_2Me_2][\{RuCl(\mu-Cl)(R-dm-segphos)\}_2(\mu-Cl)_3]$ (935449-46-0)
 $(CH_3)_2NH_2^+ [C_{92}H_{88}Cl_5O_8P_4Ru_2]$; FW: 1870.06; light brown powder; m.p. >100° dec.
air sensitive

250mg
1g
5g

Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

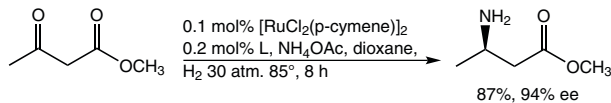


Technical Notes:

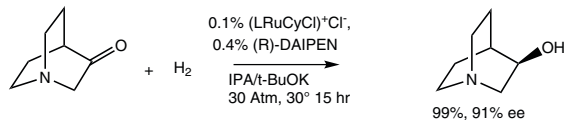
1. Biaryl bisphosphine ligand with narrow dihedral angle. The DM-SEGPHOS ligand, as the ruthenium complex, gives superior enantioselectivity and diastereoselectivity in the asymmetric hydrogenation of α-substituted β-ketoesters. See 15-0066.
2. Ruthenium catalyzed enantioselective synthesis of β amino acids by hydrogenation.
3. Ruthenium catalyzed asymmetric hydrogenation of 3-quinuclidinone. See 44-0098 for Ru catalyst.

RUTHENIUM (Compounds)

44-0520 Dimethylammonium dichlorotri(μ-chloro)bis{(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}diruthenate(II) [NH₂Me₂][{RuCl((R)-dm-segphos®)}₂(μ-Cl)₃] (935449-46-0)
(continued)



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (2)

References:

1. WIPO Pat. WO2005028419
2. U.S. Pat. App. 2006047122.

44-0521 Dimethylammonium dichlorotri(μ-chloro)bis{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}diruthenate(II) 250mg
NEW [NH₂Me₂][{RuCl((S)-dm-segphos®)}₂(μ-Cl)₃] (944451-14-3) 1g
(CH₃)₂NH₂⁺[C₉₂H₉₈Cl₅O₈P₄Ru₂]; FW: 1870.06; light brown powdr.; m.p. >100° dec. 5g
air sensitive

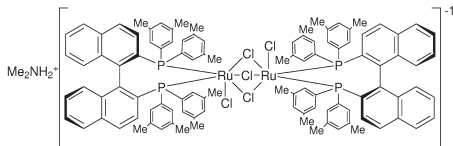
Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

Technical Note:

1. See 44-0520 (page 281)

44-0514 Dimethylammonium dichlorotri(μ-chloro)bis{(R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl}diruthenate(II) [NH₂Me₂][{RuCl((R)-xylbinap)}₂(μ-Cl)₃] 250mg
(944451-08-5) 1g
(CH₃)₂NH₂⁺[C₁₀₄H₉₈Cl₅P₄Ru₂]; FW: 1894.26; red-brown powdr. 5g
m.p. >100° dec.

air sensitive
Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Dimer Catalyst Kit component.



Technical Note:

1. Catalyst system for asymmetric hydrogenation.

References:

1. Eur. Pat. Appl. 1998, EP, 831099, A2, 19980325

44-0515 Dimethylammonium dichlorotri(μ-chloro)bis{(S)-(-)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl}diruthenate(II) [NH₂Me₂][{RuCl((S)-xylbinap)}₂(μ-Cl)₃] (944451-10-9) 250mg
(CH₃)₂NH₂⁺[C₁₀₄H₉₈Cl₅P₄Ru₂]; FW: 1894.26; red-brown powdr.; m.p. >100° dec. 1g
air sensitive 5g

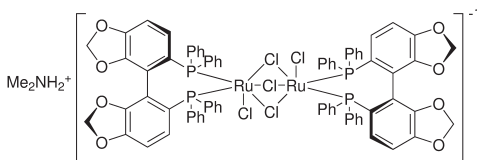
Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Dimer Catalyst Kit component.

Technical Note:

1. See 44-0514 (page 282)

44-0518 Dimethylammonium dichlorotri(μ-chloro)bis{(R)-(+)-5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole}diruthenate(II) [NH₂Me₂][{RuCl((R)-segphos®)}₂(μ-Cl)₃] 250mg
(346457-41-8) 1g
(CH₃)₂NH₂⁺[C₇₆H₄₈Cl₅O₈P₄Ru₂]; FW: 1637.57; light brown powdr. 5g
m.p. >100° dec.

air sensitive
Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

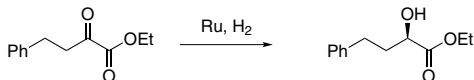


RUTHENIUM (Compounds)

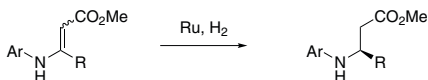
44-0518 Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-5,5'-bis(diphenylphosphino)-4,4'-bi-(continued) 1,3-benzodioxole]diruthenate(II) [NH₂Me₂][{RuCl((R)-segphos®)}₂(μ-Cl)₃] (346457-41-8)

Technical Notes:

- Highly enantioselective, highly active catalyst for hydrogenation of functionalized ketones. The chlororuthenate salts show catalytic activity at relatively low temperature. See 15-0136 .
- Catalyst for enantioselective hydrogenation of enamines.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

- Adv. Synth. Catal., 2001, 343, 264
- U.S. Pat. App., 2006, 122225

44-0519 Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole]diruthenate(II) [NH₂Me₂][{RuCl((S)-segphos®)}₂(μ-Cl)₃] (488809-34-3) 250mg
1g
5g
(CH₃)₂NH₂⁺[C₇₆H₄₈Cl₅O₈P₄Ru₂]; FW: 1637.57; light brown powdr.; m.p. >100° dec.
air sensitive
Note: Manufactured under license of Takasago patent. Takasago SEGPHOS® Ru Catalyst Kit component.

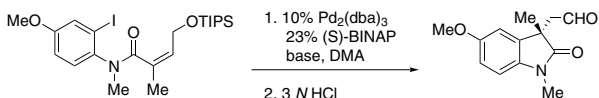
Technical Note:

- See 44-0518 (page 282)

44-0510 Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH₂Me₂][{RuCl((R)-binap)}₂(μ-Cl)₃] (199684-47-4) 250mg
1g
5g
(CH₃)₂NH₂⁺[C₈₈H₆₄Cl₅P₄Ru₂]; FW: 1669.83; orange powdr.; m.p. >100° dec.
air sensitive
Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Dimer Catalyst Kit component.

Technical Notes:

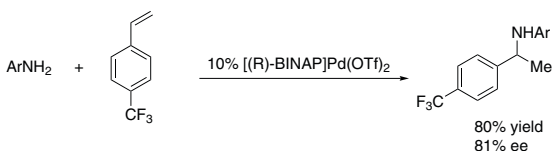
- (R)-BINAP or (R)-Tol-BINAP can be combined with dichloro(1,5-cyclooctadiene)ruthenium to form precursors to NOYORI CATALYST SYSTEMS. These systems exhibit very high catalytic activity and enantioselectivity in the hydrogenation of a wide range of substrates. NOYORI CATALYST SYSTEMS have been shown to effect highly enantioselective hydrogenation of functionalized ketones where the substituents are dialkylamino, hydroxy, siloxy, carbonyl, ester, amide or thioester
- Useful ligand in asymmetric Heck processes.
- Ligand employed in palladium-catalyzed asymmetric arylation of ketones.
- Ligand employed in rhodium-catalyzed 1,4-additions to enones.
- Ligand employed in palladium-catalyzed hydroamination of styrene derivatives.
- Ligand employed in silver-catalyzed asymmetric Sakuri-Hosomi allylation and Mukaiyama aldol reaction.
- Ligand employed in rhodium-catalyzed kinetic resolution of enynes.
- Ligand employed in asymmetric rhodium-catalyzed hydroboration of cyclopropenes.
- Ligand employed in silver-catalyzed α-hydroxylation of stannyl enol ethers.
- Ligand employed in palladium-catalyzed synthesis of chiral allenes.
- Ligand for palladium-catalyzed enantioselective hetero Michael addition to form β-amino acid derivatives.
- Ligand employed in rhodium-catalyzed asymmetric rearrangement of alkynyl alkenyl carbinols.
- Ligand employed in rhodium-catalyzed 1,2-addition of aluminium organo compounds to cyclic enones.
- Ligand employed in iridium-catalyzed transfer hydrogenative allylation of benzylic alcohols.
- Ligand employed in rhodium-catalyzed asymmetric C-Si bond formation by conjugate silyl transfer using a Si-B linkage.



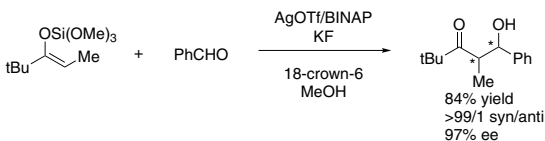
Tech. Note (2)
Ref. (5)

RUTHENIUM (Compounds)

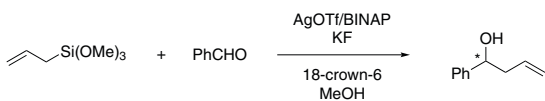
44-0510 Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH₂Me₂][{RuCl((R)-binap)}₂(μ-Cl)₃] (199684-47-4)



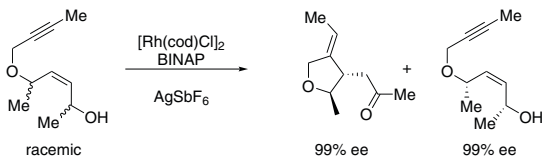
Tech. Note (5)
Ref. (9)



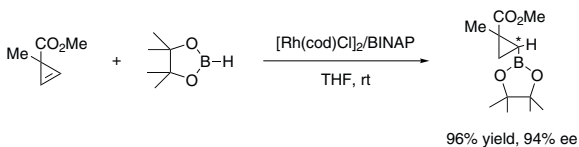
Tech. Note (6)
Ref. (10)



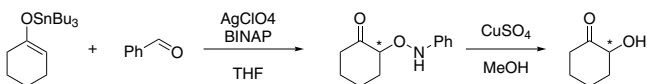
Tech. Note (6)
Ref. (10)



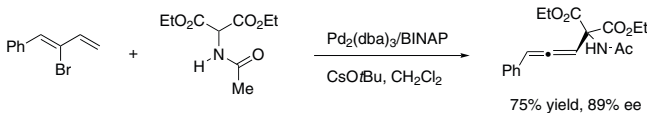
Tech. Note (7)
Ref. (11)



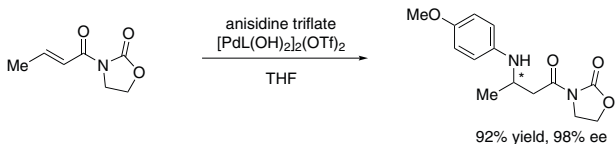
Tech. Note (8)
Ref. (12)



Tech. Note (9)
Ref. (13)



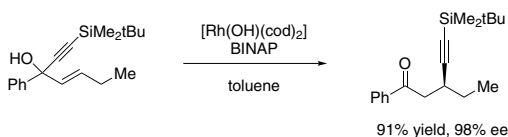
Tech. Note (10)
Ref. (14)



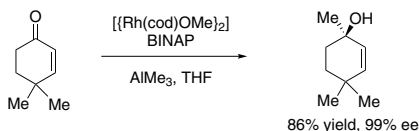
Tech. Note (11)
Ref. (15)

RUTHENIUM (Compounds)

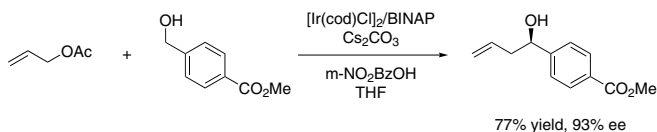
44-0510 Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH₂Me₂][{RuCl(μ-Cl)}₂(μ-Cl)₃] (199684-47-4)



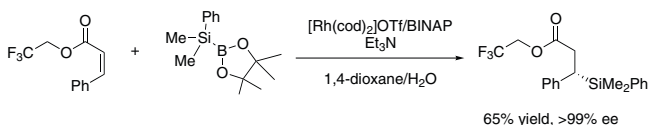
Tech. Note (12)
Ref. (16)



Tech. Note (13)
Ref. (17)



Tech. Note (15)
Ref. (18)



Tech. Note (15)
Ref. (19)

References:

1. CHEMTECH, **1992**, 360
2. *Asymmetric Catalysis in Organic Synthesis*, **1993**, 61
3. *J. Am. Chem. Soc.*, **1988**, 110, 629
4. *Science*, **1990**, 248, 1194
5. *J. Am. Chem. Soc.*, **1998**, 120, 6477;6488
6. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol.1, 509
7. *J. Am. Chem. Soc.*, **1998**, 120, 1918
8. *J. Am. Chem. Soc.*, **1998**, 120, 5579
9. *J. Am. Chem. Soc.*, **2000**, 122, 9547
10. *J. Org. Chem.*, **2003**, 68, 5593
11. *J. Am. Chem. Soc.*, **2003**, 125, 11472
12. *J. Am. Chem. Soc.*, **2003**, 125, 7198
13. *J. Am. Chem. Soc.*, **2003**, 125, 6038
14. *J. Am. Chem. Soc.*, **2001**, 123, 2089
15. US Patent Application US2006/0205968
16. *J. Am. Chem. Soc.*, **2007**, 129, 14158
17. *Angew. Chem. Int. Ed.*, **2007**, 46, 7122
18. *J. Am. Chem. Soc.*, **2008**, 130, 14891
19. *Angew. Chem. Int. Ed.*, **2008**, 47, 3818

44-0511	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH ₂ Me ₂][{RuCl(μ-Cl)} ₂ (μ-Cl) ₃] (199541-17-8) (CH ₃) ₂ NH ₂ ⁺ [C ₈₈ H ₆₄ Cl ₅ P ₄ Ru ₂] ⁻ ; FW: 1669.83; orange powd.; m.p. >100° dec. <i>air sensitive</i> Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Dimer Catalyst Kit component.	250mg 1g 5g
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Technical Note:

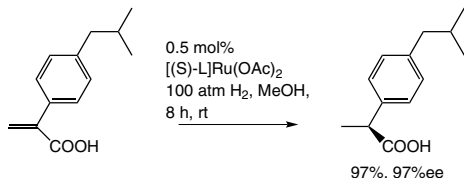
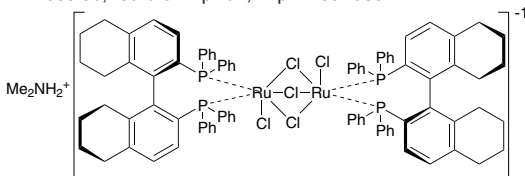
1. See 44-0510 (page 283)

RUTHENIUM (Compounds)

44-0516 Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl]diruthenate(II) 50mg
250mg
[NH₂Me₂][{RuCl((R)-H₈-binap)}₂(μ-Cl)₃] (204933-84-6)
(CH₃)₂NH₂⁺[C₈₈H₈₀Cl₅P₄Ru₂]⁻¹; FW: 1685.96; red-brown powdr.; m.p. >100° dec.
air sensitive
Note: Manufactured under license of Takasago patent.

Technical Notes:

1. Biaryl bisphosphine ligand. The H8-BINAP ligand, as the ruthenium complex, catalyzes hydrogenation of unsaturated carboxylic acids to a higher ee than does BINAP. (Ref. 1,2)
2. The ruthenium catalyzed hydrogenation of aryl propenoic acid to produce the drug Ibuprofen.



Tech. Note (1,2)
Ref. (1,2)

References:

1. *J. Org. Chem.*, **1996**, *61*, 5510
2. *Topics Organometal. Chem.* **2004**, *6*, 63, review

44-0517 Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-2,2'-bis(diphenylphosphino)-5,5',6,6',7,7',8,8'-octahydro-1,1'-binaphthyl]diruthenate(II) 50mg
250mg
[NH₂Me₂][{RuCl((S)-H₈-binap)}₂(μ-Cl)₃] (944451-12-1)
(CH₃)₂NH₂⁺[C₈₈H₈₀Cl₅P₄Ru₂]⁻¹; FW: 1685.96; red-brown powdr.; m.p. >100° dec.
air sensitive
Note: Manufactured under license of Takasago patent.

Technical Note:

1. Catalyst system for asymmetric hydrogenation.

References:

1. World Patent WO2003/0307676

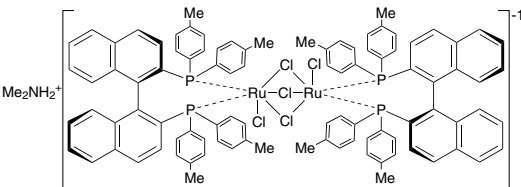
44-0512 Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH₂Me₂][{RuCl((R)-tolbinap)}₂(μ-Cl)₃] (749935-02-2) 250mg
1g
(CH₂)₂NH₂⁺[C₉₆H₈₀Cl₅P₄Ru₂]⁻¹; FW: 1782.05; brown powdr.; m.p. >100° dec.
air sensitive
Note: Manufactured under license of Takasago patent.
Takasago BINAP Ru Dimer Catalyst Kit component.

Technical Note:

1. Catalyst system for asymmetric hydrogenation.

References:

1. World Patent WO2004/074255



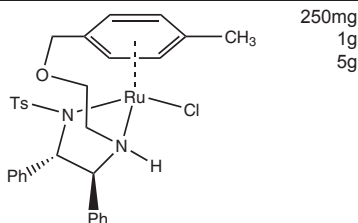
44-0513 Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl]diruthenate(II) [NH₂Me₂][{RuCl((S)-tolbinap)}₂(μ-Cl)₃] 250mg
1g
(309735-86-2)
(CH₃)₂NH₂⁺[C₉₆H₈₀Cl₅P₄Ru₂]⁻¹; FW: 1782.05; brown powdr.; m.p. >100° dec.
air sensitive
Note: Manufactured under license of Takasago patent. Takasago BINAP Ru Dimer Catalyst Kit component.

Technical Note:

1. See 44-0512 (page 286)

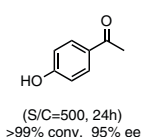
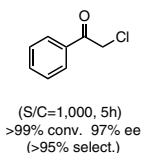
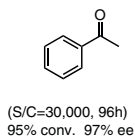
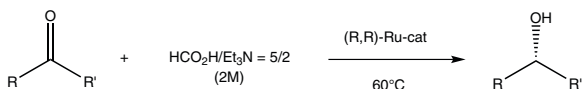
RUTHENIUM (Compounds)

44-0186 N-[(1*S*,2*S*)-1,2-Diphenyl-2-(4-methylbenzoyloxy)ethylamino)-ethyl]-4-methylbenzene sulfonamide-(chloro)ruthenium(II) (*S,S*)-Ts-DENE[®]B™
(1384974-37-1)
C₃₁H₃₃ClN₂O₃RuS; FW: 650.19; gray to brown solid
air sensitive
Note: Manufactured under license of Takasago patent application PCT/JP2011/064490.

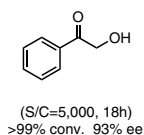
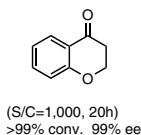
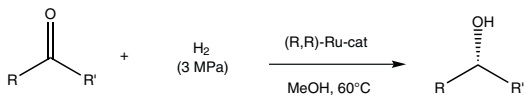
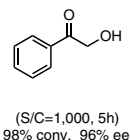
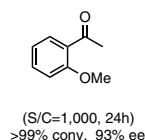
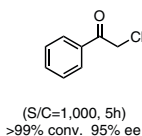


Technical Notes:

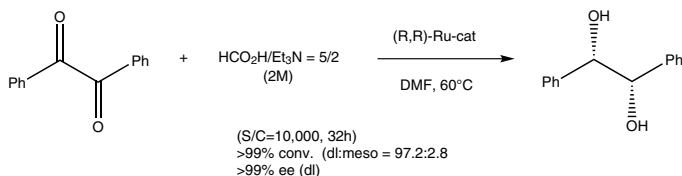
1. Catalyst used for asymmetric α -transfer hydrogenation.
2. Catalyst used for asymmetric H₂ - hydrogenation.
3. Catalyst used for dynamic kinetic resolution.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (1)

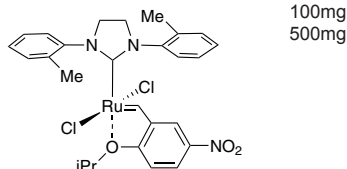
References:

1. *J. Am. Chem. Soc.*, **2011**, *133*, 14960

44-0740 (1,3-Di-*o*-tolylimidazolidin-2-ylidene)(2-*i*-propoxy-5-nitrobenzylidene)dichlororuthenium(II)
Nitro-Grela SI-*o*-Toly

NEW

C₂₇H₂₉Cl₂N₃O₃Ru; FW: 615.51; green pwd.
air sensitive, (store cold)
Note: Sold in collaboration with Apeiron Synthesis, Inc.
U.S. Patent 6/867,303 PCT/EP2003/01122.
Store at 2-8°C under inert atmosphere. Catalyst may be weighed in air.



RUTHENIUM (Compounds)

44-0740 (1,3-Di-*o*-tolylimidazolidin-2-ylidene)(2-*i*-propoxy-5-nitrobenzylidene)dichlororuthenium(II)
(continued) Nitro-Grela SI-*o*-Tolyl

Technical Note:

1. Catalyst for metathesis applications.

References:

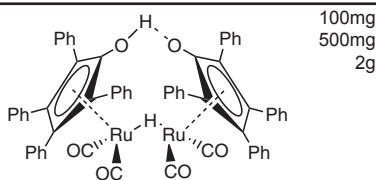
1. Rafał Gawin, Anna Kozakiewicz, Piotr A. Gunka, Paweł Dabrowski, and Krzysztof Skowerski, *Angew. Chem.* **2017**, *129*, 1001–1006.

96-3705 EnantioTech BIMAH Ru BINAP Catalyst Kit for Asymmetric Hydrogenation
See page 337

96-3710 EnantioTech BIMAH Ru DIOP Catalyst Kit for Asymmetric Hydrogenation
See page 338

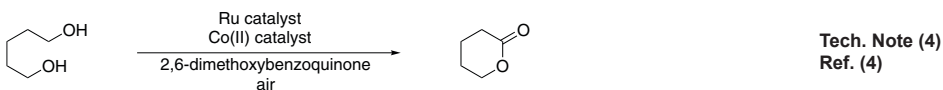
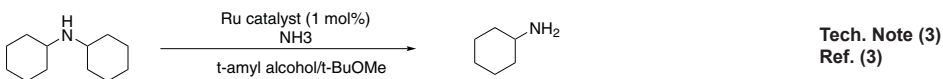
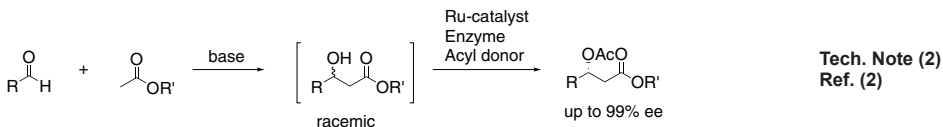
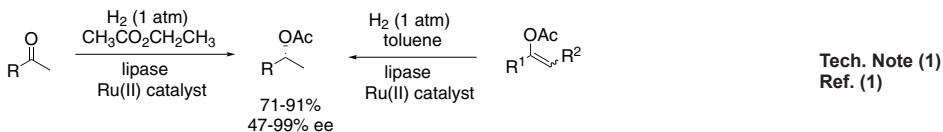
96-3705 EnantioTech BIMAH Ru Tol-BINAP Catalyst Kit for Asymmetric Hydrogenation
See page 339

44-0780 1-Hydroxytetraphenylcyclopentadienyl(tetraphenyl-2,4-cyclopentadien-1-one)- μ -hydrotetracarbonyldiruthenium(II), 98% SHVO'S CATALYST (104439-77-2)
 $C_{62}H_{42}O_6Ru_2$; FW: 1085.13; orange powder.



Technical Notes:

1. In conjugation with lipase, ruthenium catalyst used in the asymmetric transformation of ketones and enol acetates into chiral acetates.
2. Dynamic kinetic resolution resulting from the ruthenium catalyzed racemization of enzymatically- resolved substrates.
3. Conversion of secondary amines to primary amines in the presence of ammonia.
4. Co-catalyst for aerobic lactonization of diols.

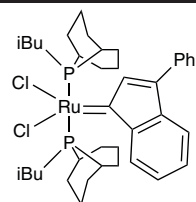


References:

1. *Org. Lett.*, **2000**, *2*, 2487
2. *Org. Lett.*, **2001**, *3*, 1209
3. *Chem. Eur. J.*, **2011**, *17*, 4705
4. *Chem. Eur. J.*, **2011**, *17*, 12596

RUTHENIUM (Compounds)

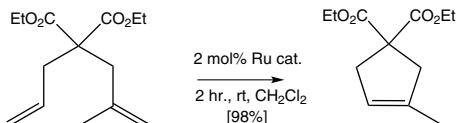
44-7778 **3-Phenyl-1H-inden-1-ylidene[bis(i-butylphoban)] ruthenium(II) dichloride (894423-99-5)**
 $C_{39}H_{56}Cl_2P_2Ru$; FW: 758.78; red powd.
 Note: Sold in collaboration with Umicore for research purposes only. Patent US 10,518,716.



250mg
1g

Technical Note:

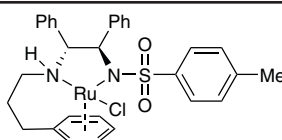
- This catalyst exhibits high selectivity as a general purpose metathesis catalyst for applications other than polymerization. It has improved air, moisture and heat resistance.



References:

- J. Org. Chem.*, **2008**, *73*, 259

44-0111 **{N-[3-(η -6-phenyl)propyl]-[(1R-2R)-1,2-diphenyl-1-4-methylbenzenesulfonylamidato(kN')-ethyl-2-amino-(kN)]}ruthenium(II) (R,R)-Teth-TsDpen RuCl WILLIS CATALYST (1192620-83-9)**
 $C_{30}H_{31}ClN_2O_2RuS$; FW: 620.17; orange powd.
air sensitive
 Note: Sold in collaboration with JM for research purposes only.



100mg
500mg

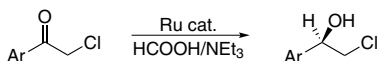
Technical Note:

- See 44-0110.

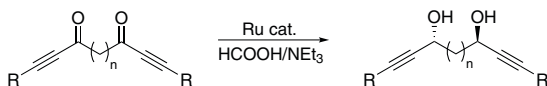
44-0110 **{N-[3-(η -6-phenyl)propyl]-[(1S-2S)-1,2-diphenyl-1-4-methylbenzenesulfonylamidato(kN')-ethyl-2-amino-(kN)]}ruthenium(II) (S,S)-Teth-TsDpen RuCl WILLIS CATALYST (851051-43-9)**
 $C_{30}H_{31}ClN_2O_2RuS$; FW: 620.17; orange powd.
air sensitive
 Note: Sold in collaboration with JM for research purposes only.

Technical Note:

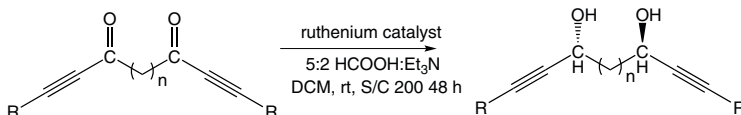
- Catalyst used for asymmetric-transfer hydrogenation.



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (2)

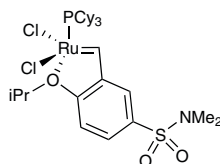


Tech. Note (1)
Ref. (2)

References:

- J. Org. Chem.*, **2006**, *71*, 7035.
- J. Org. Chem.*, **2013**, *78*, 8594.

44-0078 **{[2-(i-Propoxy)-5-(N,N-dimethylaminosulfonyl)phenyl]methylene}(tricyclohexylphosphine) ruthenium(II) dichloride Zhan Catalyst -1C (918871-44-0)**
 $C_{30}H_{50}Cl_2NO_3PRuS$; FW: 707.74; brown solid
 Note: Sold under license from Zannan for research purposes only. Patents CN1907992A, US 2007/0043180 A1, PCT WO 2007/003135 A1.



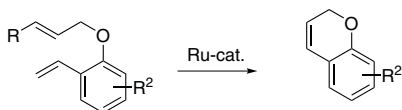
500mg
2g

Technical Notes:

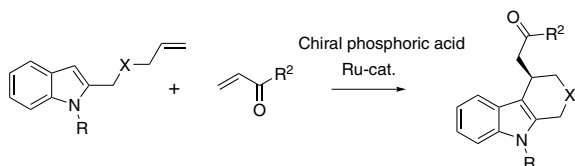
- Efficient, air-stable metathesis catalyst.
- Used in cross-metathesis/Friedel-Crafts Cascade reaction.

RUTHENIUM (Compounds)

44-0078 **{[2-(i-Propoxy)-5-(N,N-dimethylaminosulfonyl)phenyl]methylene}(tricyclohexylphosphine) ruthenium(II) dichloride Zhan Catalyst -1C (918871-44-0)**



Tech. Note (1)

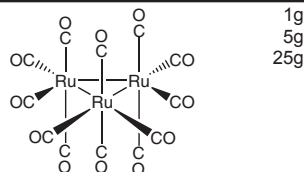


Tech. Note (2)
Ref. (2)

References:

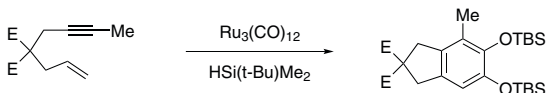
1. PCT Int. Appl. (2007), WO 2007003135 A1
2. *Angew. Chem. Int. Ed.*, **2009**, *48*, 7428

44-1850 **Ruthenium carbonyl, 99% (15243-33-1)**
Ru₃(CO)₁₂; FW: 639.34; orange xtl.; m.p. 150° dec.

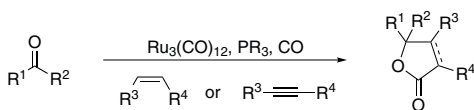


Technical Notes:

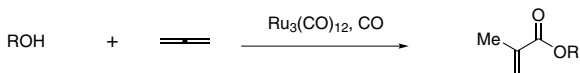
1. Catalyst for the conversion of enynes to catechol derivatives.
2. Catalyst for the intermolecular [2+2+1] cycloaddition of ketones, CO and alkenes or alkynes.
3. 3-Component couplings.
4. Reaction of α,β -unsaturated imines with carbon monoxide and alkenes to form β,γ -unsaturated γ -butyrolactams.
5. Ester decarboxylation.
6. Catalyst for hydroamination and C-H bond activation.
7. Used in sp³ C-H bond arylation⁷ and carbonylation.⁹
8. Ru/halide catalytic system for C-C bond forming reaction between alkynes and unsaturated carbonyl compounds.
9. Amination of α -hydroxy amides.



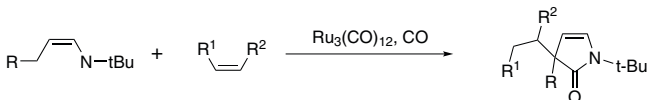
Tech. Note (1)
Ref. (1)



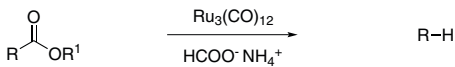
Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



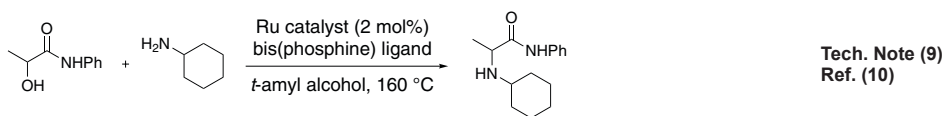
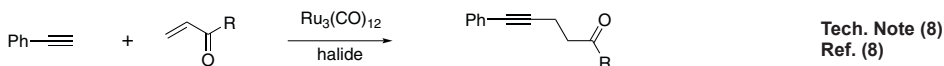
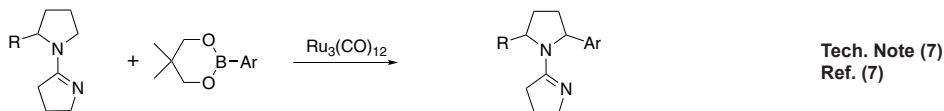
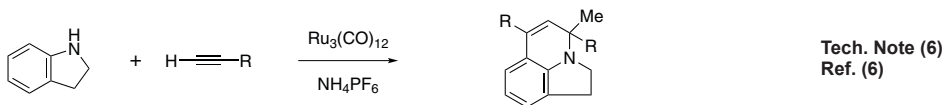
Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)

RUTHENIUM (Compounds)

44-1850 Ruthenium carbonyl, 99% (15243-33-1)
(continued)

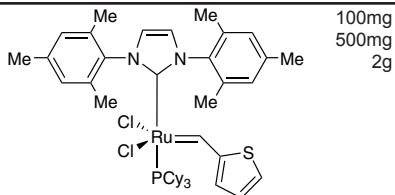


References:

1. *J. Am. Chem. Soc.*, **1993**, 115, 11614
2. *J. Am. Chem. Soc.*, **2000**, 122, 12663.
3. *Chem. Commun.*, **2002**, 2868.
4. *J. Org. Chem.*, **2002**, 67, 7014.
5. *J. Am. Chem. Soc.*, **2001**, 123, 4849.
6. *J. Am. Chem. Soc.*, **2005**, 127, 5782.
7. *J. Am. Chem. Soc.*, **2006**, 128, 14220.
8. *Adv. Synth. Catal.*, **2007**, 349, 2563.
9. *J. Am. Chem. Soc.*, **2011**, 133, 8070.
10. *Angew. Chem. Int. Ed.*, **2011**, 50, 11197.

96-4450	Ruthenium Photocatalyst Kit See page 347
96-6955	Takasago ATH (Asymmetric Transfer Hydrogenation) Catalyst Kit See page 349
96-6953	Takasago BINAP Ru Acetate Catalyst Kit See page 350
96-6951	Takasago BINAP Ru Cymene Catalyst Kit See page 351
96-6954	Takasago BINAP Ru Diamine Catalyst Kit See page 352
96-6952	Takasago BINAP Ru Dimer Catalyst Kit See page 353
96-6901	Takasago SEGPHOS® Ru Catalyst Kit See page 354

44-7785 Tricyclohexylphosphine[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene] [2-thienylmethylene]ruthenium(II) dichloride, min. 95% [catMETium® RF 2] (1190427-49-6)
C₄₄H₆₁Cl₂N₂PRuS; FW: 852.98; brown powdr.
Note: Sold in collaboration with Evonik for research purposes only. Patent US 6635768.

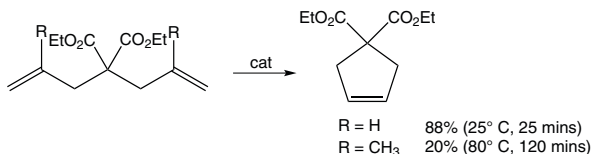


Technical Note:

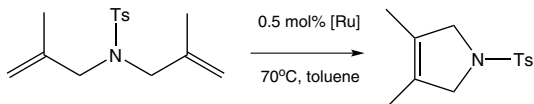
1. Efficient catalyst for ring-closing metathesis.

RUTHENIUM (Compounds)

44-7785 Tricyclohexylphosphine[1,3-bis(2,4,6-trimethylphenyl) imidazol-2-ylidene][2-thienyl-methylene]ruthenium(II) dichloride, min. 95% [catMETium® RF 2] (1190427-49-6)
(continued)



Ref. (1)

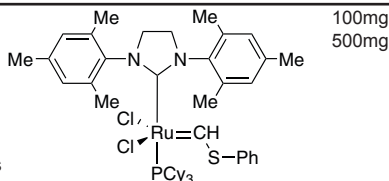


Ref. (2)

References:

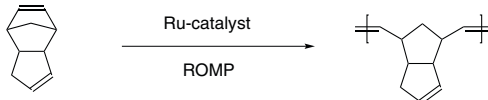
1. *Organometallics*, **1999**, 18, 5416
2. *ChemistryToday*, **2009**, 27, 24

44-7780 Tricyclohexylphosphine[1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene][(phenylthio)methylene]ruthenium(II) dichloride (1155422-69-7)
RuCl₂[C₂₁H₂₆N₂][C₇H₆S][P(C₆H₁₁)₃]; FW: 881.04; purple-brown solid

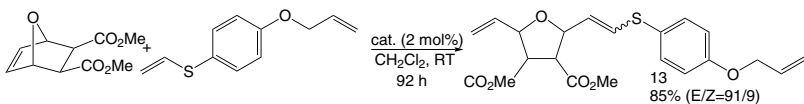


Technical Notes:

1. Metathesis catalyst, stable in air and can be used in aqueous media.
2. Catalyst of choice for the ring-opening metathesis polymerization of cycloolefins.
3. Catalyst concentration 2-3 times lower than comparable phenyl and vinyl substituted ruthenium carbenes.
4. Excellent initiator for solvent-free polymerization and control of initiation rates and gelation times.
5. Highly selective catalyst for the ring opening/cross-metathesis of norbornene derivatives.



Tech. Note (2)
Ref. (2)

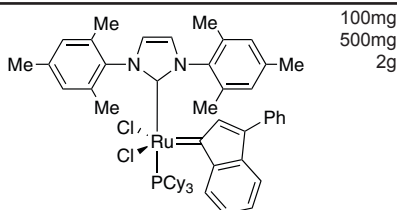


Tech. Note (5)
Ref. (3)

References:

1. *J. Org. Chem.*, **2000**, 606, 65.
2. "Ring Opening Metathesis Polymerization of Related Chemistry", NATO Science Series II, **2002**, 23.
3. *Organometallics*, **2003**, 22, 586.

44-7775 Tricyclohexylphosphine[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene][3-phenyl-1H-inden-1-ylidene]ruthenium(II) dichloride, min. 95% [catMETium® RF1] (254972-49-1)
RuCl₂[C₂₁H₂₄N₂][C₁₅H₁₀][P(C₆H₁₁)₃]; FW: 947.07; orange to brown powdr.
Note: Sold in collaboration with Evonik for research purposes only. Patent US 6635768.
For use in pharmaceutical applications only.
Other uses are unauthorized.

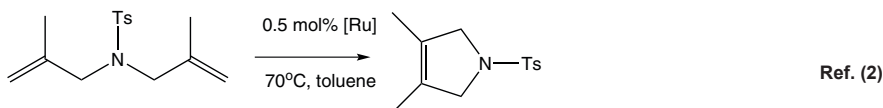
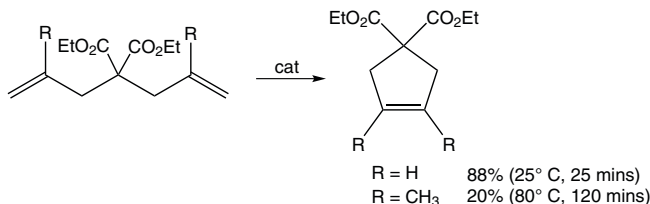


Technical Note:

1. Efficient catalyst for ring-closing metathesis.

RUTHENIUM (Compounds)

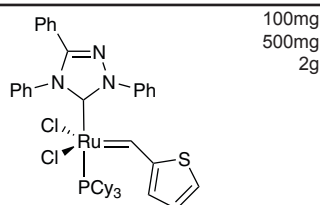
44-7775 Tricyclohexylphosphine[1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene][3-phenyl-1H-inden-1-ylidene]ruthenium(II) dichloride, min. 95% [catMETium® RF1] (254972-49-1)



References:

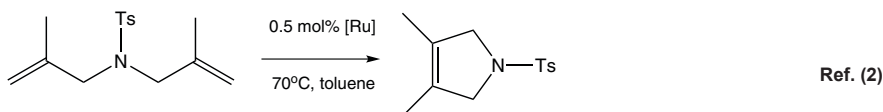
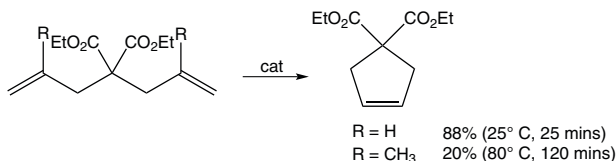
1. *Organometallics*, **1999**, 18, 5416
2. *ChemistryToday*, **2009**, 27, 24

44-7795 Tricyclohexylphosphine[2,4-dihydro-2,4,5-triphenyl-3H-1,2,4-triazol-3-ylidene][2-thienylmethylene]ruthenium(II) dichloride, min. 95% [catMETium® RF 4] (1190427-51-0)
 $C_{43}H_{52}Cl_2N_3PRuS$; FW: 845.91; violet to brown pwr.
 Note: Sold in collaboration with Evonik for research purposes only. Patent US 6635768.



Technical Note:

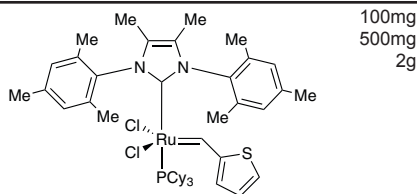
1. Efficient catalyst for ring-closing metathesis.



References:

1. *Organometallics*, **1999**, 18, 5416
2. *ChemistryToday*, **2009**, 27, 24

44-7790 Tricyclohexylphosphine[4,5-dimethyl-1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene][2-thienylmethylene]ruthenium(II) dichloride, min. 95% [catMETium® RF 3] (1190427-50-9)
 $C_{46}H_{65}Cl_2N_2PRuS$; FW: 881.04;
 violet to brown pwr.
 Note: Sold in collaboration with Evonik for research purposes only. Patent US 6635768.

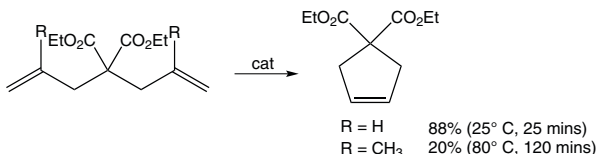


Technical Note:

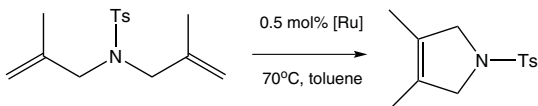
1. Efficient catalyst for ring-closing metathesis.

RUTHENIUM (Compounds)

44-7790 Tricyclohexylphosphine[4,5-dimethyl-1,3-bis(2,4,6-trimethylphenyl)imidazol-2-ylidene] [2-thienylmethylene]ruthenium(II) dichloride, min. 95% [catMETium® RF 3] (1190427-50-9) (continued)



Ref. (1)

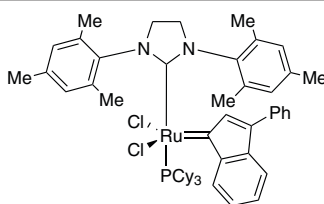


Ref. (2)

References:

1. *Organometallics*, **1999**, 18, 5416
2. *ChemistryToday*, **2009**, 27, 24

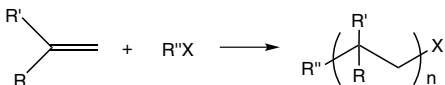
44-7777 Tricyclohexylphosphine[3-phenyl-1H-inden-1-ylidene][1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene]ruthenium(II) dichloride, min. 95% (536724-67-1)
C₅₄H₆₉Cl₂N₂PRu; FW: 949.09; dark red pwdr.
Note: Sold in collaboration with Umicore for research purposes only. For use in lifecycle applications and research purposes only.



100mg
500mg

Technical Note:

1. Catalyst used for the Atom Transfer Radical Polymerization (ATRP) of vinyl monomers.

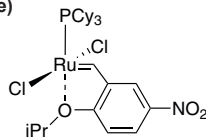


References:

1. *New J. Chem.*, **2003**, 27, 257

44-0763 Tricyclohexylphosphine(2-i-propoxy-5-nitrobenzylidene) dichlororuthenium(II) Nitro-Grela 1 gen. (625082-83-9)
NEW C₂₈H₄₄Cl₂NO₃PRu; FW: 645.60; brown pwdr.
air sensitive, (store cold)

Note: Sold in collaboration with Apeiron Synthesis, Inc.
U.S. Patent 6/867,303 PCT/EP2003/01122.
Store at 2-8°C under inert atmosphere. Catalyst may be weighed in air.



100mg
500mg

Technical Note:

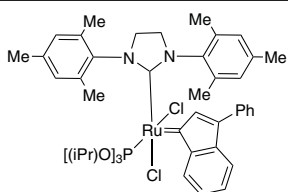
1. Catalyst for metathesis applications.

References:

1. *ACS Catalysis*, **2017**, 7(8), 5443-5449.
2. *Angew. Chem* **2017**, 129, 1001-1006.
3. *Chemistry - A European Journal*, **2014**, 20(42), 13716-13721.
4. *Advanced Synthesis & Catalysis*, **2013**, 355(10), 1997-2006.

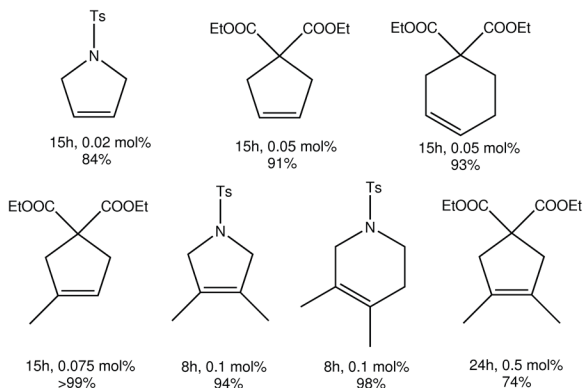
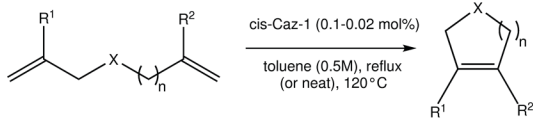
RUTHENIUM (Compounds)

44-7783 Tri(*i*-propoxy)phosphine(3-phenyl-1H-inden-1-ylidene)[1,3-bis(2,4,6-trimethylphenyl)-4,5-dihydroimidazol-2-ylidene] ruthenium (II) dichloride, min. 95% *cis*-Caz-1
 $C_{45}H_{57}Cl_2N_2O_3PRu$; FW: 876.89; brown powdr.



Technical Note:

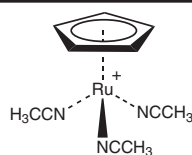
- Efficient catalyst for ring-closing metathesis.



References:

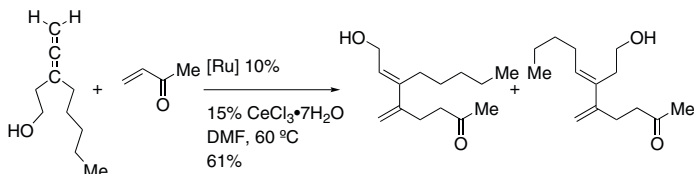
- Chem. Commun.*, **2010**, 7115

44-7870 Tris(acetonitrile)cyclopentadienylruthenium(II) hexafluorophosphate, min. 98% (80049-61-2)
 $C_5H_5Ru(CH_3CN)_3 \cdot PF_6^-$; FW: 434.30;
 yellow to orange powdr.; m.p. 117-118° (dec.)
air sensitive, (store cold)

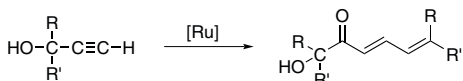


Technical Notes:

- Catalyst used for the coupling of allene with activated olefines to form 1,3-diene.
- Catalyst used for the dimerization of propargyl alcohols.
- Catalyst used in the Trost's ruthenium-catalyzed ene-yne cross-coupling reaction.
- Catalyst for asymmetric cyclization of ω -hydroxy allyl alcohols to give α -alkenyl cyclic ethers.
- Catalyst for synthesis of furans from bis(alkynes) and DMSO.



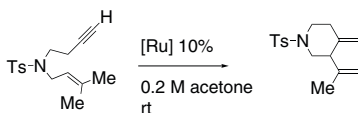
Tech. Note (1)
Ref. (1)



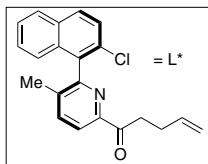
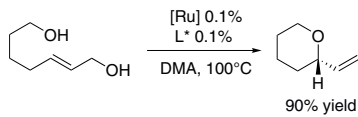
Tech. Note (2)
Ref. (2)

RUTHENIUM (Compounds)

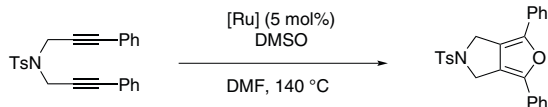
44-7870 Tris(acetonitrile)cyclopentadienylruthenium(II) hexafluorophosphate, min. 98%
(continued) (80049-61-2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)

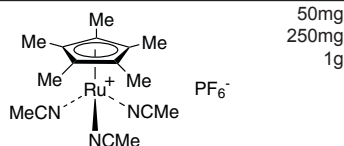


Tech. Note (5)
Ref. (5)

References:

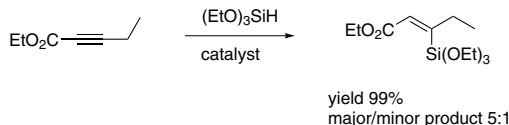
1. *J. Am. Chem. Soc.*, **2001**, *123*, 12466.
2. *J. Am. Chem. Soc.*, **2001**, *123*, 8862.
3. *J. Am. Chem. Soc.*, **2000**, *122*, 714.
4. *Angew. Chem. Int. Ed.*, **2009**, *48*, 8948.
5. *J. Am. Chem. Soc.*, **2012**, *134*, 7660.

44-7880 Tris(acetonitrile)pentamethylcyclopentadienylruthenium(II) hexafluorophosphate, min. 98%
(99604-67-8)
[Ru(C₁₀H₁₅)(CH₃CN)₃]⁺PF₆⁻; FW: 504.42;
yellow orange powdr.
air sensitive, (store cold)

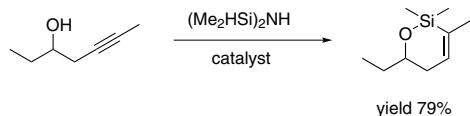


Technical Notes:

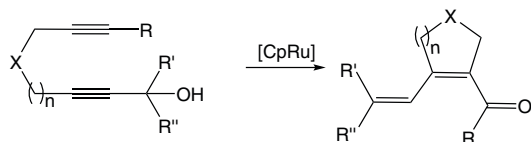
1. Useful catalyst for the hydrosilylation of internal and terminal alkynes. The reaction has also been extended to intramolecular hydrosilylation.
2. Catalyst for the cycloisomerization of diynes.
3. Catalyst for synthesis of furans from bis(alkynes) and DMSO.



Tech. Note (1)
Ref. (1)



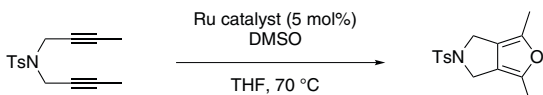
Tech. Note (1)
Ref. (2)



Tech. Note (2)
Ref. (3)

RUTHENIUM (Compounds)

44-7880 **Tris(acetonitrile)pentamethylcyclopentadienylruthenium(II) hexafluorophosphate, min. 98%** (continued) (99604-67-8)



Tech. Note (3)
Ref. (4)

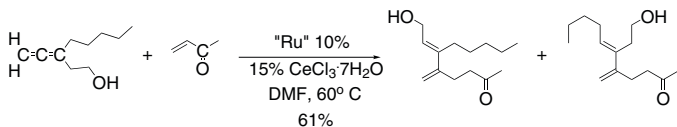
References:

1. *J. Am. Chem. Soc.*, **2001**, 123, 12726
2. *J. Am. Chem. Soc.*, **2003**, 125, 30
3. *J. Am. Chem. Soc.*, **2005**, 127, 4763
4. *J. Am. Chem. Soc.*, **2012**, 134, 7660

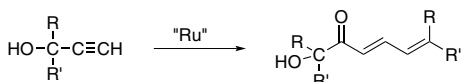
44-7890 **Tris(acetonitrile)pentamethylcyclopentadienylruthenium(II) trifluoromethanesulfonate, min. 98%** (113860-02-9) 250mg
[Ru(C₁₀H₁₅)(CH₃CN)₃]⁺CF₃SO₃⁻; FW: 508.52; orange powdr. 1g
air sensitive, (store cold)

Technical Notes:

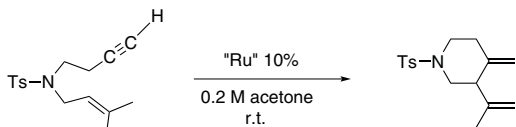
1. Catalyst used for the coupling of allenes with activated olefins to form 1,3-dienes.
2. Catalyst used for the dimerization of propargyl alcohols.
3. Catalyst used in the cycloisomerization of 1,6 and 1,7 enynes.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

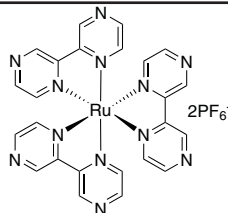


Tech. Note (3)
Ref. (3)

References:

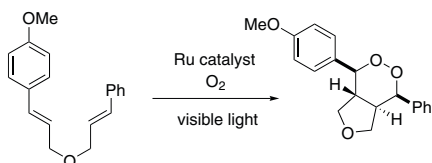
1. *J. Am. Chem. Soc.*, **2001**, 123, 12466
2. *J. Am. Chem. Soc.*, **2001**, 123, 8862
3. *J. Am. Chem. Soc.*, **2000**, 122, 714

44-7910 **Tris(2,2'-bipyrazine)ruthenium(II) hexafluorophosphate, 95%** (80907-56-8) 50mg
NEW C₂₄H₁₈F₁₂N₁₂P₂Ru; FW: 865.48; red powdr. 250mg
air sensitive
Note: Photocatalyst.



Technical Notes:

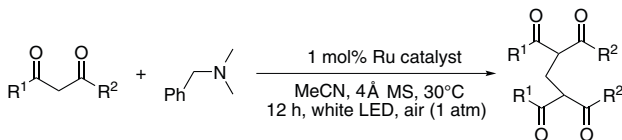
1. Endoperoxide synthesis by photocatalytic aerobic [2+2+2] cycloadditions.
2. Aerobic oxidation of a tertiary aliphatic amine under visible-light photocatalysis. Facile synthesis of methylene-bridged bis-1,3-dicarbonyl compounds.
3. Hydrophosphinylation of unactivated alkenes with secondary phosphine oxides under visible-light photocatalysis.
4. [3+2] Photooxygenation of aryl cyclopropanes via visible light photocatalysis.



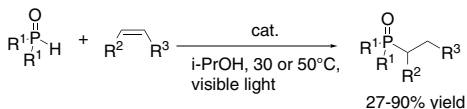
Tech. Note (1)
Ref. (1)

RUTHENIUM (Compounds)

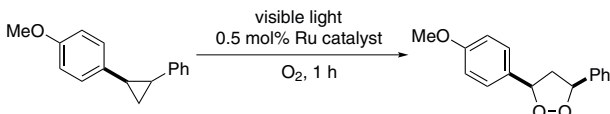
44-7910 Tris(2,2'-bipyrazine)ruthenium(II) hexafluorophosphate, 95% (80907-56-8)
(continued)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

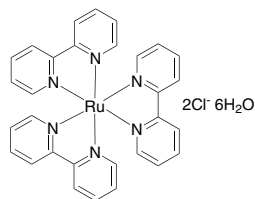


Tech. Note (4)
Ref. (4)

References:

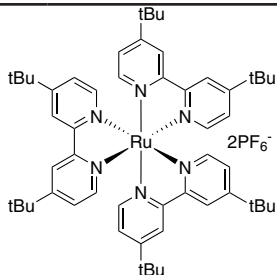
1. *Org. Lett.*, **2012**, *14*, 1640.
2. *Chemistry – An Asian Journal*, **2012**, *7*, 2764.
3. *Green Chemistry*, **2013**, *15*, 1844.
4. *Tetrahedron*, **2014**, *70*, 4270.

44-7900 Tris(2,2'-bipyridyl)ruthenium(II) chloride hexahydrate, min. 98% (50525-27-4)
Ru(C₁₀H₈N₂)₃Cl₂·6H₂O; FW: 640.54 (748.63); orange to red xtl.
Note: Photocatalyst



250mg
1g
5g

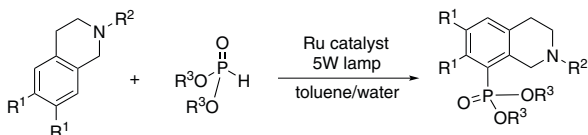
44-7940 Tris[4,4'-bis(t-butyl)-2,2'-bipyridine]ruthenium(II) hexafluorophosphate, 95% (75777-87-6)
C₅₄H₇₂F₁₂N₆RuP₂; FW: 1196.19; red powder.
air sensitive
Note: Photocatalyst.



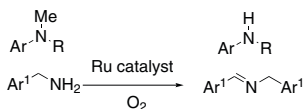
50mg
250mg

Technical Notes:

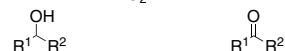
1. Photoredox catalyzed C-P bond formation reactions – visible light mediated oxidative phosphorylations of amines.
2. Photoredox catalysis as an efficient tool for the aerobic oxidation of amines and alcohols.
3. Visible-light induced, direct synthesis of polysubstituted furans from cyclopropyl ketones.



Tech. Note (1)
Ref. (1)

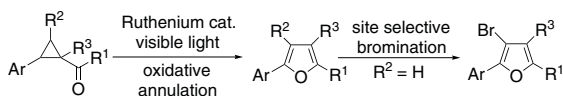


Tech. Note (2)
Ref. (2)



RUTHENIUM (Compounds)

44-7940 Tris[4,4'-bis(t-butyl)-2,2'-bipyridine]ruthenium(II) hexafluorophosphate, 95% (75777-87-6)
(continued)



Tech. Note (3)
Ref. (3)

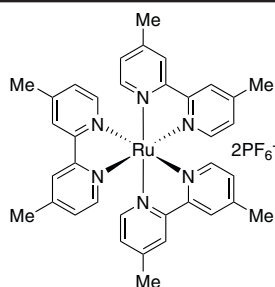
References:

1. *Chem. Commun.*, **2011**, 47, 8679.
2. *ACS Catalysis*, **2012**, 2, 2810.
3. *J. Org. Chem.*, **2016**, 81, 7008.

44-7930 Tris(4,4'-dimethyl-2,2'-bipyridine)ruthenium(II) hexafluorophosphate, 95%, DMBPY

NEW

(83605-44-1)
C₃₆H₃₆F₁₂N₆RuP₂; FW: 943.71; red pwdr.
air sensitive
Note: Photocatalyst.

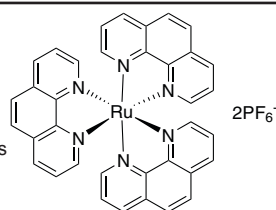


50mg
250mg

44-7955 Tris(1,10-phenanthroline)ruthenium(II) hexafluorophosphate, 95% (60804-75-3)

NEW

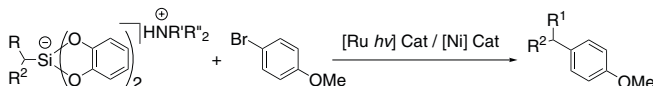
C₃₆H₂₄F₁₂N₆RuP₂; FW: 931.62; red pwdr.
air sensitive
Note: Photocatalyst



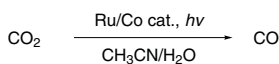
50mg
250mg

Technical Notes:

1. Photoredox catalyst for nickel assisted cross-coupling reactions of ammonium alkylsilicates with aryl bromides
2. A photosensitizer for cobalt catalyzed visible-light driven CO₂ - Reduction to CO in CH₃CN/H₂O Solution



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

1. *J. Am. Chem. Soc.*, **2016**, 138, 475.
2. *Angew. Chem. Int. Ed.*, **2017**, 56, 738.

SAMARIUM (Compounds)

62-3100 Samarium(II) iodide, 0.1M in THF (32248-43-4)
HAZ
SmI₂; FW: 404.21; liq. stabilized with Sm pwdr.; d. 0.922 g/ml
air sensitive, moisture sensitive
Note: Free rubber septum included.

50ml
250ml

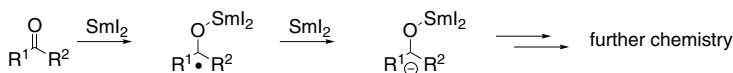
Technical Note:

1. SmI₂ has been used extensively in literature due to its large reduction potential. Known as a single-electron transfer reagent.



RUTHENIUM (Compounds)

62-3100 Samarium(II) iodide, 0.1M in THF (32248-43-4)
(continued)



References:

1. *Chem. Rev.*, **1996**, 96, 307, review
2. *Tetrahedron*, **1998**, 54, 3321
3. *Org. React.*, **1994**, 46, 211
4. *Tetrahedron*, **2003**, 59, 10351, review
5. *Chem. Rev.*, **2004**, 104, 3371, review
6. *Angew. Chem. Int. Ed.*, **2009**, 48, 7140, review
7. *Chem. Soc. Rev.*, **2004**, 33, 599, review

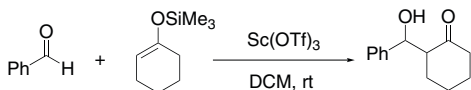
SCANDIUM (Compounds)

21-2000 Scandium(III) trifluoromethanesulfonate, min. 98% (Scandium triflate) 250mg
(144026-79-9) 1g
 $\text{Sc}(\text{SO}_2\text{CF}_3)_3$; FW: 492.17; white powdr. 5g
hygroscopic

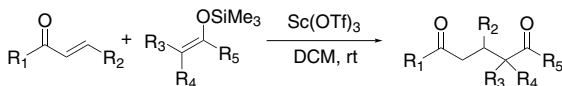
Technical Notes:

1. Water tolerant Lewis acid.
2. Commonly used in a range of Lewis acid catalyzed reactions.
3. Efficient metal source for Lewis acid catalyzed asymmetric reactions.
4. Catalyzes Friedel-Crafts alkylation, acylation and related reactions.
5. Catalyzes various domino- and multi-component processes.
6. Catalyzes electrophilic additions of alpha-diazoesters with ketones.
7. Catalyzes carbon insertion reactions.

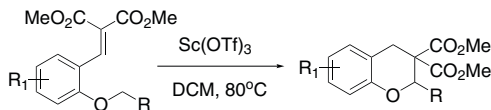
Aldol-type Reactions



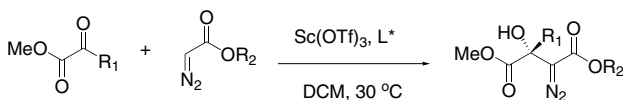
Michael Reactions



Hydride transfer



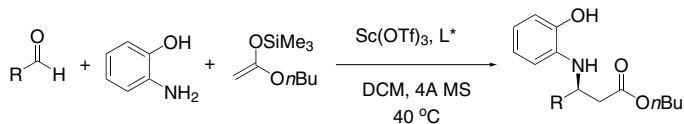
Enantioselective Aldol



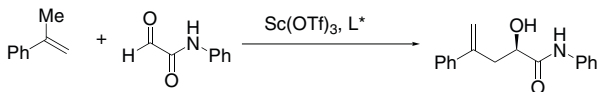
SCANDIUM (Compounds)

21-2000 Scandium(III) trifluoromethanesulfonate, min. 98% (Scandium triflate) (144026-79-9)
(continued)

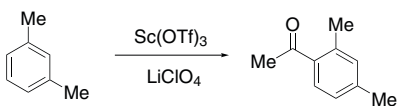
Enantioselective Mannich



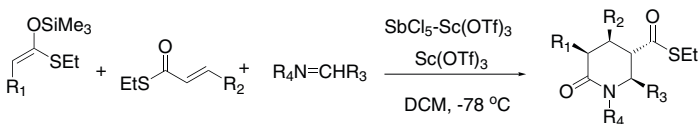
Enantioselective Ene Reaction



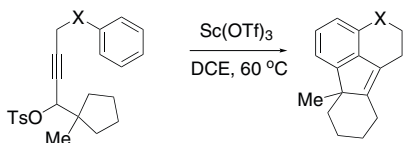
Friedel-Crafts



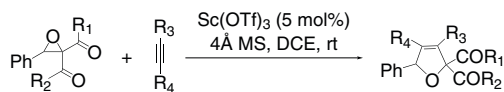
Multi-component



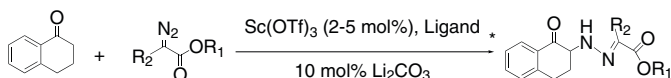
Domino Reactions



Cycloaddition Reactions



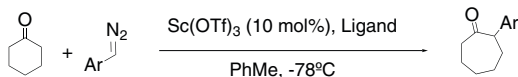
Enantioselective Electrophilic Diazoester Addition



SCANDIUM (Compounds)

21-2000 Scandium(III) trifluoromethanesulfonate, min. 98% (Scandium triflate) (144026-79-9)
(continued)

Carbon Insertion



References:

1. *Synlett*, **1993**, 7, 472
2. *Synlett*, **1994**, 9, 689
3. *Org. Lett.*, **2009**, 11, 2972
4. *Chem. Comm.*, **2009**, 7297
5. *Chem. Eur. J.*, **2009**, 15, 5884
6. *J. Am. Chem. Soc.*, **2005**, 127, 8006
7. *Chem. Comm.*, **1996**, 183
8. *Tetrahedron Lett.*, **1997**, 38, 4819
9. *Angew. Chemie. Int. Ed.*, **2009**, 48, 7857
10. *Chem. Comm.*, **2011**, 47, 12870
11. *Org. Lett.*, **2011**, 13, 5940
12. *J. Am. Chem. Soc.*, **2011**, **133**, 15268
13. *Org. Lett.*, **2011**, 13, 2004

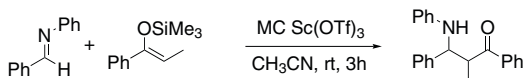
21-2004 Scandium(III) trifluoromethanesulfonate (Scandium triflate),
Microencapsulated in a Styrene Polymer [~13% Sc(SO₃CF₃)₃]
Sc(SO₃CF₃)₃; white solid

500mg

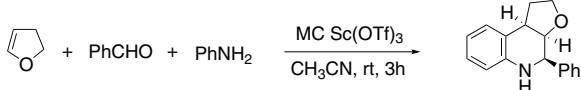
Technical Note:

1. Microencapsulated Scandium triflate is a useful Lewis acid catalyst which can be applied to various synthetic procedures such as the aldol, Michael, alkylation, Friedel-Crafts acylation, Mannich and Strecher type reactions. The encapsulated Sc(SO₃CF₃)₃ has a higher activity than the free monomer, can easily be separated from the reaction mixture, and is reusable.

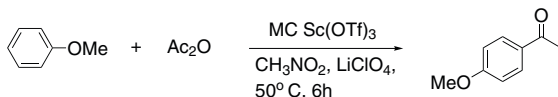
Imino Aldol Reaction (Flow System)



Quinoline Synthesis (Flow System)



Friedel-Crafts Acylation (Batch System)

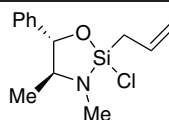


References:

1. *J. Am. Chem. Soc.*, **1998**, 120, 2985
2. *Eur. J. Org. Chem.*, **1999**, 15

SILICON (Compounds)

14-1815 (4S,5S)-2-Allyl-2-chloro-3,4-dimethyl-5-phenyl-1-oxa-3-aza-2-silacyclopentane, min. 98%
(~2:1 mixture of diastereomers) (447440-43-9)
C₁₃H₁₈ClNOSi; FW: 267.83; colorless oil
moisture sensitive, (store cold)
Note: Patent WO 03/074534, WO 06/062901.

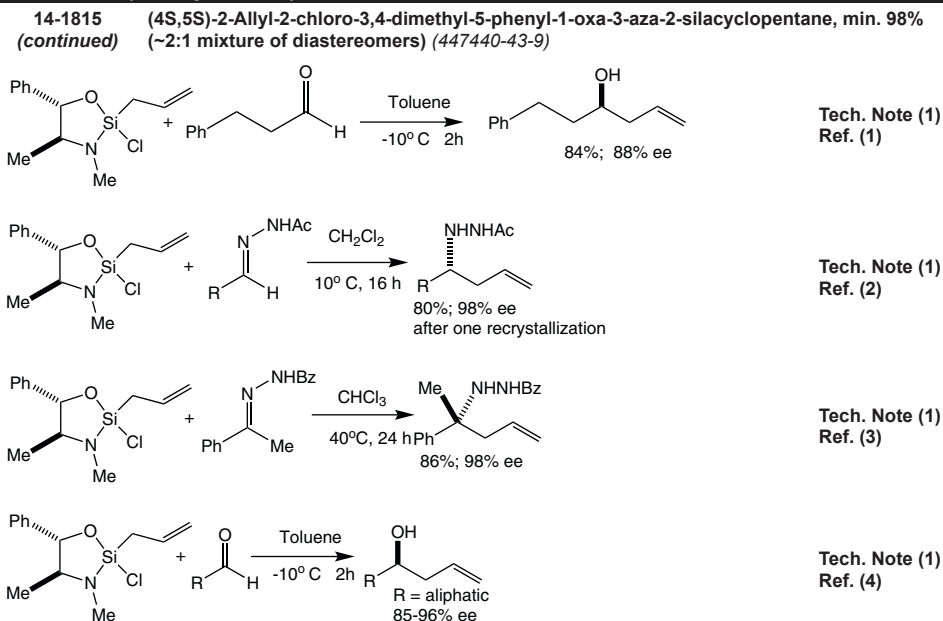


1g
5g

Technical Note:

1. Versatile reagent for the enantioselective allylation of aldehydes and hydrazones.

SILICON (Compounds)



References:

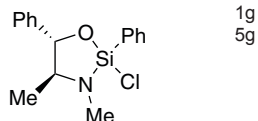
1. *Angew. Chem. Int. Ed.*, **2003**, 42, 946
2. *J. Am. Chem. Soc.*, **2003**, 125, 9596
3. *J. Am. Chem. Soc.*, **2004**, 126, 5686
4. *Angew. Chem. Int. Ed.*, **2006**, 45, 3811

14-1810 (4*S*,5*S*)-2-Chloro-3,4-dimethyl-2,5-diphenyl-1-oxa-3-aza-2-silacyclopentane, min. 98% (~2:1 mixture of diastereomers)

(680592-40-9)
C₁₆H₁₈ClNOSi; FW: 303.86; colorless oil

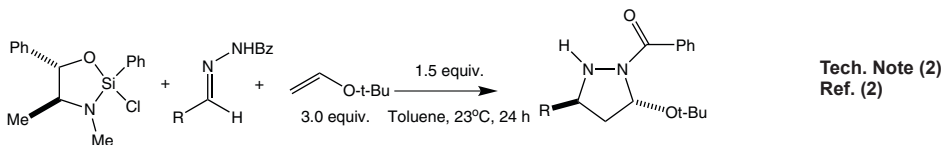
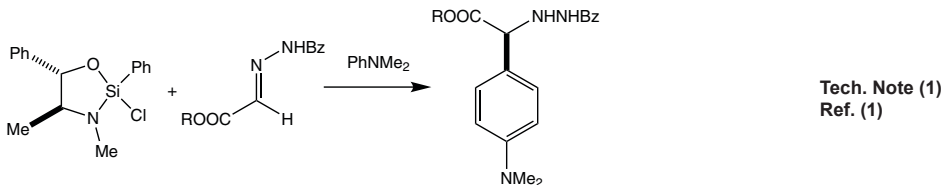
moisture sensitive, (store cold)

Note: Patent WO 03/074534, WO 06/062901.



Technical Notes:

1. Reagent used in the enantioselective Friedel-Crafts alkylations with benzoylhydrazones
2. Reagent used in highly enantioselective [3+2] acylhydrazone-enol ether cycloadditions.



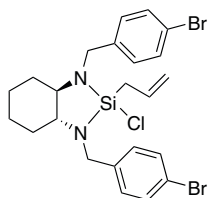
References:

1. *J. Am. Chem. Soc.*, **2005**, 127, 2858
2. *J. Am. Chem. Soc.*, **2005**, 127, 9974

SILICON (Compounds)

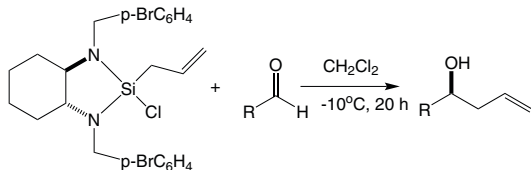
14-1880 (1*R*,2*R*)-[1,2-Cyclohexanediamino-*N,N'*-bis(4-bromobenzyl)allylchlorosilane, min. 98% (546084-25-7)
 $C_{23}H_{27}Br_2ClN_2Si$; FW: 554.82; white solid
moisture sensitive, (store cold)
 Note: Patent WO 3/074534, WO 06/062901.

250mg
1g

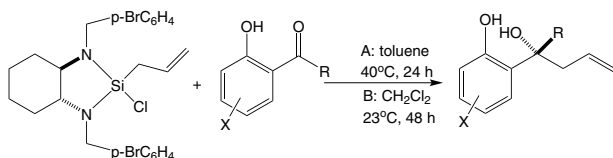


Technical Notes:

1. Reagent used in the enantioselective allylation of aldehydes.
2. Useful reagent for the enantioselective allylation of sterically hindered and functionalized ketones.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

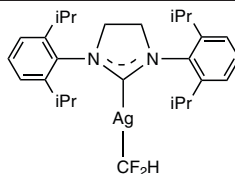
References:

1. *Angew. Chem. Int. Ed.*, **2003**, 42, 946
2. *Angew. Chem. Int. Ed.*, **2006**, 45, 3811

SILVER (Compounds)

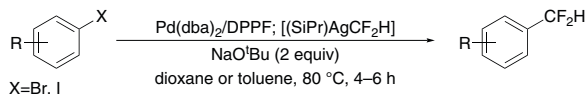
47-2575 [1,3-Bis[2,6-bis(*i*-propyl)phenyl]-2-imidazolidinylidene]difluoromethylsilver(I)
NEW
 $C_{28}H_{40}AgF_2N_2$; FW: 549.50; off-white powdr.
air sensitive, (store cold)

100mg
500mg

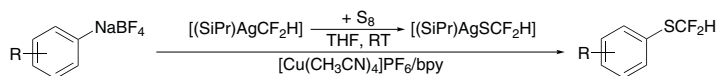


Technical Notes:

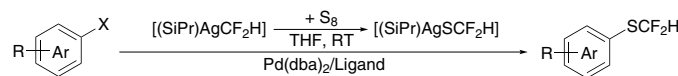
1. Catalyst for Pd(dba)₂/DPPF assisted direct difluoromethylation of aryl bromides and iodides.
2. Pre-catalyst for copper assisted difluoromethylthiolation of aryl and heteroaryl diazonium salts.
3. Pre-catalyst for palladium assisted difluoromethylthiolation of pyridyl, quinolinyl, benzothiazolyl, thiophenyl, carbazolyl and pyrazolyl heteroaryl bromides, iodides, triflates and aryl iodides.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

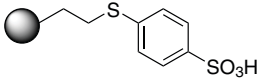
X=Br, I, OTf

Ar = pyridyl, quinolinyl, benzothiazolyl, thiophenyl, carbazolyl, pyrazolyl

References:

1. *Nat. Commun.* **2014**, 5, 5405.
2. *Angew. Chem. Int. Ed.* **2015**, 54, 7648.
3. *Chem. Sci.*, **2016**, 7, 3757.

SULFUR (Compounds)

07-0215	(2S)-(-)-2-[[[3,5-Bis(trifluoromethyl)phenyl]amino]thioxomethyl]amino]-N-(diphenylmethyl)-N,3,3-trimethylbutanamide, 95% (1186602-28-7) See page 103		
07-0283	1-[3,5-Bis(trifluoromethyl)phenyl]-3-[[1R,2R)-(-)-2-(dimethylamino)cyclohexyl]thiourea (R,R-TUC) (620960-26-1) See page 103		
07-0284	1-[3,5-Bis(trifluoromethyl)phenyl]-3-[[1S,2S)-(+)-2-(dimethylamino)cyclohexyl]thiourea (S,S-TUC) (851477-20-8) See page 104		
16-0760	Phenyl sulfonic acid ethyl sulfide Silica (PhosphonicS SPhSA) white to cream solid; SA: 380 m ² /g Note: Sold in collaboration with PhosphonicS Ltd. for research purposes only. Also see 15-0011.		10g 50g

Particle size range: 315-700 microns

Average pore size: 60Å

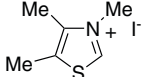
Functional group loading: 0.5 to 0.8 mmol/g

Technical Note:

- Applications include esterification, trans-esterification, hydrolysis, rearrangements, dehydration, protection and de-protection, cyclizations, etherifications. At the end of the reaction the solid silica catalyst can simply be filtered from the reaction mixture and reused.

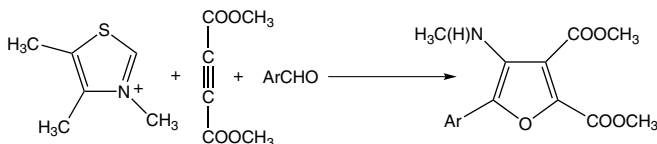
References:

- Manufacturing Chemist, 2007, July/ August Ed. 27

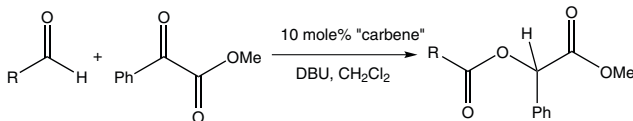
16-2230	3,4,5-Trimethylthiazolium iodide, 99% (62993-85-5) C ₆ H ₁₀ INS; FW: 255.12; white solid moisture sensitive		1g 5g
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Technical Notes:

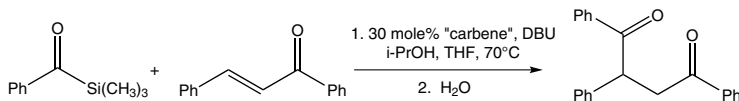
- Reagent used for the synthesis of highly substituted 4-aminofurans.
- N-Heterocyclic carbene precursor used for the catalytic hydroacylation of activated ketones.
- N-Heterocyclic carbene precursor used for the catalytic addition of acylsilanes.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



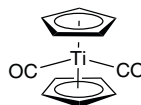
Tech. Note (3)
Ref. (3)

References:

- J. Org. Chem., 2005, 70, 8919
- J. Am. Chem. Soc., 2006, 128, 4558
- J. Org. Chem., 2006, 71, 5715

TITANIUM (Compounds)

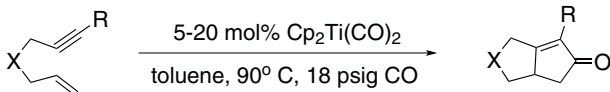
22-0180 **Bis(cyclopentadienyl)dicarbonyl titanium(II), min. 98%**
 amp (12129-51-0)
 HAZ (C₅H₅)₂Ti(CO)₂; FW: 234.09; red xtl.
air sensitive



1g
5g

Technical Note:

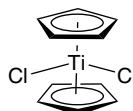
1. Catalyst for the Pauson-Khand like conversion of enynes to cyclopentenones.



References:

1. *J. Am. Chem. Soc.*, **1996**, *118*, 9450
2. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol 3, 1632

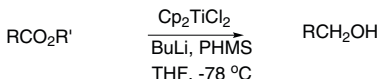
22-0200 **Bis(cyclopentadienyl)titanium dichloride, 99+% (Titanocene dichloride) (1271-19-8)**
 (C₅H₅)₂TiCl₂; FW: 249.00; red xtl.; m.p. 289-291°
air sensitive, moisture sensitive



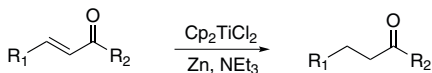
25g
100g

Technical Notes:

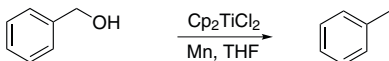
1. Precatalyst for reduction of esters and α,β-unsaturated ketones.
2. Catalyzes reductive deoxygenation of alcohols and hydroxylamines.
3. Catalyst for the radical cyclization of epoxides.
4. Reagent for the conversion of enynes to bicyclic cyclopentenones.
5. Catalyzes silylation of alkenes and alkynes.



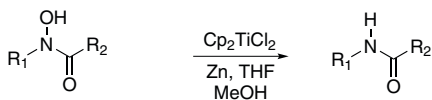
Tech. Note (1)
Ref. (1)



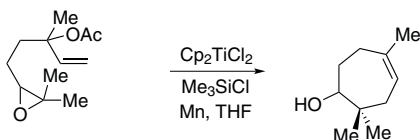
Tech. Note (1)
Ref. (2)



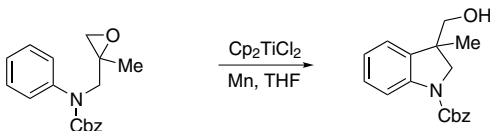
Tech. Note (2)
Ref. (4)



Tech. Note (2)
Ref. (4)



Tech. Note (3)
Ref. (5)



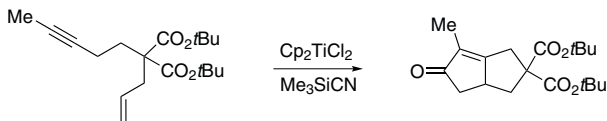
Tech. Note (3)
Ref. (6)

TITANIUM (Compounds)

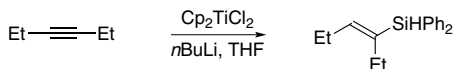
22-0200

Bis(cyclopentadienyl)titanium dichloride, 99+% (Titanocene dichloride) (1271-19-8)

(continued)



Tech. Note (4)
Ref. (7)



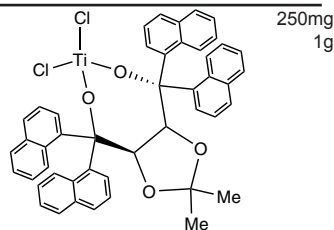
Tech. Note (5)
Ref. (8)

References:

1. *J. Org. Chem.*, **1994**, 59, 4323
2. *Org. Lett.*, **2010**, 12, 44
3. *J. Am. Chem. Soc.*, **2010**, 132, 254
4. *J. Org. Chem.*, **2009**, 74, 448
5. *J. Am. Chem. Soc.*, **2005**, 127, 14911
6. *Org. Lett.*, **2008**, 10, 4383
7. *J. Am. Chem. Soc.*, **1994**, 116, 8593
8. *Org. Lett.*, **2003**, 5, 3479

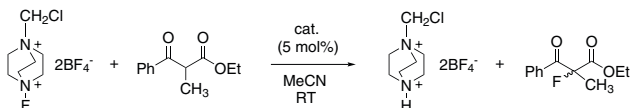
22-0761

(4R,5R)-(-)-2,2-Dimethyl- $\alpha,\alpha,\alpha',\alpha'$ -tetra(1-naphthyl)-1,3-dioxolane-4,5-dimethanolatitanium(IV) dichloride acetonitrile adduct (197389-47-2)
[$\text{C}_{47}\text{H}_{26}\text{O}_4$] $\text{TiCl}_2 \cdot \text{CH}_3\text{CN}$; FW: 783.58 (824.63); yellow powdr. air sensitive, moisture sensitive



Technical Notes:

1. Catalyst used in the enantioselective fluorination of β -ketoesters.
2. Versatile catalyst used in the enantioselective 1,2 and 1,4 additions to carbonyl compounds, transfer of allyl groups to aldehydes, cycloadditions and others. See reference (2).



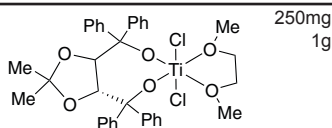
Tech. Note (1)
Ref. (1)

References:

1. *Angew. Chem. Int. Ed.*, **2000**, 39, 4359
2. *Angew. Chem. Int. Ed.*, **2001**, 40, 92-138. (review article)

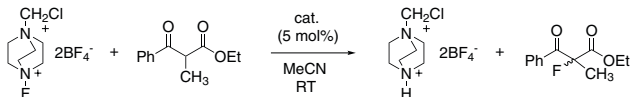
22-0780

(4R,5R)-(-)-2,2-Dimethyl- $\alpha,\alpha,\alpha',\alpha'$ -tetraphenyl-1,3-dioxolane-4,5-dimethanolato[1,2-bis(dimethoxy)ethane]titanium(IV) dichloride acetonitrile adduct (328123-04-2)
[$\text{C}_{31}\text{H}_{26}\text{O}_4$][$\text{C}_4\text{H}_{10}\text{O}_2$] $\text{TiCl}_2 \cdot \text{CH}_3\text{CN}$; FW: 673.45 (714.50); white xtl. air sensitive, moisture sensitive



Technical Notes:

1. Catalyst used in the enantioselective fluorination of β -ketoesters.
2. Versatile catalyst used in the enantioselective 1,2 and 1,4 additions to carbonyl compounds, transfer of allyl groups to aldehydes, cycloadditions and others. See reference (2).



Tech. Note (1)
Ref. (1)

References:

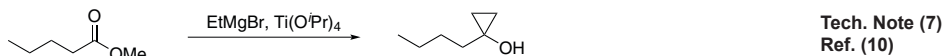
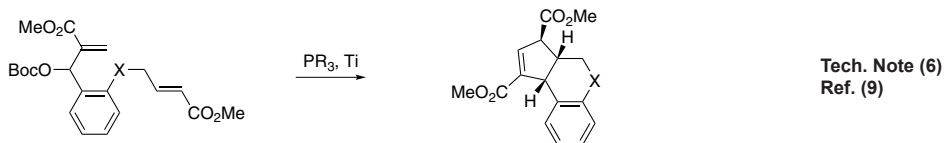
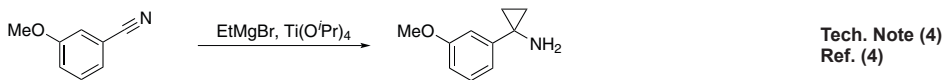
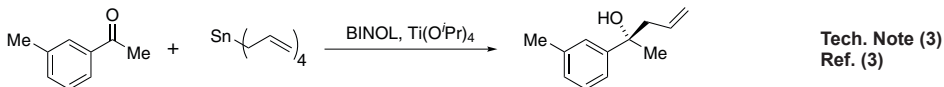
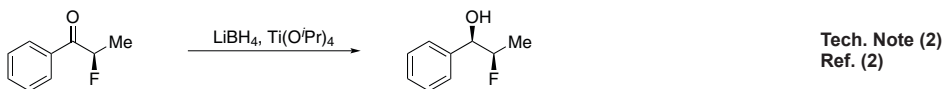
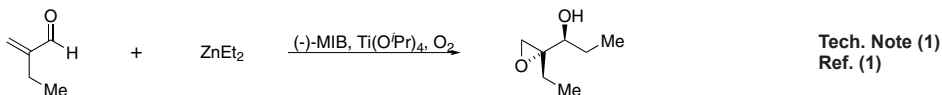
1. *Angew. Chem. Int. Ed.*, **2000**, 39, 4359
2. *Angew. Chem. Int. Ed.*, **2001**, 40, 92-138. (review article)

TITANIUM (Compounds)

93-2216 Titanium(IV) i-propoxide, min. 98% (546-68-9) 250g
 HAZ $\text{Ti}[\text{OCH}(\text{CH}_3)_2]_4$; FW: 284.25; colorless to pale yellow liq.; m.p. 20°; 1kg
 b.p. 58°/1 mm; f.p. 81°F; d. 0.9550
moisture sensitive
 Note: Available prepacked in ALD cylinder- see 98-4030.

Technical Notes:

1. Catalyst for the synthesis of acyclic epoxy alcohols and allylic epoxy alcohols.
2. Useful for diastereoselective reduction of alpha-fluoroketones.
3. Catalyzes the asymmetric allylation of ketones.
4. Reagent for the synthesis of cyclopropylamines from aryl and alkenyl nitriles.
5. Useful for racemic and/or enantioselective addition of nucleophiles to aldehydes⁶, ketones⁷ and imines⁸.
6. Catalytic intramolecular formal [3+2] cycloaddition.
7. Catalyst for the synthesis of cyclopropanols from esters and organomagnesium reagents.



References:

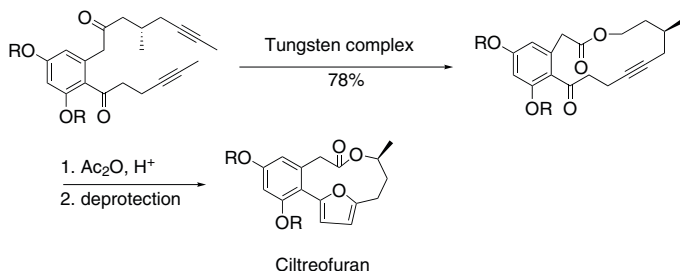
1. *J. Am. Chem. Soc.*, **2005**, *127*, 14668
2. *J. Am. Chem. Soc.*, **2005**, *127*, 11896
3. *J. Am. Chem. Soc.*, **2004**, *126*, 12580
4. *J. Org. Chem.*, **2003**, *68*, 7133
5. *J. Am. Chem. Soc.*, **2006**, *128*, 14808
6. *Org. Lett.*, **2009**, *11*, 5578
7. *Org. Lett.*, **2009**, *11*, 499
8. *Org. Lett.*, **2009**, *11*, 4596
9. *J. Org. Chem.*, **2009**, *74*, 3394
10. *Synthesis*, **1991**, 234

TITANIUM (Compounds)

<p>74-1800 amp</p>	<p>Tris(t-butoxy)(2,2-dimethylpropylidene)tungsten(VI), 98% Schrock Alkyne Metathesis Catalyst (78234-36-3) (C₄H₉O)₃W=CC(CH₃)₃; FW: 472.31; off-white to tan powdr. <i>air sensitive, moisture sensitive, (store cold)</i></p>		<p>100mg 500mg</p>
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Technical Notes:

1. A well-defined tungsten-based alkyne metathesis catalyst first prepared by Professor Richard Schrock. The catalyst has been used to prepare a variety of products through alkyne metathesis, including natural products that contain large rings.
2. Catalyst for alkyne metathesis.



References:

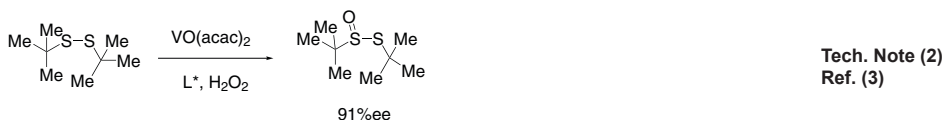
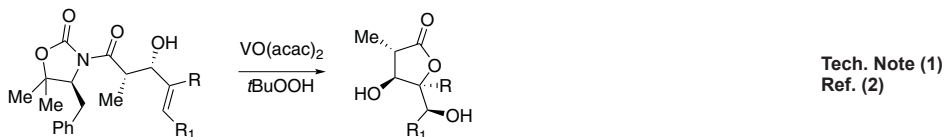
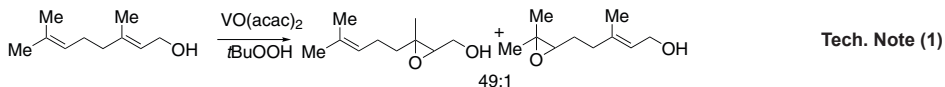
1. *Acc. Chem. Res.*, **1986**, *19*, 342. (review article)
2. *Angew. Chem. Int. Ed.*, **2000**, *39*, 3012. (review article)
3. *J. Org. Chem.*, **2003**, *68*, 1521
4. *Angew. Chem., Int. Ed.*, **2010**, *49*, 7257

VANADIUM (Compounds)

<p>96-6770</p>	<p>PhosphonicS Metal Oxidation Catalyst Kit See page 346</p>	
<p>23-2202</p>	<p>Vanadium(IV) bis(acetylacetonato)oxide, 98% (Vanadyl acetylacetonate) (3153-26-2) VO(C₅H₇O₂)₂; FW: 265.16; bluish green powdr.; m.p. 250° dec.</p>	<p>50g 250g</p>

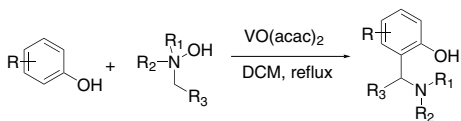
Technical Notes:

1. Catalyst for the hydroxyl-directed epoxidation of olefins.
2. Catalyst for the asymmetric oxidation of disulfides.
3. Catalyst for the Mannich reaction.
4. Catalyst for sulfoxidation of alkanes.

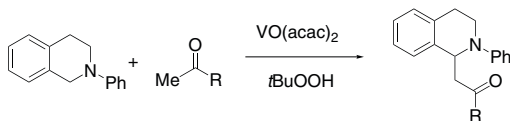


VANADIUM (Compounds)

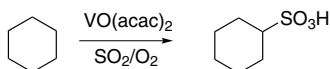
23-2202 Vanadium(IV) bis(acetylacetonato)oxide, 98% (Vanadyl acetylacetonate) (3153-26-2)
(continued)



Tech. Note (3)
Ref. (4)



Tech. Note (3)
Ref. (5)



Tech. Note (4)
Ref. (6,7)

References:

1. *Chem. Rev.*, **1993**, 93, 1307
2. *Org. Lett.*, **2009**, 11, 2896
3. *J. Am. Chem. Soc.*, **1998**, 120, 8011
4. *Org. Lett.*, **2002**, 4, 463
5. *Chem. Comm.*, **2009**, 3169
6. *J. Am. Chem. Soc.*, **2000**, 122, 7390
7. *J. Am. Chem. Soc.*, **2001**, 123, 1545

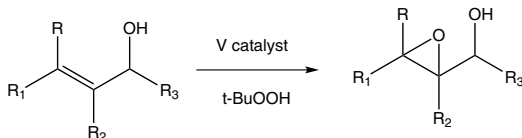
23-4350 Vanadium(III) chloride tetrahydrofuran adduct (19559-06-9)

HAZ VCl₃(C₄H₈O)₃; FW: 373.61; red xtl.
moisture sensitive, (store cold)

5g
25g

Technical Note:

1. Catalyst used for oxidation of a wide variety allylic alcohols.

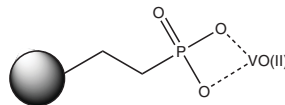


References:

1. *Tetrahedron Lett.*, **2004**, 45, 4465

23-4380 Vanadyl(III) ethyl/butyl phosphonate Silica (PhosphonicS POVO)

blue-green solid; SA: >350 m²/g
Note: Sold in collaboration with PhosphonicS Ltd.
for research purposes only. PhosphonicS Metal
Oxidation Catalyst Kit component.



5g
25g

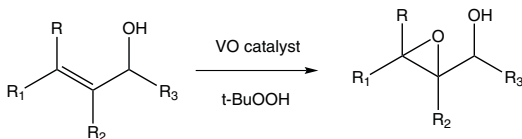
Particle size range: 70-200 microns

Average pore size: 60Å

Effective loadings: 0.3 to 0.5 mmol/g

Technical Note:

1. Catalyst used for oxidation of a wide variety allylic alcohols.



References:

1. *Tetrahedron Lett.*, **2004**, 45, 4465

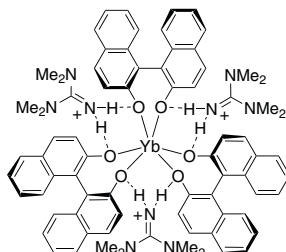
VANADIUM (Compounds)

70-0130

NEW

Tris[N,N,N,N-tetramethylguanidinium] [tris(1S)-(1,1'-binaphalene)-2,2'-diolato] ytterbate Yb-HTMG-B (1611526-75-0)
 $C_{75}H_{78}N_9O_6Yb$; FW: 1374.52;
 off-white to pale yellow powdr.
 Note: U.S. Patent 14/898,925.

250mg
1g



Technical Note:

- See 57-1250 (page 80)

YTTRIUM (Compounds)

03-2010

Lithium tris(S-(-)-1,1'-binaphthyl-2,2'-diolato)yttrate(III) tetrahydrofuran adduct, min. 97% (500995-67-5)
 See page 81

39-1500

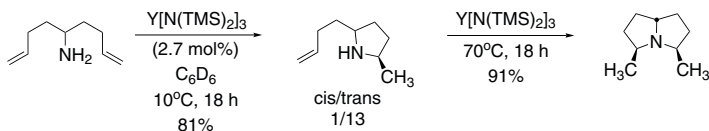
amp

Tris[N,N-bis(trimethylsilyl)amide]yttrium(III), min. 98% (99.9%-Y) (REO) (41836-28-6)
 $\{[(CH_3)_3Si_2N_2]_3Y\}$; FW: 570.06; white to off-white powdr.; m.p. 180-184°;
 b.p. subl. 105°/10⁻⁴mm
air sensitive, moisture sensitive
 Note: Available prepacked in ALD cylinder- see 98-4018.

1g
5g
25g

Technical Note:

- Catalyst used in intramolecular, alkene hydroaminations.



References:

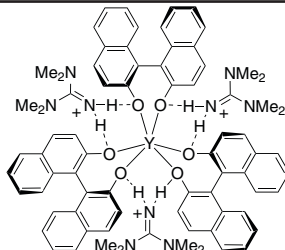
- Tetrahedron Lett.*, **2001**, 42, 2933.
- Org. Lett.*, **2005**, 7, 1737.

39-5850

NEW

Tris[N,N,N,N-tetramethylguanidinium] [tris(1S)-(1,1'-binaphalene)-2,2'-diolato]yttrate Y-HTMG-B (1611526-73-8)
 $C_{75}H_{78}N_9O_6Y$; FW: 1290.39; orange powdr.
 Note: U.S. Patent 14/898,925.

250mg
1g



Technical Note:

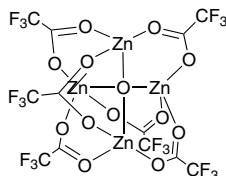
- See 57-1250 (page 80)

ZINC (Compounds)

30-4050

Oxo[hexa(trifluoroacetato)]tetrazinc trifluoroacetic acid adduct ZnTAC₂₄TM (1299489-47-6)
 $Zn_4(CF_3COO)_6(O)(CF_3COOH)_2$; FW: 955.65;
 white solid
moisture sensitive
 Note: Manufactured under license of Takasago patent.

5g
25g

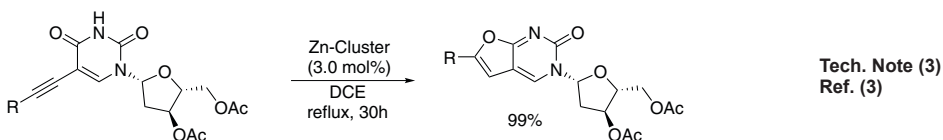
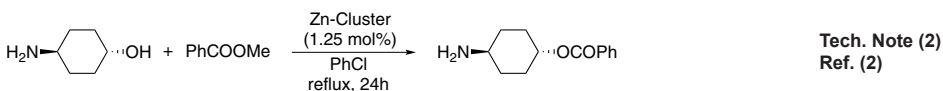
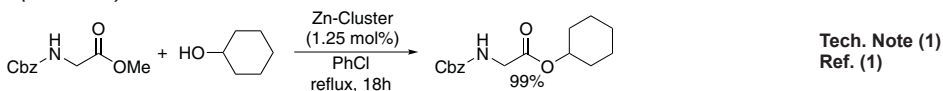


Technical Notes:

- Zinc-catalyzed transesterification of various methyl esters under mild conditions
- Zinc-catalyzed acylation of alcohols in the presence of amines
- Zinc-catalyzed cycloisomerization. Synthesis of substituted furanes and furopyrimidine nucleosides

ZINC (Compounds)

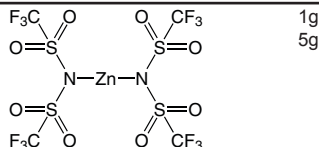
30-4050 Oxo[hexa(trifluoroacetato)]tetrazinc trifluoroacetic acid adduct ZnTAC₂₄TM (1299489-47-6)
(continued)



References:

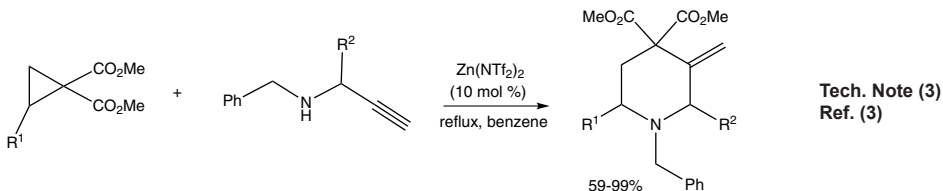
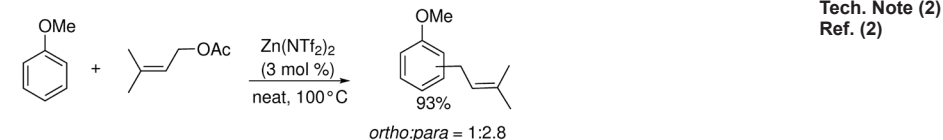
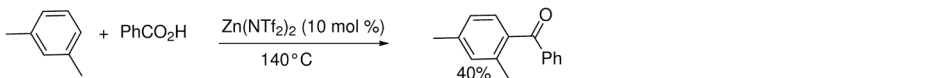
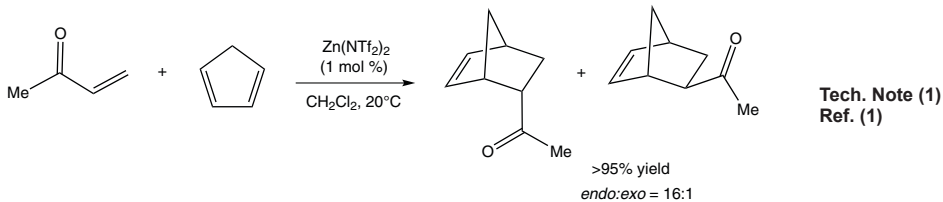
1. *J. Org. Chem.*, **2008**, 73, 5147
2. *J. Am. Chem. Soc.*, **2008**, 130, 2944
3. *J. Org. Chem.*, **2008**, 73, 5881

30-1350 Zinc bis(trifluoromethylsulfonyl)imide, min. 97%
(168106-25-0)
Zn[(CF₃SO₂)₂N]₂; FW: 625.69; white powdr.
hygroscopic



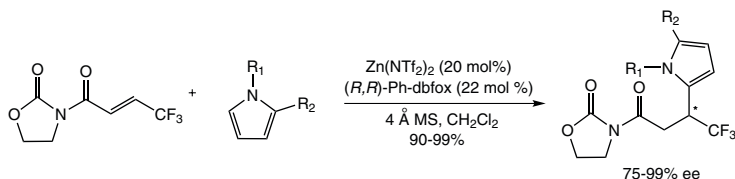
Technical Notes:

1. Useful catalyst for the Diels-Alder reaction.
2. Excellent catalyst for the Friedel-Crafts acylations in ionic liquids, or solvent free.
3. Active catalyst for the ring-opening of cyclopropanes.
4. Used in the asymmetric Friedel-Crafts reaction of pyrroles and acrylates.



ZINC (Compounds)

30-1350 Zinc bis(trifluoromethylsulfonyl)imide, min. 97% (168106-25-0)
(continued)



References:

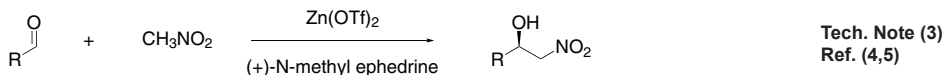
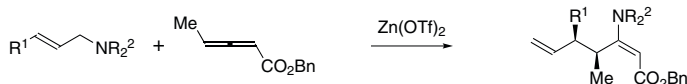
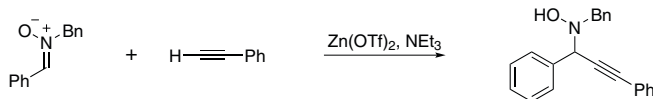
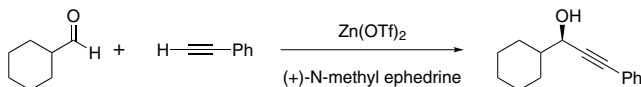
1. *Chem. Lett.*, **1995**, 24, 307
2. *Chem. Commun.*, **2004**, 1368.
3. *Org. Lett.*, **2009**, 11, 3770.
4. *Org. Lett.* **2010**, 12, 1136.

30-4000 Zinc trifluoromethanesulfonate, min. 98% (Zinc triflate) (54010-75-2)
HAZ Zn(SO₃CF₃)₂; FW: 363.54; white powdr.
hygroscopic

5g
25g

Technical Notes:

1. Catalyst for the addition of acetylenes to carbonyls and nitrones.
2. Claisen rearrangement.
3. Catalyst for the enantioselective Henry and Aza-Henry reactions.
4. Pd-catalyzed hydroalkylation of styrenes with zinc reagents.

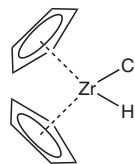


References:

1. *Acc. Chem. Res.*, **2000**, 33, 373
2. *J. Am. Chem. Soc.*, **2001**, 123, 9472
3. *J. Am. Chem. Soc.*, **2002**, 124, 13646
4. *Angew. Chem. Int. Ed.*, **2005**, 44, 3881
5. *Angew. Chem. Int. Ed.*, **2006**, 45, 117
6. *J. Am. Chem. Soc.*, **2009**, 131, 18042

ZIRCONIUM (Compounds)

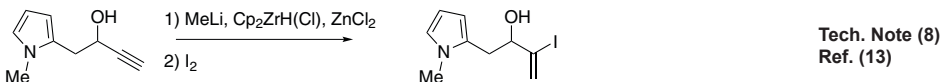
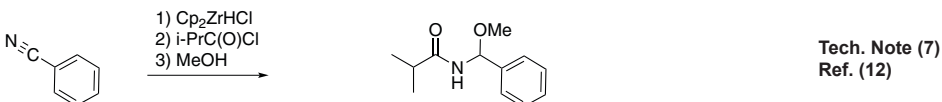
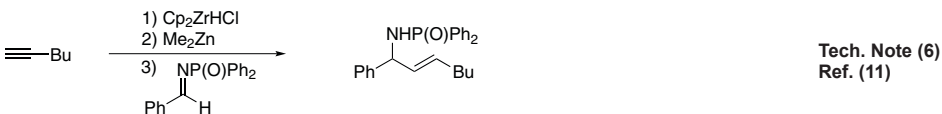
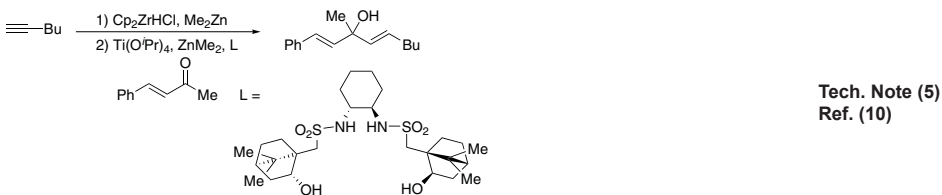
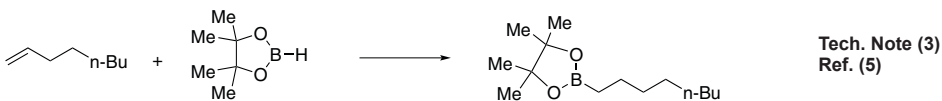
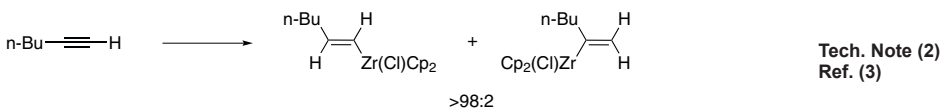
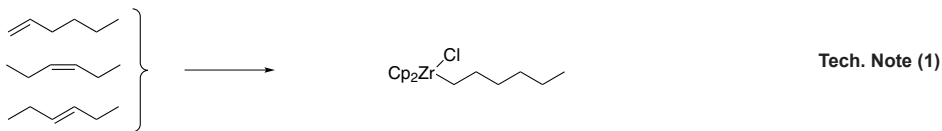
40-1040 Bis(cyclopentadienyl)zirconium chloride hydride (Schwartz's Reagent), 95% (37342-97-5)
 (C₅H₅)₂ZrClH; FW: 257.87; off-white powdr.; m.p. > 300°
light sensitive, moisture sensitive



1g
5g
25g

Technical Notes:

1. Reagent for the hydrozirconation of olefins.
2. Reagent for the hydrozirconation of alkynes.
3. Catalyst for the hydroboration of olefins.
4. Mediates the reduction of tertiary amides to aldehydes, without reduction of cyano, nitro, ester, or α,β-unsaturated groups.
5. Catalyst for the asymmetric vinylation and dienylation of ketones.
6. Useful reagent for dimethylzinc mediated additions alkenylzirconocenes to aldimines.
7. Useful reagent for the synthesis of oxidized amides from nitriles.
8. Reagent for the hydrozirconation of propargylic alcohols.



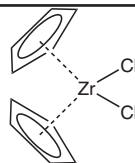
ZIRCONIUM (Compounds)

40-1040 Bis(cyclopentadienyl)zirconium chloride hydride (Schwartz's Reagent), 95% (37342-97-5)
(continued)

References:

1. *Comprehensive Organic Synthesis*, **1991**, Vol. 8, Chapter 3.9, 667.
2. *Organic Syntheses*, **1992**, 71, 77.
3. *Synthesis*, **1988**, 1.
4. *Synthesis*, **1993**, 537.
5. *J. Am. Chem. Soc.*, **1996**, 118, 909.
6. *Tetrahedron*, **1996**, 52, 12853.
7. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol. 2, 1082.
8. *Tetrahedron*, **1998**, 54, 753.
9. *J. Am. Chem. Soc.*, **2007**, 129, 3408.
10. *J. Am. Chem. Soc.*, **2005**, 127, 8355.
11. *J. Am. Chem. Soc.*, **2003**, 125, 761.
12. *Org. Lett.*, **2007**, 9, 5385.
13. *J. Am. Chem. Soc.*, **2007**, 129, 12088.

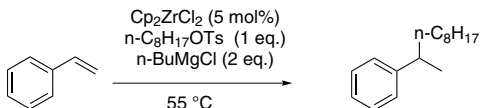
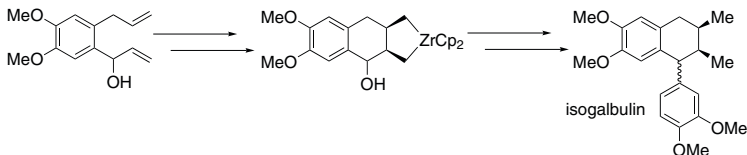
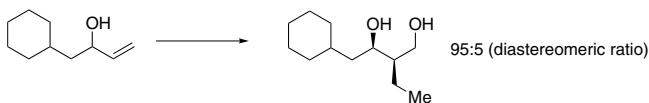
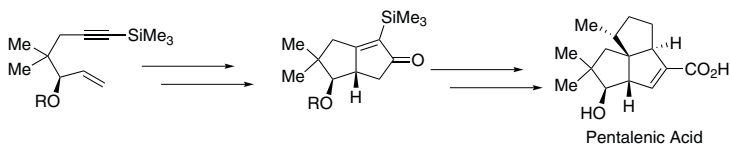
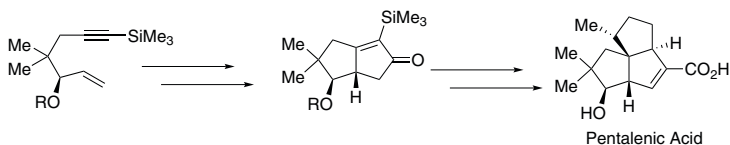
93-4002 Bis(cyclopentadienyl)zirconium dichloride, 99%
(Zirconocene dichloride) (1291-32-3)
(C₅H₅)₂ZrCl₂; FW: 292.32; white to off-white powdr.
moisture sensitive



5g
25g
100g

Technical Notes:

1. Reagent for the conversion of enynes to bicyclic cyclopentenones.
2. Precursor for the cyclization of dienes to cyclopentane and cyclohexane derivatives.
3. Precatalyst for the alkylation of olefins.
4. Precursor to zirconocene complexes of unsaturated organic molecules.
5. Catalyst for the coupling of alkoxyethyl-substituted styrene derivatives.
6. Reagent for the carboalumination-Claisen rearrangement-carbonyl addition cascade reaction.
7. Useful for the preparation of vinyl allenenes.
8. Reagent for the alkylation of epoxides.
9. Catalyst for the formation of carbocycles from cyclic enol ether.

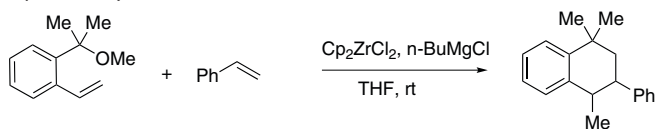


ZIRCONIUM (Compounds)

93-4002

(continued)

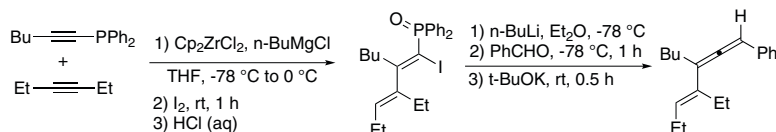
Bis(cyclopentadienyl)zirconium dichloride, 99% (Zirconocene dichloride) (1291-32-3)



Tech. Note (5)
Ref. (11)



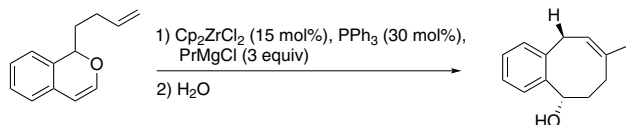
Tech. Note (6)
Ref. (12)



Tech. Note (7)
Ref. (13)



Tech. Note (8)
Ref. (14)



Tech. Note (9)
Ref. (15)

References:

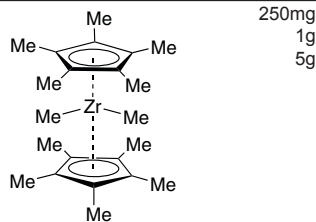
1. *J. Am. Chem. Soc.*, **1989**, *111*, 3336
2. *Tetrahedron Lett.*, **1992**, *33*, 7735
3. *J. Am. Chem. Soc.*, **1991**, *113*, 6268
4. *J. Am. Chem. Soc.*, **1992**, *114*, 6692
5. *J. Am. Chem. Soc.*, **1993**, *115*, 6614
6. *Encyclopedia of Reagents for Organic Synthesis*, **1995**, Vol. 3 1667.
7. *Science*, **1993**, *261*, 1696
8. *Acc. Chem. Res.*, **1994**, *27*, 124 (review)
9. *J. Org. Chem.*, **2000**, *65*, 3236
10. *J. Am. Chem. Soc.*, **2000**, *122*, 5977
11. *J. Org. Chem.*, **2005**, *70*, 4354
12. *J. Org. Chem.*, **2005**, *70*, 8096
13. *J. Org. Chem.*, **2005**, *70*, 8785
14. *J. Org. Chem.*, **2008**, *73*, 1093
15. *Org. Lett.*, **2007**, *9*, 3081

40-1054

NEW

Bis(pentamethylcyclopentadienyl) dimethylzirconium(IV), 99% (67108-80-9)

[(CH₃)₅C₅]₂Zr(CH₃)₂; FW: 391.75; white to off-white xtl. air sensitive, moisture sensitive



250mg
1g
5g

Technical Note:

1. Zirconium complex used as a polymerization catalyst.

References:

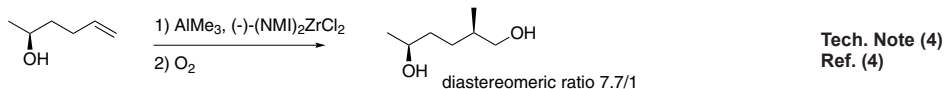
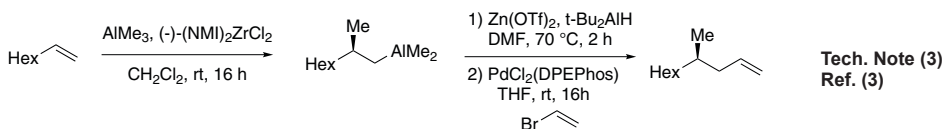
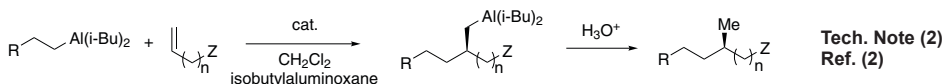
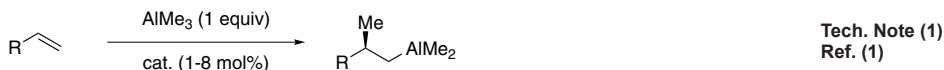
1. *J. Am. Chem. Soc.*, **2009**, *131*, 16658.
2. *Organometallics*, **2005**, *24*, 6013.

ZIRCONIUM (Compounds)

40-1056	(+)-Bis[1-((1'R,2'R,5'R)-2'-i-propyl-5'-methylcyclohexyl)indenyl]zirconium(IV) dichloride (148347-90-4) (C ₁₉ H ₂₆) ₂ ZrCl ₂ ; FW: 668.93; orange powdr. <i>moisture sensitive</i>	100mg 500mg
----------------	--	----------------

Technical Notes:

1. Catalyst used for the enantioselective carboalumination of unactivated alkenes.
2. Catalyst used for the enantioselective synthesis of methyl-substituted alkanols and their derivatives.
3. Reagent for the synthesis of reduced polypropionates via "one pot" Zr-catalyzed asymmetric carboalumination Pd-catalyzed cross-coupling tandem process.
4. Catalyst used for the asymmetric carboalumination of internally hydroxylated terminal alkenes.



References:

1. *Pure Appl. Chem.*, **2002**, 74(1), 151.
2. *Angew. Chem. Int. Ed.*, **2002**, 41, 2141.
3. *J. Am. Chem. Soc.*, **2005**, 127, 2838.
4. *Org. Lett.*, **2007**, 9, 2771.

40-1142	rac-Dimethylsilylbis(1-indenyl)zirconium dichloride, min. 97% (121009-93-6) (CH ₃) ₂ Si(C ₉ H ₆) ₂ ZrCl ₂ ; FW: 448.53; orange powdr. <i>moisture sensitive</i>	100mg 500mg
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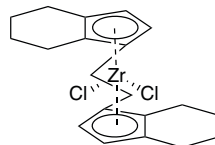
Technical Note:

1. Chiral, stereorigid metallocene catalyst with co-catalyst methylaluminoxane (MAO) is a type of Ziegler-Natta catalyst, showing extremely high activity for polymerization of olefins such as ethylene, propylene, and styrene.

References:

1. *Organometallics*, **1994**, 13, 954.
2. *US Patents* 5,103,030; 5,017,714.

40-1400	rac-Ethylenebis(4,5,6,7-tetrahydro-1-indenyl)zirconium dichloride (100163-29-9) C ₂ H ₄ (C ₉ H ₁₀) ₂ ZrCl ₂ ; FW: 426.54; white to pale yellow powdr. <i>moisture sensitive</i>	100mg 500mg
----------------	---	----------------



Technical Note:

1. The Kaminsky catalyst with co-catalyst methylaluminoxane (MAO) is a type of Ziegler-Natta catalyst, showing extremely high activity for polymerization of olefins such as ethylene, propylene, and styrene.

References:

1. *Journal of Organometallic Chemistry*, **1985**, 288, 63.
2. *Polyhedron*, **1988**, 7, 2375.
3. *US Patent* 4,769,510.

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BIOCATALYST KITS - CalB immo KIT™ - Immobilized enzyme

96-4050

CalB immo KIT™ - Immobilized enzyme

NEW

Store in dry conditions (2-8°C). Do not freeze. Shelf Life: 1 year; Sold in collaboration with PuroLite for research purposes only.

Components also available for individual sale. Contains the following:

07-3130	CalB immo Plus™ - Immobilized enzyme	10g	See page 3
07-3142	CalB immo 8285™ - Immobilized enzyme	10g	See page 3
07-3148	CalB immo 8806™ - Immobilized enzyme	10g	See page 3
07-3152	CalB immo 5587™ - Immobilized enzyme	10g	See page 2
07-3155	CalB immo 1090™ - Immobilized enzyme	10g	See page 2
07-3159	CalB immo 5872™ - Immobilized enzyme	10g	See page 2

Item #	Immobilized on	Immobilization	Enzyme activity (PLU/g dry)
07-3130	DVB/methacrylate	Adsorption	>9,000
07-3142	Epoxy/butyl methacrylate	Covelent	>10,000
07-3148	Octadecyl methacrylate	Adsorption	>10,000
07-3152	Styrene/DVB copolymer	Adsorption	>4,000
07-3155	Macroporous styrene/DVB	Adsorption	>8,000
07-3159	Styrene/DVB	Adsorption	>3,500

Appearance: White to slightly yellow spherical beads, free from foreign matter

Principial Applications: Screening of immobilized lipases for process development, Esterifications (regio- and stereo-selective), Transesterification, Amidation, Fats and oils modification

Advantages: Fast screening in process development, Wide selection of enzyme carriers for different applications

BIOCATALYST KITS - Lipase immo Kit - Immobilized enzymes

96-4065

Lipase immo Kit - Immobilized enzymes

NEW

The KIT contains 10g of each of the following:

- CalB immo Plus™ (Lipase from Candida antarctica B)*07-3130*
- CalA immo (Lipase from Candida antarctica A)
- TL immo (Lipase from Thermomyces lanuginosa)
- RM immo (Lipase from Rhizomucor miehei)
- CR immo (Lipase from Candida rugosa)
- PS immo (Lipase from Pseudomonas cepacia)

A selection of immobilized lipases on different Lifetech™ ECR enzyme carrier resins for screening purposes.

Store in dry conditions (2-8°C). Do not freeze.

Sold in collaboration with PuroLite for research purposes only.

Principal Applications: Esterifications (regio - and stereo-selective), Transesterification, Kinetic resolution of racemic alcohols, amines, esters and triacylglycerides, Fats and oils modification, Hydrolysis of esters

Advantages: Fast screening in process development, Wide selection of immobilized lipases, Optimal for all applications in organic solvents.

BIOCATALYST KITS - Novozymes Endoprotease Screening Kit

96-0224

NEW

Novozymes Endoprotease Screening Kit (contains 6 endoprotease enzymes)

Store at 0-10°C. DO NOT FREEZE. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes
Components also available for individual sale. Contains the following:

06-3110	Alcalase® 2.4 L FG (9014-01-1)	10g	See page 2
06-3112	Alcalase® 2.5 L (9014-01-1)	10g	See page 2
06-3115	Esperase® 8.0 L (9014-01-1)	10g	See page 9
06-3137	Savinase® 12 T (9014-01-1)	10g	See page 11
06-3150	Savinase® 16 L (9014-01-1)	10g	See page 11
06-3160	Neutrase® 0.8 L (9080-56-2)	10g	See page 9

Item#	Density	Activity	Formulation	Optimal Conditions	Substrate Specificity
06-3110	1.17	2.4 AU-A/g	Liquid	30-65°C, pH 7-9	Serine endopeptidase
06-3112	1.08	2.5 AU-A/g	Liquid	30-65°C, pH 7-10	Serine endopeptidase
06-3115	1.07	8 KNPU-E/g	Liquid	pH 8-12.5	Serine endopeptidase
06-3137	1.13	12 KNPU S/g	Granulate	30-70°C, pH 8-10	Serine endopeptidase
06-3150	1.16	16 KNPU S/g	Liquid	30-70°C, pH 8-10	Serine endopeptidase
06-3160	1.26	0.8 AU/g	Liquid	40-50°C, pH 7	Metalloprotease

Optimal storage is 0-10°C/32-50°F. If stored above 25°C/77°F the samples should be used within 3 months.

BIOCATALYST KITS - Novozymes Lipase Screening Kit

96-0220

NEW

Novozymes Lipase Screening Kit (contains 9 lipase enzymes)

Store at 0-10°C. DO NOT FREEZE. Sold in collaboration with Novozymes A/S. Novozymes does not promote nor support the use of enzymes as Active Pharmaceutical Ingredients or excipients. www.strem.com/novozymes
Components also available for individual sale. Contains the following:

06-3100	NovoCor® AD L (9001-62-1)	10g	See page 9
06-3105	Lipozyme® CALB L (9001-62-1)	10g	See page 9
06-3118	Palatase® 20000 L (9001-62-1)	5g	See page 10
06-3120	Novozym® 40086 (9001-62-1)	5g	See page 10
06-3123	Novozym® 435 (9001-62-1)	5g	See page 10
06-3125	Resinase® HT (9001-62-1)	10g	See page 10
06-3135	Novozym® 51032 (9001-62-1)	10g	See page 10
06-3140	Lipozyme® TL 100 L (9001-62-1)	10g	See page 9
06-3155	Lipozyme® TL IM (9001-62-1)	10g	See page 9

Item#	Density	Activity	Formulation	Optimal Conditions	Substrate Specificity
06-3100	1.17	6000 LU/g	Liquid	30-60°C, pH 5-9	Sterically hindered esters
06-3105	1.20	5000 LU/g	Liquid	30-60°C, pH 5-9	Esters and alcohols
06-3118	1.19	20000 LU/g	Liquid	30-50°C, pH 7-10	Esters
06-3120	0.33	275 IUN/g	Immobilized Granulate	30-50°C, pH 7-10	Esters
06-3123	0.40	10000 PLU/g	Immobilized Granulate	30-60°C, pH 5-9	Esters and alcohols
06-3125	1.05	50 KLU/g	Liquid	up to 90°C, pH 5-8	Esters
06-3135	1.04	15 KLU/g	Liquid	35-70°C, pH 7-10	Esters
06-3140	1.05	100 KLU/g	Liquid	20-50°C, pH 7-10	Esters and diesters
06-3155	0.40	250 IUN/g	Immobilized Granulate	50-75°C, pH 6-8	Esters

Optimal storage is 0-10°C/32-50°F. If stored above 25°C/77°F the samples should be used within 3 months.

CATALYST & ORGANOCATALYST KITS - Apeiron Ruthenium Metathesis Catalyst Kit

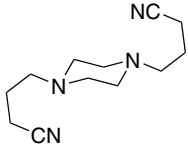
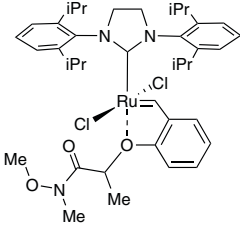
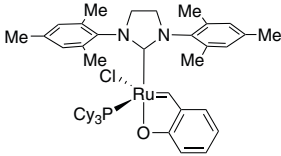
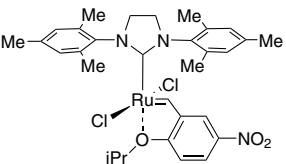
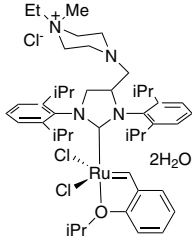
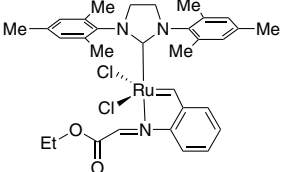
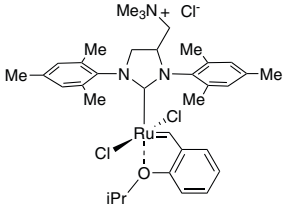
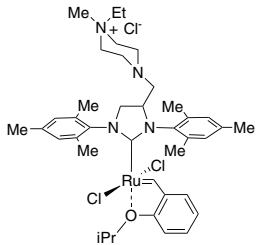
96-0400

Apeiron Ruthenium Metathesis Catalyst Kit

NEW

Sold in collaboration with Apeiron Synthesis, Inc.

Components also available for individual sale. Contains the following:

 <p>07-2203 SnatchCat Metal Scavenger</p> <p>1g</p>	 <p>44-0750 GreenCat</p> <p>100mg</p>	 <p>44-0753 LatMet</p> <p>100mg</p>
 <p>44-0758 nitro-Grela</p> <p>100mg</p>	 <p>44-0759 FixCat</p> <p>100mg</p>	 <p>44-0760 HeatMet</p> <p>100mg</p>
 <p>44-0765 StickyCat Cl</p> <p>100mg</p>		 <p>44-0768 AquaMet</p> <p>100mg</p>

CATALYST & ORGANOCATALYST KITS - Apeiron Ruthenium Metathesis Catalyst Kit

07-2203	1,4-Bis(2-isocyanopropyl)piperazine (SnatchCat Metal Scavenger) (51641-96-4)	1g	visit strem.com
44-0750	[1,3-Bis(2,6-di-i-propylphenyl)imidazolidin-2-ylidene] {2-[[1-(methoxy(methyl)amino)-1-oxopropan-2-yl]oxy]benzylidene}ruthenium(II) dichloride GreenCat (1448663-06-6)	100mg	See page 225
44-0753	[1,3-Bis(2,4,6-trimethylphenyl)imidazolidin-2-ylidene] (tricyclohexylphosphine)-(2-oxobenzylidene)ruthenium(II) chloride LatMet (1407229-58-6)	100mg	See page 233
44-0758	[1,3-Bis(2,4,6-trimethylphenylimidazolidin-2-ylidene)]-(2-i-propoxy-5-nitrobenzylidene)ruthenium(II) dichloride nitro-Grela (502964-52-5)	100mg	See page 232
44-0759	(1,3-Bis(2,6-diisopropylphenyl)-4-((4-ethyl-4-methylpiperazin-1-ium-1-yl)methyl)imidazolidin-2-ylidene)(2-isopropoxybenzylidene) ruthenium(II) chloride dihydrate FixCat (1799947-97-9)	100mg	See page 224
44-0760	Dichloro(1,3-bis(2,4,6-trimethylphenyl)imidazolidin-2-ylidene) {2-[(ethoxy-2-oxoethylidene)amino]benzylidene}ruthenium(II) HeatMet	100mg	See page 277
44-0765	[1,3-Bis(2,4,6-trimethylphenyl)-4-[(trimethylammonio)methyl]imidazolidin-2-ylidene]-(2-i-propoxybenzylidene) dichlororuthenium(II) chloride StickyCat Cl (1452227-72-3)	100mg	See page 234
44-0768	[1,3-Bis(2,4,6-trimethylphenyl)-4-[(4-ethyl-4-methylpiperazin-1-ium-1-yl)methyl]imidazolidin-2-ylidene]-(2-i-propoxybenzylidene) dichlororuthenium(II) chloride AquaMet (1414707-08-6)	100mg	See page 230

CATALYST & ORGANOCATALYST KITS - BASF Blocking Group Removal Catalyst Kit

96-6715

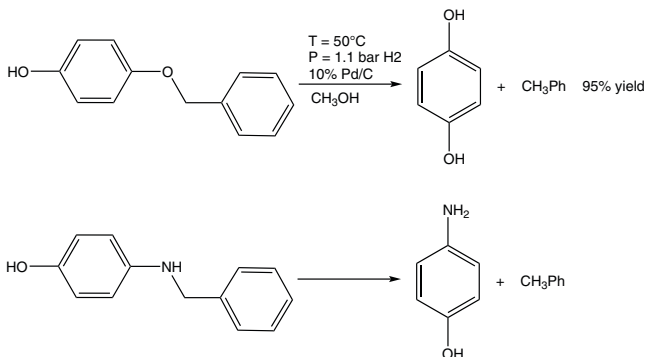
BASF Blocking Group Removal Catalyst Kit

Sold in collaboration with BASF for research purposes only. Components also available for individual sale. Contains the following:

46-1905	Palladium, 10% on activated wood carbon, reduced, 50% water wet (Escat™ 1931) (7440-05-3)	10g	visit strem.com
46-1906	Palladium, 10% on activated wood carbon, unreduced, 50% water wet (Escat™ 1921) (7440-05-3)	10g	
46-1907	Palladium, 3% on activated carbon, reduced, 50% water wet paste (Escat™ 1911) (7440-05-3)	10g	
46-1908	Palladium, 5% on activated carbon, reduced, 50% water wet paste (Escat™ 1941) (7440-05-3)	10g	
46-1909	Palladium, 5% on activated carbon, reduced, 50% water wet paste (Escat™ 1961) (7440-05-3)	10g	
46-1911	Palladium, 5% on activated carbon, reduced, 50% water wet paste (Escat™ 1971) (7440-05-3)	10g	

Technical Note:

- In synthesis, the commonly practiced deprotection of benzylated alcohols and amines by precious metal catalyzed hydrogenolysis requires that the catalyst achieve complete deprotection under a limited range of available process conditions and in the presence of various process solvents and complex organic functionalities. Relative to classic catalysts, the Englehard family of blocking group removal catalysts exhibits unprecedented high intrinsic catalytic activity, exceptional fast filtration characteristics, robust functional group tolerance, and good activity in a broad range of solvents.



CATALYST & ORGANOCATALYST KITS - BASF Heterogeneous Catalyst Kit

96-6717 HAZ	BASF Heterogeneous Catalyst Kit Product offered is commercial grade, sold in collaboration with BASF for research purposes only. Components also available for individual sale. Contains the following:		
44-4065	Ruthenium, 5% on activated carbon, reduced, 50% water wet paste (Escat™ 4401) (7440-18-8)	5g	visit strem.com
45-1875	Rhodium, 5% on activated wood carbon, reduced, 50% water wet paste (Escat™ 3401) (7440-16-6)	1g	
46-1707	Palladium, 20% on activated carbon (Pearlman's catalyst), unreduced, 50% water wet paste (Escat™ 1951) (7440-05-3)	5g	
46-1710	Palladium, 0.6% on activated carbon, 50% water-wet paste (NanoSelect LF 100) (7440-05-3)	5g	
46-1901	Palladium, 5% on activated peat carbon, reduced, 50% water wet paste (Escat™ 1621) (7440-05-3)	10g	
46-1902	Palladium, 5% on activated wood carbon, reduced, dry (Escat™ 1431) (7440-05-3)	10g	
46-1903	Palladium, 5% on activated wood carbon, reduced, 50% water wet paste (Escat™ 1421) (7440-05-3)	10g	
46-1904	Palladium, 5% on activated wood carbon, unreduced, 50% water wet paste (Escat™ 1471) (7440-05-3)	10g	
46-1905	Palladium, 10% on activated wood carbon, reduced, 50% water wet (Escat™ 1931) (7440-05-3)	10g	
46-1951	Palladium, 5% on alumina powder, reduced, dry (Escat™ 1241) (7440-05-3)	5g	
78-1611	Platinum, 5% on activated wood carbon, reduced, dry (Escat™ 2431) (7440-06-4)	5g	
78-1612	Platinum, 5% on activated wood carbon, reduced, 50% water wet paste (Escat™ 2421) (7440-06-4)	5g	
78-1613	Platinum, 5% on activated carbon, unreduced, 50% water wet paste (Escat™ 2441) (7440-06-4)	5g	

CATALYST & ORGANOCATALYST KITS - BASF Palladium Catalyst Kit

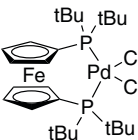
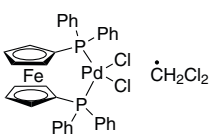
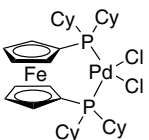
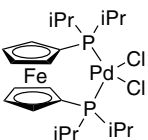
96-6719 HAZ	BASF Palladium Catalyst Kit Product offered is commercial grade, sold in collaboration with BASF for research purposes only. Components also available for individual sale. Contains the following:		
46-1707	Palladium, 20% on activated carbon (Pearlman's catalyst), unreduced, 50% water wet paste (Escat™ 1951) (7440-05-3)	5g	visit strem.com
46-1710	Palladium, 0.6% on activated carbon, 50% water-wet paste (NanoSelect LF 100) (7440-05-3)	5g	
46-1901	Palladium, 5% on activated peat carbon, reduced, 50% water wet paste (Escat™ 1621) (7440-05-3)	10g	
46-1902	Palladium, 5% on activated wood carbon, reduced, dry (Escat™ 1431) (7440-05-3)	10g	
46-1903	Palladium, 5% on activated wood carbon, reduced, 50% water wet paste (Escat™ 1421) (7440-05-3)	10g	
46-1904	Palladium, 5% on activated wood carbon, unreduced, 50% water wet paste (Escat™ 1471) (7440-05-3)	10g	
46-1905	Palladium, 10% on activated wood carbon, reduced, 50% water wet (Escat™ 1931) (7440-05-3)	10g	
46-1906	Palladium, 10% on activated wood carbon, unreduced, 50% water wet (Escat™ 1921) (7440-05-3)	10g	
46-1951	Palladium, 5% on alumina powder, reduced, dry (Escat™ 1241) (7440-05-3)	5g	

CATALYST & ORGANOCATALYST KITS - BASF Platinum Catalyst Kit

96-6721 HAZ	BASF Platinum Catalyst Kit Product offered is commercial grade, sold in collaboration with BASF for research purposes only. Components also available for individual sale. Contains the following:		
78-1611	Platinum, 5% on activated wood carbon, reduced, dry (Escat™ 2431) (7440-06-4)	5g	visit strem.com
78-1612	Platinum, 5% on activated wood carbon, reduced, 50% water wet paste (Escat™ 2421) (7440-06-4)	5g	visit strem.com
78-1613	Platinum, 5% on activated carbon, unreduced, 50% water wet paste (Escat™ 2441) (7440-06-4)	5g	visit strem.com
78-1614	Platinum, 3% on activated wood carbon, reduced, 70% water wet paste (Escat™ 2931) (7440-06-4)	5g	visit strem.com
78-1661	Platinum, 5% on alumina powder, reduced, dry (Escat™ 2941) (7440-06-4)	5g	visit strem.com
78-1892	Platinum(IV) oxide hydrate (~80-82% Pt) (99.95+%-Pt) ADAMS' CATALYST [BASF C7018] (52785-06-5)	1g	See page 185

CATALYST & ORGANOCATALYST KITS - [1,1'-Bis(dialkyl/diarylphosphino) ferrocene] palladium(II) dichloro Catalyst Kit

96-3735 [1,1'-Bis(dialkyl/diarylphosphino)ferrocene]palladium(II) dichloro Catalyst Kit
Components also available for individual sale. Contains the following:

			
46-0445	46-0450	46-0455	46-0460
500mg	1g	250mg	500mg

46-0445	Dichloro[1,1'-bis(di-t-butylphosphino) ferrocene]palladium(II), 99% (95408-45-0)	500mg	See page 144
46-0450	Dichloro 1,1'-bis(diphenylphosphino)ferrocene palladium (II) dichloromethane, 99% (95464-05-4)	1g	See page 146
46-0455	Dichloro[1,1'-bis(dicyclohexylphosphino)ferrocene]palladium(II), dichloromethane adduct, 99% (917511-90-1)	250mg	See page 144
46-0460	Dichloro[1,1'-bis(di-i-propylphosphino)ferrocene]palladium(II), 99% (215788-65-1)	500mg	See page 148

CATALYST & ORGANOCATALYST KITS - Buchwald Palladacycle Precatalyst Kit 1

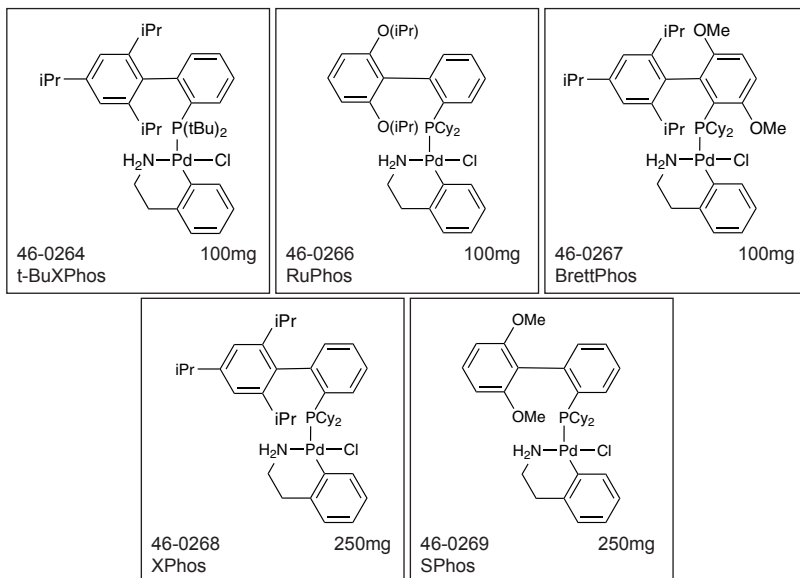
96-5503

Buchwald Palladacycle Precatalyst Kit 1

(Chloro-2-aminoethylphenyl- Palladacycles Gen. 1)

Patents US 6,395,916, US 6,307,087.

Components also available for individual sale. Contains the following:



46-0264	Chloro(2-di- <i>t</i> -butylphosphino-2',4',6'-tri- <i>i</i> -propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II), min. 98% [t-BuXPhos Palladacycle Gen. 1] (1142811-12-8)	100mg	See page 128
46-0266	Chloro(2-dicyclohexylphosphino-2',6'-di- <i>i</i> -propoxy-1,1'-biphenyl)[2-(2-aminoethyl)phenyl]palladium(II), methyl- <i>t</i> -butylether adduct, min. 98% [RuPhos Palladacycle Gen. 1] (1028206-60-1)	100mg	See page 132
46-0267	Chloro[2-(dicyclohexylphosphino)-3,6-dimethoxy-2',4',6'-tri- <i>i</i> -propyl-1,1'-biphenyl][2-(2-aminoethyl)phenyl]palladium(II), min. 98% [BrettPhos Palladacycle Gen. 1] (1148148-01-9)	100mg	See page 130
46-0268	Chloro(2-dicyclohexylphosphino-2',4',6'-tri- <i>i</i> -propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II) methyl- <i>t</i> -butylether adduct, min. 98% [XPhos Palladacycle Gen. 1] (1028206-56-5)	250mg	See page 133
46-0269	Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)[2-(2-aminoethyl)phenyl]palladium(II) methyl- <i>t</i> -butylether adduct, min. 98% [SPhos Palladacycle Gen. 1] (1028206-58-7)	250mg	See page 129

CATALYST & ORGANOCATALYST KITS - Buchwald Palladacycle Precatalyst Kit 3


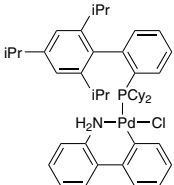
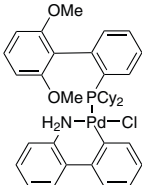
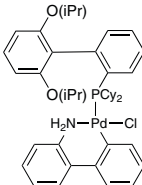
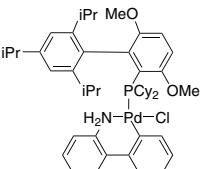
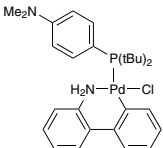
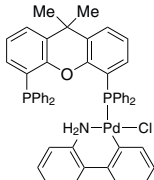
96-5508

Buchwald Palladacycle Precatalyst Kit 3

(Chloro- 2'-amino-1,1'-biphenyl-2-yl - Palladacycles Gen. 2)

Patents: US 6,395,916, US 6,307,087.

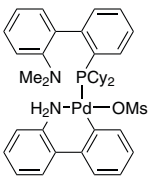
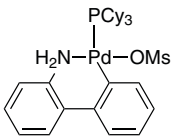
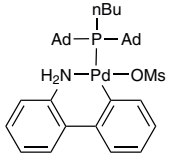
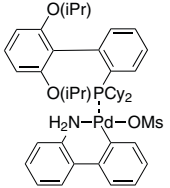
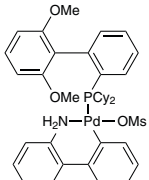
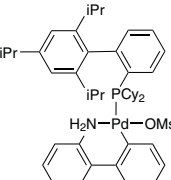
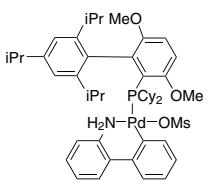
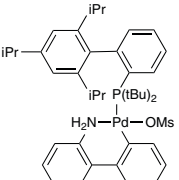
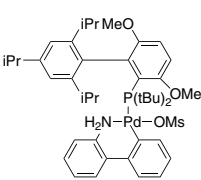
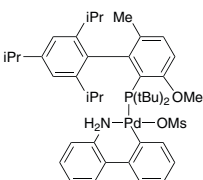
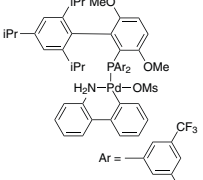
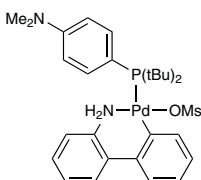
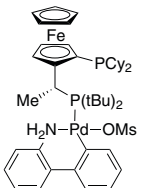
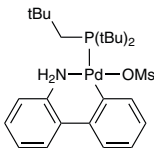
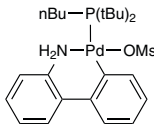
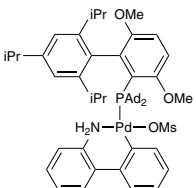
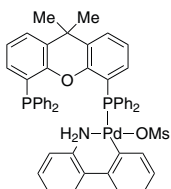
Components also available for individual sale. Contains the following:

 <p>46-0232 DavePhos</p> <p>250mg</p>	 <p>46-0281 XPhos</p> <p>250mg</p>	 <p>46-0283 SPhos</p> <p>250mg</p>	 <p>46-0286 RuPhos</p> <p>250mg</p>
 <p>46-0292 BrettPhos</p> <p>100mg</p>	 <p>46-0342 Amphos</p> <p>250mg</p>	 <p>46-0955 Xantphos</p> <p>500mg</p>	

46-0232	Chloro[2-(dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [DavePhos Palladacycle Gen. 2]	250mg	See page 131
46-0281	Chloro(2-dicyclohexylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [XPhos Palladacycle Gen. 2] (1310584-14-5)	250mg	See page 132
46-0283	Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II) min. 98% [SPhos Palladacycle Gen. 2] (1375325-64-6)	250mg	See page 129
46-0286	Chloro(2-dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 2] (1375325-68-0)	250mg	See page 131
46-0292	Chloro(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [BrettPhos Palladacycle Gen. 2] (1451002-39-3)	100mg	See page 130
46-0342	Chloro[[4-(N,N-dimethylamino)phenyl]di-t-butylphosphino](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [Amphos Palladacycle Gen. 2]	250mg	See page 134
46-0955	Chloro[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene][2'-amino-1,1'-biphenyl]palladium(II) dichloromethane adduct, min. 98% [Xantphos Palladacycle Gen. 2] (1375325-77-1)	500mg	See page 134

CATALYST & ORGANOCATALYST KITS - Buchwald Palladacycle Precatalyst Kit 2a

96-5505 Buchwald Palladacycle Precatalyst Kit 2a
 (Methanesulfonato-2'-amino-1,1'-biphenyl-2-yl- Palladacycles Gen. 3)
 Patents: US 6,395,916, US 6,307,087.
 Components also available for individual sale. Contains the following:

 <p>46-0237 250mg DavePhos</p>	 <p>46-0239 250mg PCy3</p>	 <p>46-0278 250mg cataCXium® A</p>	 <p>46-0314 250mg RuPhos</p>
 <p>46-0318 250mg SPhos</p>	 <p>46-0320 250mg XPhos</p>	 <p>46-0322 100mg BrettPhos</p>	 <p>46-0323 250mg t-BuXPhos</p>
 <p>46-0325 100mg t-BuBrettPhos</p>	 <p>46-0335 100mg RockPhos</p>	 <p>46-0340 100mg JackiePhos</p>	 <p>46-0345 250mg Amphos</p>
 <p>46-0353 100mg Josiphos</p>	 <p>46-0358 250mg DTBNpP</p>	 <p>46-0365 250mg P(t-Bu)2(n-Bu)</p>	 <p>46-0480 50mg AdBrettPhos</p>
 <p>46-0957 500mg Xantphos</p>			

CATALYST & ORGANOCATALYST KITS - Buchwald Palladacycle Precatalyst Kit 2a

46-0237	Methanesulfonato[2-(dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl) palladium(II) CH ₂ Cl ₂ adduct, min. 98% [DavePhos Palladacycle Gen. 3] (1445085-87-9)	250mg	See page 166
46-0239	Methanesulfonato(tricyclohexylphosphine)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [PCy ₃ Palladacycle Gen. 3] (1445086-12-3)	250mg	See page 173
46-0278	Methanesulfonato(diadamantyl-n-butylphosphino)-2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 95% [cataCXium® A Palladacycle Gen. 3]	250mg	See page 157
46-0314	Methanesulfonato(2-dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 3] (1445085-77-7)	250mg	See page 167
46-0318	Methanesulfonato(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II) dichloromethane adduct min. 98% [SPhos Palladacycle Gen. 3] (1445085-82-4)	250mg	See page 165
46-0320	Methanesulfonato(2-dicyclohexylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II) dichloromethane adduct, min. 98% [Xphos Palladacycle Gen. 3] (1445085-55-1)	250mg	See page 168
46-0322	Methanesulfonato(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 3] (1470372-59-8)	100mg	See page 165
46-0323	Methanesulfonato(2-di-t-butylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [t-BuXPhos Palladacycle Gen. 3] (1447963-75-8)	250mg	See page 163
46-0325	Methanesulfonato(2-(di-t-butylphosphino)-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), dichloromethane adduct, min. 98% [t-BuBrettPhos Palladacycle Gen. 3] (1536473-72-9)	100mg	See page 160
46-0335	Methanesulfonato(2-(di-t-butylphosphino)-3-methoxy-6-methyl-2',4',6'-tri-i-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RockPhos Palladacycle Gen. 3] (2009020-38-4)	100mg	See page 162
46-0340	Methanesulfonato[2-bis(3,5-di(trifluoromethyl) phenylphosphino)-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [JackiePhos Palladacycle Gen. 3]	100mg	See page 156
46-0345	Methanesulfonato{[4-(N,N-dimethylamino)phenyl]di-t-butylphosphino}(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [Amphos Palladacycle Gen. 3] (1820817-64-8)	250mg	See page 170
46-0353	Methanesulfonato{(R)-(-)-1-[(S)-2-(dicyclohexylphosphino) ferrocenyl]ethyl}di-t-butylphosphine)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [Josiphos Palladacycle Gen. 3] (1702311-34-9)	100mg	See page 168
46-0358	Methanesulfonato(di-t-butylneopentylphosphine)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [DTBNpP Palladacycle Gen. 3] (1507403-89-5)	250mg	See page 159
46-0365	Methanesulfonato(di-t-butyl(n-butyl)phosphine)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [P(t-Bu) ₂ (n-Bu) Palladacycle Gen. 3] (1445086-17-8)	250mg	See page 159
46-0480	Methanesulfonato[2-(di-1-adamantylphosphino)-3,6-dimethoxy-2',4',6'-tri-i-propyl-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [AdBrettPhos Palladacycle Gen. 3] (1445972-29-1)	50mg	See page 157
46-0957	Methanesulfonato[9,9-dimethyl-4,5-bis(diphenylphosphino) xanthene][2'-amino-1,1'-biphenyl]palladium(II) dichloromethane adduct, min. 98% [Xantphos Palladacycle Gen. 3] (1445085-97-1)	500mg	See page 170

CATALYST & ORGANOCATALYST KITS - Buchwald Palladacycle Precatalyst Kit 2b

96-5506

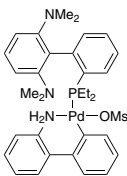
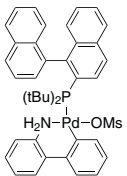
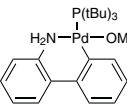
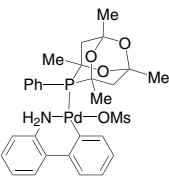
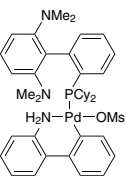
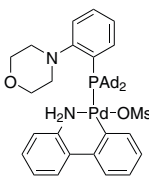
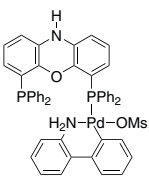
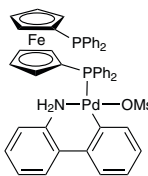
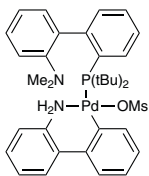
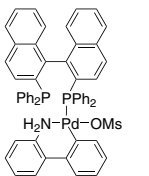
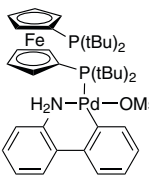
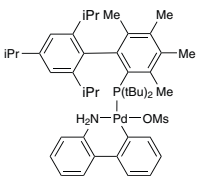
Buchwald Palladacycle Precatalyst Kit 2b

(Methanesulfonato-2'-amino-1,1'-biphenyl-2-yl)- Palladacycles Gen. 3)

Patents: US 6,395,916, US 6,307,087.

Components also available for individual sale. Contains the following:

NEW

 <p>46-0348 50mg EtCPhos</p>	 <p>46-0357 100mg TrixiePhos</p>	 <p>46-0387 50mg P(t-Bu)₃</p>	 <p>46-0392 500mg MeCgPPH</p>
 <p>46-0487 100mg CPhos</p>	 <p>46-0935 50mg Mor-DalPhos</p>	 <p>46-0959 100mg NiXantphos</p>	 <p>46-2128 250mg DPPF</p>
 <p>46-2135 250mg t-BuDavePhos</p>	 <p>46-2153 250mg BINAP</p>	 <p>46-2158 250mg DTBPF</p>	 <p>46-2163 100mg Me4 t-ButylXPhos</p>

CATALYST & ORGANOCATALYST KITS - Buchwald Palladacycle Precatalyst Kit 2b

46-0348	Methanesulfonato[2-diethylphosphino-2',6'-bis(dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [EtCPhos Palladacycle Gen. 3]	50mg	See page 169
46-0357	Methanesulfonato(2-di-t-butylphosphino-1,1'-binaphthyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 95% [TrixiePhos Palladacycle Gen. 3]	100mg	See page 159
46-0387	Methanesulfonato(tri-t-butylphosphino)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), 98% [P(t-Bu) ₃ Palladacycle Gen. 3] (1445086-17-8)	250mg	See page 172
46-0392	Methanesulfonato(1,3,5,7-tetramethyl-8-phenyl-2,4,6-trioxo-8-phosphaadamantane)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [MeCgPPH Palladacycle Gen. 3]	500mg	See page 171
46-0487	Methanesulfonato(2-dicyclohexylphosphino-2',6'-bis(dimethylamino)-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), 98% [CPhos Palladacycle Gen. 3] (1447963-73-6)	100mg	See page 164
46-0935	Methanesulfonato[N-(2-(di-1-adamantylphosphino)phenyl)morpholine](2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [Mor-Dalpos Palladacycle Gen. 3]	250mg	See page 157
46-0959	Methanesulfonato(4,6-bis(diphenylphosphino)phenoxazine)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), 98% [NiXantphos Palladacycle Gen. 3] (1602922-03-1)	100mg	See page 155
46-2128	Methanesulfonato[1,1'-bis(diphenylphosphino)ferrocene](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [DPPF Palladacycle Gen. 3] (1445086-28-1)	250mg	See page 154
46-2135	Methanesulfonato[2-(di-t-butylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [t-BuDavePhos Palladacycle Gen. 3] (1445085-92-6)	250mg	See page 161
46-2153	Methanesulfonato[2,2'-bis(diphenylphosphino)-1,1'-binaphthyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BINAP Palladacycle Gen. 3]	250mg	See page 154
46-2158	Methanesulfonato(1,1'-bis(di-t-butylphosphino)ferrocene)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [DTBPF Palladacycle Gen. 3]	250mg	See page 153
46-2163	Methanesulfonato(2-di-t-butylphosphino-3,4,5,6-tetramethyl-2',4',6'-tri-i-propylbiphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 95% [Me4-t-ButylXPhos Palladacycle Gen. 3] (1507403-85-1)	100mg	See page 163

CATALYST & ORGANOCATALYST KITS - Buchwald Palladacycle Precatalyst Kit 4

96-5512

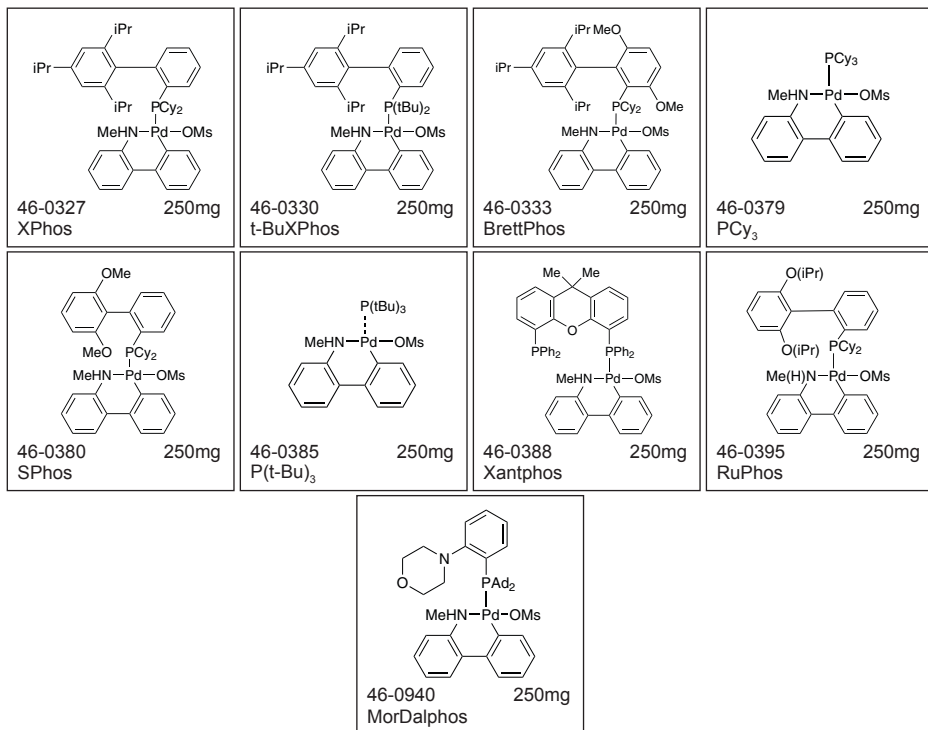
Buchwald Palladacycle Precatalyst Kit 4

(Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl)- Palladacycles Gen. 4)

NEW

Patents: PCT/US2013/030779, US Serial No. 13/799620

Components also available for individual sale. Contains the following:



46-0327	Methanesulfonato(2-dicyclohexylphosphino-2',4',6'-tri- <i>i</i> -propyl-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [XPhos Palladacycle Gen. 4] (1599466-81-5)	250mg	See page 169
46-0330	Methanesulfonato(2-di- <i>t</i> -butylphosphino-2',4',6'-tri- <i>i</i> -propyl-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [t-BuXphos Palladacycle Gen. 4] (1599466-89-3)	250mg	See page 164
46-0333	Methanesulfonato(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri- <i>i</i> -propyl-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 4] (1599466-83-7)	250mg	See page 166
46-0379	Methanesulfonato(tricyclohexylphosphino)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98% [PCy ₃ Palladacycle Gen. 4]	250mg	See page 173
46-0380	Methanesulfonato(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct min. 98% [SPhos Palladacycle Gen. 4] (1599466-87-1)	250mg	See page 165
46-0385	Methanesulfonato(tri- <i>t</i> -butylphosphino)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98% [P(t-Bu) ₃ Palladacycle Gen. 4] (1621274-11-0)	250mg	See page 172
46-0388	Methanesulfonato[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene](2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), 98% [Xantphos Palladacycle Gen. 4] (1621274-19-8)	250mg	See page 171
46-0395	Methanesulfonato(2-dicyclohexylphosphino-2',6'-di- <i>i</i> -propoxy-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 4] (1599466-85-9)	250mg	See page 168
46-0940	Methanesulfonato{N-[2-(di-1-adamantyl)phosphino]phenyl}morpholine(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [MorDalpos Palladacycle Gen. 4]	250mg	See page 158

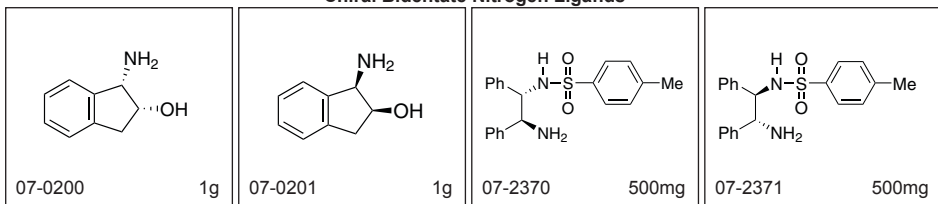
CATALYST & ORGANOCATALYST KITS - CATHy™ Catalyst Kit

96-7650 CATHy™ Catalyst Kit for Asymmetric Transfer Hydrogenation of Ketones and Imines

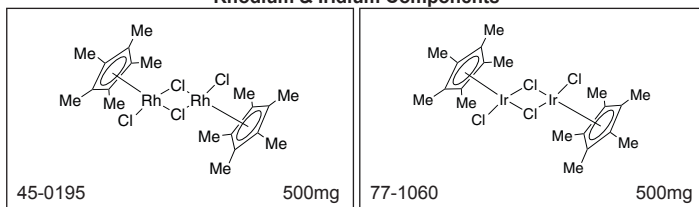
For asymmetric transfer hydrogenation of ketones and imines.

Components also available for individual sale. Contains the following:

Chiral Bidentate Nitrogen Ligands



Rhodium & Iridium Components

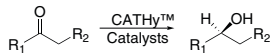
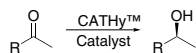
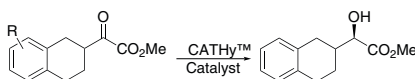
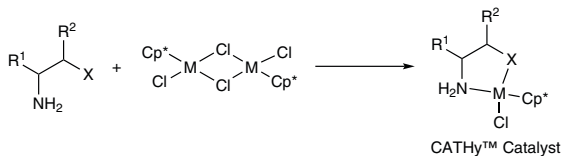


07-0200	(1S,2R)-(-)-cis-1-Aminoindan-2-ol, 98% (126456-43-7)	1g	visit strem.com
07-0201	(1R,2S)-(+)-cis-1-Aminoindan-2-ol, 98% (136030-00-7)	1g	visit strem.com
07-2370	(1S,2S)-(+)-N-(4-toluenesulfonyl)-1,2-diphenylethylenediamine, 98% (S,S)-TsDPEN (167316-27-0)	500mg	visit strem.com
07-2371	(1R,2R)-(-)-N-(4-toluenesulfonyl)-1,2-diphenylethylenediamine, 98% (R,R)-TsDPEN (144222-34-4)	500mg	visit strem.com
45-0195	Dichloro(pentamethylcyclopentadienyl)rhodium(III) dimer, 99% (12354-85-7)	500mg	See page 210
77-1060	Dichloro(pentamethylcyclopentadienyl)iridium(III) dimer, 98% (12354-84-6)	500mg	See page 66

Technical Notes:

1. Catalyst for asymmetric ketone reduction in organic and aqueous media
2. Catalyst for asymmetric imine reduction in organic and aqueous media
3. Catalyst for asymmetric oxidative lactonizations of meso-diols
4. Catalyst for asymmetric transfer hydrogenation of quinolines

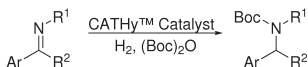
Catalyst Preparation



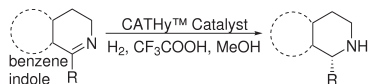
Tech. Note (1)
Ref. (1-7)

CATALYST & ORGANOCATALYST KITS - CATHy™ Catalyst Kit

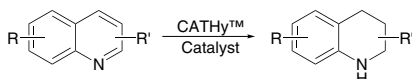
96-7650 CATHy™ Catalyst Kit for Asymmetric Transfer Hydrogenation of Ketones and Imines
(continued)



Tech. Note (2)
Ref. (1, 8-10)



Tech. Note (3)
Ref. (11)



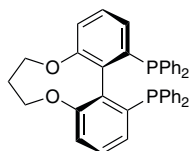
Tech. Note (4)
Ref. (12-13)

References:

1. Blacker A.J., Mellor B.J. WO9842643A1, filed 26/03/97, Avecia Ltd.; Blacker A.J. Conf. Proceedings: The Scale up of Chemical Processes. Jersey 1998 ISBN 0953399400;
2. *Tetrahedron*, **2006**, 62, 1864
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4. *Chem. Eur. J.* **2008**, 14, 2209
5. *J. Org. Chem.* **2010**, 75, 2981
6. *J. Org. Chem.* **2015**, 80, 4419
7. *J. Organometal. Chem.* **2016**, 810, 12
8. *Chem. Eur. J.* **2011**, 17, 1109
9. *Org. Lett.* **2015**, 17, 2878
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11. *Organometallics* **2002**, 21, 3493
12. *Org. Lett.*, **2008**, 10, 5265
13. *Angew. Chem. Int. Ed.* **2009**, 48, 6524

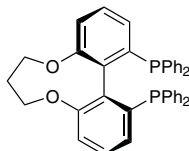
CATALYST & ORGANOCATALYST KITS - Chiral Quest Catalyst & Ligand Toolbox Kit

96-5900 Chiral Quest Catalyst and Ligand Toolbox Kit for Asymmetric Hydrogenation
Components also available for individual sale. Contains the following:



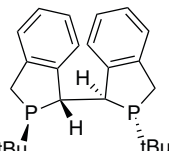
15-0175
(R)-C₃-TUNEPHOS

100mg



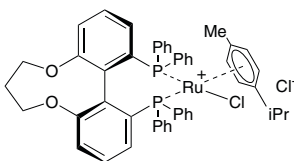
15-0176
(S)-C₃-TUNEPHOS

100mg



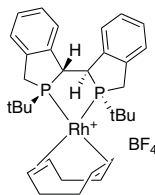
15-1060
(R,R,S,S)-DUANPHOS

100mg



44-0109
(R)-C₃-TUNEPHOS-Ru

100mg



45-0663
(R,R,S,S)-DUANPHOS-Rh

100mg

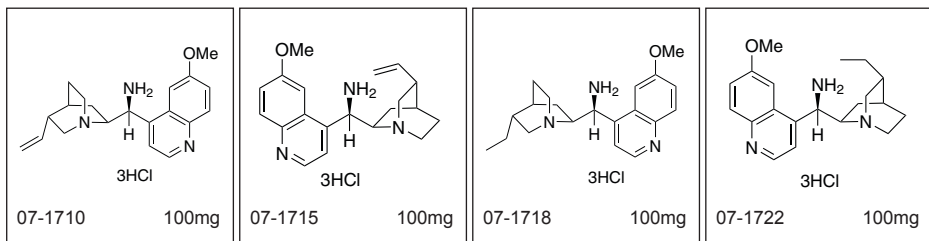
CATALYST & ORGANOCATALYST KITS - Chiral Quest Catalyst & Ligand Toolbox Kit

96-5900 (continued)	Chiral Quest Catalyst and Ligand Toolbox Kit for Asymmetric Hydrogenation		
15-0175	R-(-)-1,13-Bis(diphenylphosphino)-7,8-dihydro-6H-dibenzo[f,h][1,5]dioxonin, 97% (R)-C ₃ -TUNEPHOS (301847-89-2)	100mg	visit strem.com
15-0176	(S)-(+)-1,13-Bis(diphenylphosphino)-7,8-dihydro-6H-dibenzo[f,h][1,5]dioxonin, 95% (S)-C ₃ -TUNEPHOS (486429-99-6)	100mg	visit strem.com
15-1060	(1R,1'R,2S,2'S)-(+)-2,2'-Di-t-butyl-2,3,2',3'-tetrahydro-1,1'-bi-1H-isophosphindole, min. 98% (R,R,S,S)-DUANPHOS (528814-26-8)	100mg	visit strem.com
44-0109	Chloro((R)-(-)-1,13-bis(diphenylphosphino)-7,8-dihydro-6H-dibenzo[f,h][1,5]dioxonin)(p-cymene)ruthenium(II) chloride (R)-C ₃ -TUNEPHOS-Ru	100mg	See page 245
45-0663	(1R,1'R,2S,2'S)-(+)-2,2'-Di-t-butyl-2,3,2',3'-tetrahydro-1,1'-bi-1H-isophosphindole(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (R,R,S,S)-DUANPHOS-Rh	100mg	See page 208

CATALYST & ORGANOCATALYST KITS - Cinchona Alkaloid-Derived Organocatalyst Kit

96-1575 Cinchona Alkaloid-Derived Organocatalyst Kit - (enantiopure primary amines) for Iminium-Enamine Activation

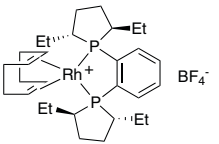
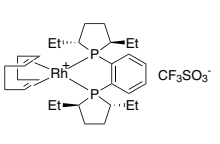
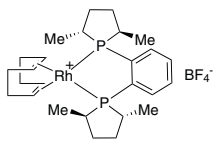
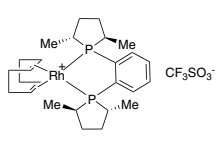
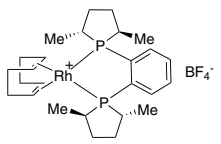
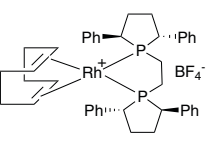
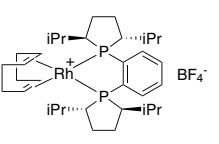
Components also available for individual sale. Contains the following:



07-1710	(8α, 9S)-6'-Methoxycinchonan-9-amine trihydrochloride, min. 90% (1231763-32-8)	100mg	visit strem.com
07-1715	(8α, 9R)-6'-Methoxycinchonan-9-amine trihydrochloride, min. 90% (1391506-12-9)	100mg	visit strem.com
07-1718	(8α, 9S)-10,11-Dihydro-6'-methoxycinchonan-9-amine trihydrochloride, min. 90% (852913-53-2)	100mg	visit strem.com
07-1722	(9R)-10,11-Dihydro-6'-methoxycinchonan-9-amine trihydrochloride, min. 90% (931098-92-9)	100mg	visit strem.com

CATALYST & ORGANOCATALYST KITS - (R,R)-Duphos and BPE Rhodium Catalyst Kit

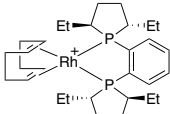
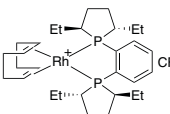
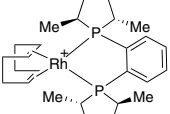
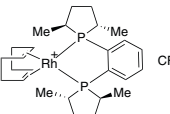
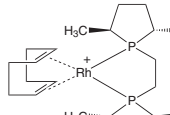
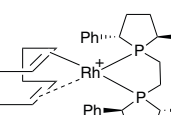
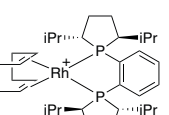
96-4730 (R,R)-Duphos and BPE Rhodium Catalyst Kit for Asymmetric Hydrogenation
Components also available for individual sale. Contains the following:

			
45-0148 100mg (R,R)-Et-DUPHOS-Rh	45-0150 100mg (R,R)-Et-DUPHOS-Rh	45-0158 100mg (R,R)-Me-DUPHOS-Rh	45-0160 100mg (R,R)-Me-DUPHOS-Rh
			
45-0168 100mg (R,R)-Me-BPE-Rh	45-0201 100mg (R,R)-Ph-BPE-Rh	45-0210 100mg (R,R)-i-Pr-DUPHOS-Rh	

45-0148	(-)-1,2-Bis((2R,5R)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (R,R)-Et-DUPHOS-Rh (228121-39-9)	100mg	See page 188
45-0150	(-)-1,2-Bis((2R,5R)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (R,R)-Et-DUPHOS-Rh (136705-77-6)	100mg	See page 188
45-0158	(-)-1,2-Bis((2R,5R)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (R,R)-Me-DUPHOS-Rh (210057-23-1)	100mg	See page 192
45-0160	(-)-1,2-Bis((2R,5R)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I)trifluoromethanesulfonate, 98+% (R,R)-Me-DUPHOS-Rh (187682-63-9)	100mg	See page 193
45-0168	(+)-1,2-Bis((2R,5R)-2,5-dimethylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (R,R)-Me-BPE-Rh (305818-67-1)	100mg	See page 193
45-0201	(-)-1,2-Bis((2R,5R)-2,5-diphenylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (R,R)-Ph-BPE-Rh (528565-84-6)	100mg	See page 199
45-0210	(+)-1,2-Bis((2R,5R)-2,5-di-i-propylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (R,R)-i-Pr-DUPHOS-Rh (569650-64-2)	100mg	See page 200

CATALYST & ORGANOCATALYST KITS - (S,S)-Duphos and BPE Rhodium Catalyst Kit

96-4731 (S,S)-Duphos and BPE Rhodium Catalyst Kit for Asymmetric Hydrogenation
Components also available for individual sale. Contains the following:

	45-0149 (S,S)-Et-DUPHOS-Rh	100mg	
	45-0151 (S,S)-Et-DUPHOS-Rh	100mg	
	45-0159 (S,S)-Me-DUPHOS-Rh	100mg	
	45-0161 (S,S)-Me-DUPHOS-Rh	100mg	
	45-0169 (S,S)-Me-BPE-Rh	100mg	
	45-0202 (S,S)-Ph-BPE-Rh	100mg	
	45-0211 (S,S)-i-Pr-DUPHOS-Rh	100mg	
45-0149	(+)-1,2-Bis((2S,5S)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (S,S)-Et-DUPHOS-Rh (213343-64-7)	100mg	See page 188
45-0151	(+)-1,2-Bis((2S,5S)-2,5-diethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (S,S)-Et-DUPHOS-Rh (142184-30-3)	100mg	See page 191
45-0159	(+)-1,2-Bis((2S,5S)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (S,S)-Me-DUPHOS-Rh (205064-10-4)	100mg	See page 193
45-0161	(+)-1,2-Bis((2S,5S)-2,5-dimethylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) trifluoromethanesulfonate, 98+% (S,S)-Me-DUPHOS-Rh (136705-75-4)	100mg	See page 193
45-0169	(-)-1,2-Bis((2S,5S)-2,5-dimethylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, 98+% (S,S)-Me-BPE-Rh (213343-65-8)	100mg	See page 194
45-0202	(+)-1,2-Bis((2S,5S)-2,5-diphenylphospholano)ethane(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (S,S)-Ph-BPE-Rh (849950-53-4)	100mg	See page 199
45-0211	(-)-1,2-Bis((2S,5S)-2,5-di-i-propylphospholano)benzene(1,5-cyclooctadiene)rhodium(I) tetrafluoroborate, min. 98% (S,S)-i-Pr-DUPHOS-Rh	100mg	See page 200

CATALYST & ORGANOCATALYST KITS - Enantiotech BIMAH Ru BINAP Catalyst Kit

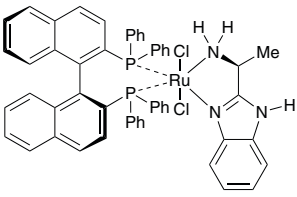
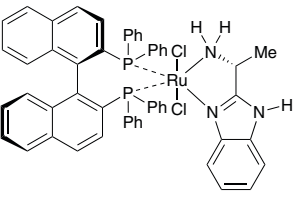
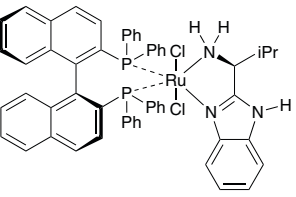
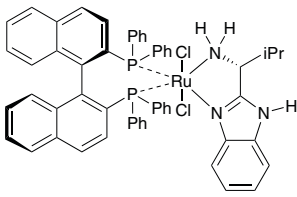
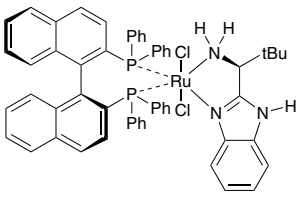
96-3705

Enantiotech BIMAH Ru BINAP Catalyst Kit for Asymmetric Hydrogenation

Sold under license from Enantiotech for research purposes.

PCT/CN2008/073648, CN 200810038929.

Components also available for individual sale. Contains the following:

 <p>44-0905 100mg</p>	 <p>44-0910 100mg</p>	 <p>44-0915 100mg</p>
 <p>44-0920 100mg</p>	 <p>44-0925 100mg</p>	
<p>44-0905</p>	<p>Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(alpha-methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95% (1443051-87-3)</p>	<p>100mg See page 267</p>
<p>44-0910</p>	<p>Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(S)-(+)-2-(alpha-methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95%</p>	<p>100mg See page 267</p>
<p>44-0915</p>	<p>Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(alpha-(i-propyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95%</p>	<p>100mg See page 268</p>
<p>44-0920</p>	<p>Dichloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(R)-(+)-2-(alpha-(i-propyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95%</p>	<p>100mg See page 267</p>
<p>44-0925</p>	<p>Dichloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(alpha-(t-butyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95%</p>	<p>100mg See page 265</p>

CATALYST & ORGANOCATALYST KITS - Enantiotech BIMAH Ru DIOP Catalyst Kit

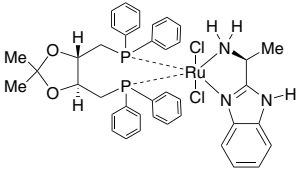
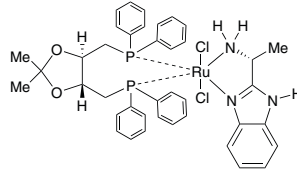
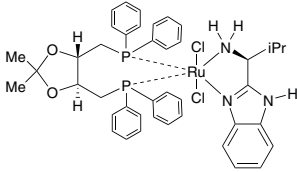
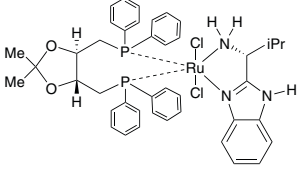
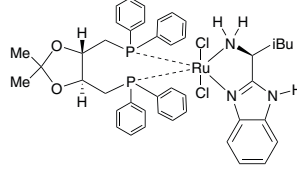
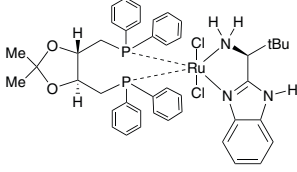
96-3715

Enantiotech BIMAH Ru DIOP Catalyst Kit for Asymmetric Hydrogenation

Sold under license from Enantiotech for research purposes only.

PCT/CN2008/073648, CN 200810038929.

Components also available for individual sale. Contains the following:

 <p>44-0955 100mg</p>	 <p>44-0960 100mg</p>	 <p>44-0965 100mg</p>
 <p>44-0970 100mg</p>	 <p>44-0975 100mg</p>	 <p>44-0980 100mg</p>

44-0955	Dichloro[(4S,5S)-(+)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(S)-(-)-2-(alpha-methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 98% (1280730-21-3)	100mg	See page 270
44-0960	Dichloro[(4R,5R)-(-)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(R)-(+)-2-(alpha-methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95% (1280732-29-7)	100mg	See page 269
44-0965	Dichloro[(4S,5S)-(+)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(S)-(-)-2-(i-propyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95% (1443051-97-5)	100mg	See page 270
44-0970	Dichloro[(4R,5R)-(-)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(R)-(+)-2-(i-propyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95%	100mg	See page 270
44-0975	Dichloro[(4S,5S)-(+)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(S)-(-)-2-(i-butyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 95% (1574321-76-8)	100mg	See page 268
44-0980	Dichloro[(4S,5S)-(+)-4,5-bis(diphenylphosphinomethyl)-2,2-dimethyl-1,3-dioxolane][(S)-(-)-2-(t-butyl)methanamine)-1H-benzimidazole]ruthenium(II), min. 97% (1443051-98-6)	100mg	See page 269

CATALYST & ORGANOCATALYST KITS - Enantiotech BIMAH Ru Tol-BINAP Catalyst Kit

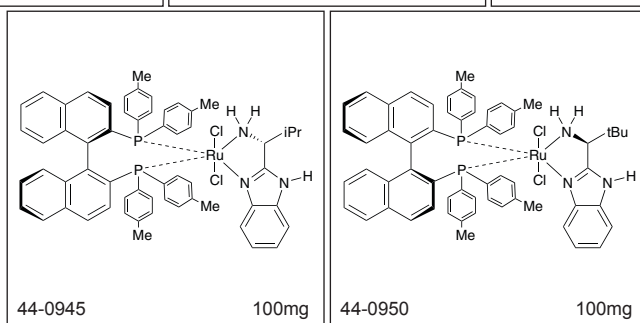
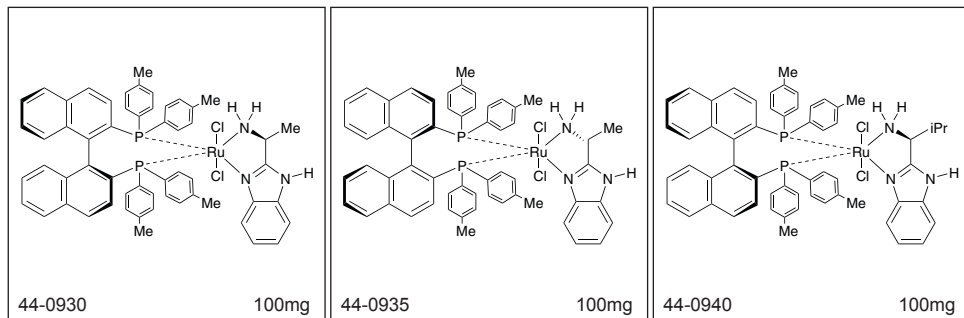
96-3710

Enantiotech BIMAH Ru Tol-BINAP Catalyst Kit for Asymmetric Hydrogenation

Sold under license from Enantiotech for research purposes only.

PCT/CN2008/073648, CN 200810038929.

Components also available for individual sale. Contains the following:



44-0930	Dichloro[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(alpha-methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 97%	100mg	See page 272
44-0935	Dichloro[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(R)-(+)-2-(alpha-methylmethanamine)-1H-benzimidazole]ruthenium(II), min. 95%	100mg	See page 271
44-0940	Dichloro[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(alpha-(i-propyl) methanamine)-1H-benzimidazole]ruthenium(II), min. 95%	100mg	See page 272
44-0945	Dichloro[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(R)-(+)-2-(alpha-(i-propyl) methanamine)-1H-benzimidazole]ruthenium(II), min. 95%	100mg	See page 272
44-0950	Dichloro[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl][(S)-(-)-2-(alpha-(t-butyl) methanamine)-1H-benzimidazole]ruthenium(II), min. 97%	100mg	See page 271

CATALYST & ORGANOCATALYST KITS - Evonik Heterogeneous Catalyst Kit

96-6670

Evonik Heterogeneous Catalyst Kit

Components also available for individual sale. Contains the following:

44-4060	Ruthenium, 5% on activated carbon, (50-70% wetted powder) Evonik Noblyst® P3060 (7440-18-8)	10g	visit strem.com
45-1863	Rhodium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P3053 (7440-16-6)	10g	
46-1703	Palladium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P1086 (7440-05-3)	10g	
46-1706	Palladium, 10% on activated carbon, Pearlman (50-70% wetted powder) Evonik Noblyst® P1070 (7440-05-3)	10g	
46-1740	Palladium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P1090 (7440-05-3)	10g	
46-1743	Palladium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P1093 (7440-05-3)	10g	
46-1747	Palladium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P1092 (7440-05-3)	10g	
46-1750	Palladium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P1109 (7440-05-3)	10g	
78-1530	Platinum, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P2058 (7440-06-4)	10g	
78-1534	Platinum, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P2060 (7440-06-4)	10g	
78-1536	Platinum 1% and vanadium 2%, on activated carbon (50-70% wetted powder) Evonik Noblyst® P8078 (7440-06-4)	10g	
78-1540	Platinum, 3% on activated carbon, sulfided (50-70% wetted powder) Evonik Noblyst® P2065 (7440-06-4)	10g	

CATALYST & ORGANOCATALYST KITS - Evonik Heterogeneous Catalyst Kit for Selective Hydrogenation

96-6674

Evonik Heterogeneous Catalyst Kit for Selective Hydrogenation

Components also available for individual sale. Contains the following:

44-4060	Ruthenium, 5% on activated carbon, (50-70% wetted powder) Evonik Noblyst® P3060 (7440-18-8)	10g	visit strem.com
45-1863	Rhodium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P3053 (7440-16-6)	10g	
78-1530	Platinum, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P2058 (7440-06-4)	10g	
78-1534	Platinum, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P2060 (7440-06-4)	10g	
78-1536	Platinum 1% and vanadium 2%, on activated carbon (50-70% wetted powder) Evonik Noblyst® P8078 (7440-06-4)	10g	
78-1540	Platinum, 3% on activated carbon, sulfided (50-70% wetted powder) Evonik Noblyst® P2065 (7440-06-4)	10g	

CATALYST & ORGANOCATALYST KITS - Evonik Heterogeneous Palladium Catalyst Kit

96-6672

Evonik Heterogeneous Palladium Catalyst Kit

Components also available for individual sale. Contains the following:

46-1703	Palladium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P1086 (7440-05-3)	10g	visit strem.com
46-1706	Palladium, 10% on activated carbon, Pearlman (50-70% wetted powder) Evonik Noblyst® P1070 (7440-05-3)	10g	
46-1740	Palladium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P1090 (7440-05-3)	10g	
46-1743	Palladium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P1093 (7440-05-3)	10g	
46-1747	Palladium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P1092 (7440-05-3)	10g	
46-1750	Palladium, 5% on activated carbon (50-70% wetted powder) Evonik Noblyst® P1109 (7440-05-3)	10g	

CATALYST & ORGANOCATALYST KITS - Evonik Heterogeneous Catalyst Application Sheet

Kits 96-6670, 96-6672 & 96-6674 sold in collaboration with Evonik for research purposes only.

Stream Item #		96-6670 - Heterogeneous Catalyst Kit										44-4060	78-1536
		96-6672 - Palladium Catalyst Kit					96-6674 - Selective Hydrogenation Kit						
Evonik Item #		46-1706	46-1703	46-1740	46-1747	46-1743	46-1750	78-1530	78-1534	78-1540	45-1863	H 198 PW	CF 1082 BVW
Nobylist® nomenclature Application/ Catalyst		E 101 NEW	E 101 RW	E 105 NW	E 105 NNW	E 105 OW	E 107 MA	F 1015 REW	F 105 NW	F 1082 QHW	G 106 NW	Nobylist® P 2080 5% Ru	Nobylist® P 8078 1% Pt
Hydrogenation of C=C Double Bonds			●		○	●	○						
Hydrogenation of CN Bonds		○		○	●		●	○			●		
Reduction of the C=O Group			○		●	○	●				●	●	
Hydrogenation of Nitro Groups		●			●	○	○	●		○			●
Hydrogenolysis Reactions (Deprotections, Dehalogenations, etc.)		○		●	●		○						
Reductive Alkylation and Amination			●	○	○	●				●			
Hydrogenation of (Hetero) Aromatic Rings			●	○	●	○		○	○		●	●	
Oxidations (Alcohols and Sugars)								●					
CC Coupling Reactions		○			●		○						

○ recommended
● preferred

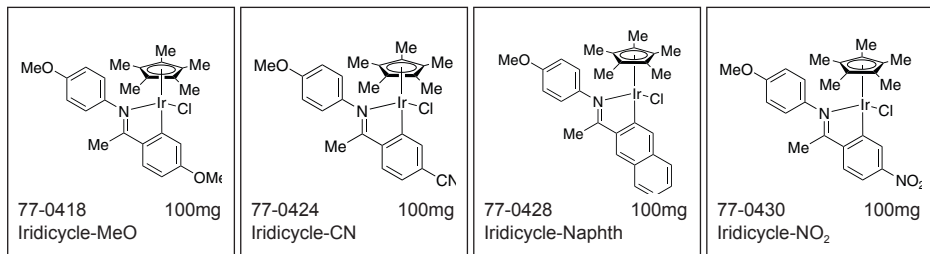
Note: Please refer to the different reaction classes in the Evonik manual for more detailed information regarding selectivity, activity and reaction conditions. This sample kit is designed as an entry point to find a suitable catalyst. Please contact one of our technical specialists for further recommendations. Most often the catalyst performance can be improved significantly by tailoring the catalyst to your requirements.

The recommendations given above are believed to be accurate at the time of publication but EVONIK makes no warranty with respect thereto, including but not limited to any results to be obtained or the infringement of any proprietary right.

CATALYST & ORGANOCATALYST KITS - Iridicycle Catalyst Kit

96-3745 Iridicycle Catalyst Kit

Sold in collaboration with Yorkshire Process Technology for research purposes only. Developed by Prof. J. Xiao, Liverpool University. Patents GB 1206572.8 and GB 1206573.6 Components also available for individual sale. Contains the following:



77-0418	Chloro(pentamethylcyclopentadienyl){5-methoxy-2-[(4-methoxyphenyl)imino-kN]ethyl}phenyl-kC}iridium(III), 99% Iridicycle-MeO (1258964-48-5)	100mg	See page 60
77-0424	Chloro(pentamethylcyclopentadienyl){5-cyano-2-[(4-methoxyphenyl)imino-kN]ethyl}phenyl-kC}iridium(III), 99% Iridicycle-CN (1258964-46-3)	100mg	See page 60
77-0428	Chloro(pentamethylcyclopentadienyl){2-[(4-methoxyphenyl)imino-kN]ethyl}naphthyl-kC}iridium(III), 99% Iridicycle-Naphth (1469467-94-4)	100mg	See page 61
77-0430	Chloro(pentamethylcyclopentadienyl){5-nitro-2-[(4-methoxyphenyl)imino-kN]ethyl}phenyl-kC}iridium(III), 99% Iridicycle-NO ₂ (1439402-25-1)	100mg	See page 62

CATALYST & ORGANOCATALYST KITS - Iridium Photocatalyst Kit

96-7780

Iridium Photocatalyst Kit

Components also available for individual sale. Contains the following:

NEW

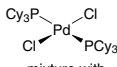
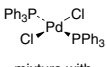
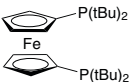
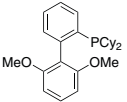
	77-0218	50mg		77-0285	50mg		77-0410	100mg		77-0425	50mg
	77-0453	50mg		77-0465	100mg		77-6100	50mg		77-6580	50mg
				77-7015	50mg		77-7030	50mg			

77-0218	4,4'-Bis(t-butyl-2,2'-bipyridine)bis[5-methyl-2-(4-methyl-2-pyridinyl-kN)phenyl-kC]iridium hexafluorophosphate, 95% (1607469-49-7)	50mg	See page 55
77-0285	[4,4'-Di-t-butyl-2,2'-bipyridine]bis[5-(t-butyl)-2-[4-(t-butyl)-2-pyridinyl-kN]phenyl-kC]iridium(III) hexafluorophosphate, 95% (808142-80-5)	50mg	See page 64
77-0410	(4,4'-Di-t-butyl-2,2'-bipyridine)bis[2-(2-pyridinyl-kN)phenyl-kC]iridium(III) hexafluorophosphate, 99% (676525-77-2)	100mg	See page 65
77-0425	(4,4'-Di-t-butyl-2,2'-bipyridine)bis[3,5-difluoro-2-[5-(trifluoromethyl)-2-pyridinyl-kN]phenyl-kC]iridium(III) hexafluorophosphate, 99% (870987-63-6)	50mg	See page 65
77-0453	(2,2'-Bipyridine)bis[3,5-difluoro-2-[5-(trifluoromethyl)-2-pyridinyl-kN]phenyl-kC]iridium(III) hexafluorophosphate, 99% (1092775-62-6)	50mg	See page 53
77-0465	(2,2'-Bipyridine)bis[2-pyridinyl-kN]phenyl-kC]iridium(III) hexafluorophosphate, 99% (106294-60-4)	100mg	See page 55
77-6100	Tris[5-fluoro-2-(2-pyridinyl-kN)phenyl-kC]iridium(III), 95% (370878-69-6)	50mg	See page 71
77-6580	Tris[(2-(2-pyridinyl-kN)-5-(trifluoromethyl)phenyl-kC]iridium(III), 95% (500295-52-3)	50mg	See page 73
77-7015	Tris(2-phenylpyridinato-C2,N)iridium(III), 95% (94928-86-8)	50mg	See page 72
77-7030	Tris[2-(2,4-difluorophenyl)pyridine]iridium(III), 95% (387859-70-3)	50mg	See page 71

CATALYST & ORGANOCATALYST KITS - Kit of CatKits - Single-Use Vials

96-3790 Kit of CatKits - Single-Use Vials for Low Catalyst Loading Experiments
Components also available for individual sale. Contains the following:

46-2030	Palladium(II) acetate/1,1'-bis(di-t-butylphosphino)ferrocene/potassium phosphate admixture [CatKit single-use vials - 2.02 wt% Pd(OAc) ₂]	5 x 1vial	See page 175
46-2033	Palladium(II) acetate/2-dicyclohexylphosphino-2,6-dimethoxy-1,1'-biphenyl (SPhos)/potassium phosphate admixture [CatKit single-use vials - 1.96 wt% Pd(OAc) ₂]	5 x 1vial	See page 175
46-2038	trans-Dichlorobis(triphenylphosphine)palladium(II)/potassium phosphate admixture [CatKit single-use vials - 6.32 wt% Pd complex] (13965-03-2)	5 x 1vial	See page 151
46-2040	trans-Dichlorobis(tricyclohexylphosphine)palladium(II)/potassium phosphate admixture [CatKit single-use vials - 6.62 wt% Pd complex] (29934-17-6)	5 x 1vial	See page 149

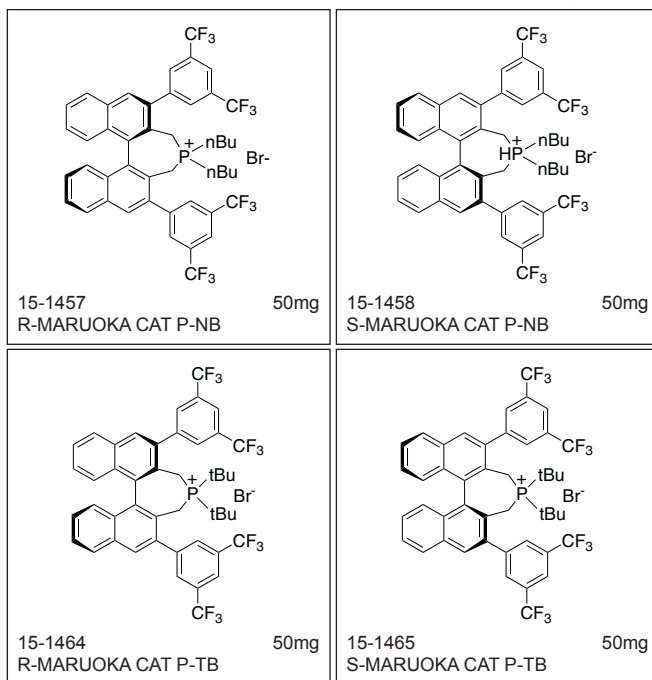
Components	46-2040	46-2038	46-2030	46-2033
Metal Precursor	 mixture with K ₃ PO ₄	 mixture with K ₃ PO ₄	Pd(OAc) ₂	Pd(OAc) ₂
Ligand	---	---	 mixture with Pd(OAc) ₂ /K ₃ PO ₄	 mixture with Pd(OAc) ₂ /K ₃ PO ₄
Base	K ₃ PO ₄	K ₃ PO ₄	K ₃ PO ₄	K ₃ PO ₄
This Kit contains 4 different types of Single-Use Vials. Each type has 5 x 1 vials.				

CATALYST & ORGANOCATALYST KITS - Maruoka Chiral Phase-Transfer Phosphonium Organocatalyst Kit

96-3750

Maruoka Chiral Phase-Transfer Phosphonium Organocatalyst Kit

Components also available for individual sale. Contains the following:



15-1457	(11bR)-(+)-4,4-Dibutyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% R-MARUOKA CAT P-NB	50mg	See page 182
15-1458	(11bS)-(-)-4,4-Dibutyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% S-Maruoka CAT P-NB (1110711-01-7)	50mg	See page 183
15-1464	(11bR)-(+)-4,4-Di-t-butyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% R-MARUOKA CAT P-TB	50mg	See page 183
15-1465	(11bS)-(-)-4,4-Di-t-butyl-2,6-bis[3,5-bis(trifluoromethyl)phenyl]-4,5-dihydro-3H-dinaphtho[2,1-c:1',2'-e]phosphepinium bromide, 99% S-MARUOKA CAT P-TB	50mg	See page 183

CATALYST & ORGANOCATALYST KITS - Palladium Kit

96-4650

Palladium Kit

For a variety of catalytic organic transformations.

Components also available for individual sale. Contains the following:

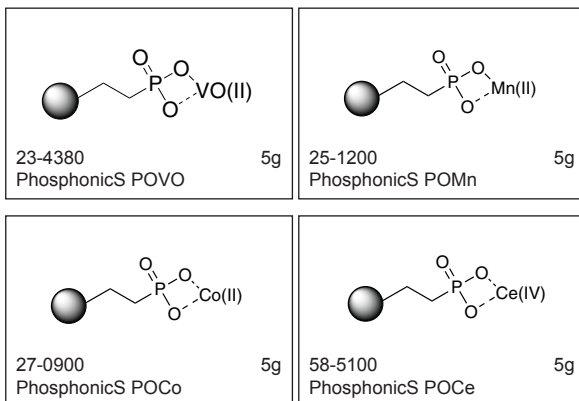
46-0100	Allylpalladium chloride dimer, min. 98% (12012-95-2)	500mg	See page 116
46-0400	Dichlorobis(benzonitrile)palladium(II), 99% (14220-64-5)	1g	See page 143
46-1780	Palladium(II) acetate, min. 98% (99.9+%Pd) (3375-31-3)	1g	See page 174
46-1850	Palladium(II) chloride (99.9%-Pd) (7647-10-1)	1g	See page 175
46-2150	Tetrakis(triphenylphosphine)palladium(0), 99% (99.9+%Pd) (14221-01-3)	5g	See page 176
46-3000	Tris(dibenzylideneacetone)dipalladium(0) (51364-51-3)	5g	See page 178
46-3010	Tris(dibenzylideneacetone)dipalladium(0) chloroform adduct (52522-40-4)	500mg	See page 179

CATALYST & ORGANOCATALYST KITS - PhosphonicS Metal Oxidation Catalyst Kit

96-6770

PhosphonicS Metal Oxidation Catalyst Kit

Sold in collaboration with PhosphonicS Ltd. for research purposes only.
Components also available for individual sale. Contains the following:



23-4380	Vanadyl(II) ethyl/butyl phosphonate Silica (PhosphonicS POVO)	5g	See page 310
25-1200	Manganese(II) ethyl/butyl phosphonate Silica (PhosphonicS POMn)	5g	See page 84
27-0900	Cobalt(II) ethyl/butyl phosphonate Silica (PhosphonicS POCo)	5g	See page 17
58-5100	Cerium(IV) ethyl/butyl phosphonate Silica (PhosphonicS POCe)	5g	See page 12

Reactions such as allylic and benzylic oxidations, alcohol oxidations and epoxidations are key chemical transformations in organic synthesis. In general these reactions are conducted by the use of stoichiometric, or even higher concentrations, of inorganic oxidants. Typical oxidizing agents include potassium permanganate, manganese dioxide, chromium trioxide, potassium chromate, potassium dichromate and peracids. These hazardous reagents produce large volumes of toxic wastes that are becoming increasingly costly to treat and dispose. In addition, difficulties are often encountered in the work up of reactions and purification of the products. There is a need for new heterogeneous oxidation catalysts that are not only effective, but exhibit ease of recovery and recyclability. PhosphonicS has developed a number of novel heterogeneous oxidation catalysts for a wide range of applications in the pharmaceutical, fine chemicals and petrochemical industries. Reactions include allylic and benzylic oxidations, epoxidations and the selective oxidations of alcohols to ketones and sulfides to sulfoxides.

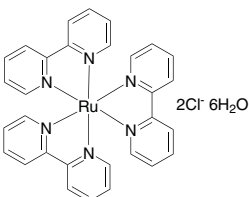
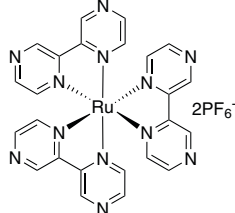
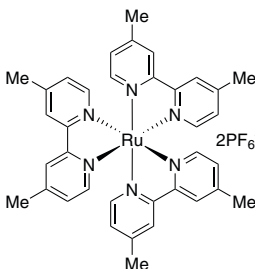
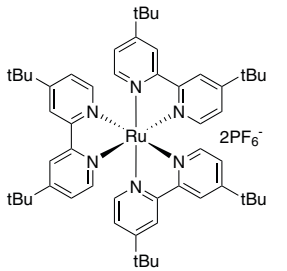
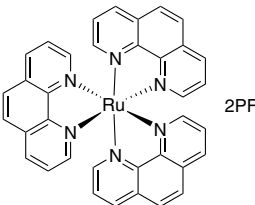
CATALYST & ORGANOCATALYST KITS - Ruthenium Photocatalyst Kit

96-4450

Ruthenium Photocatalyst Kit

Components also available for individual sale. Contains the following:

NEW

 <p>44-7900 250mg</p>	 <p>44-7910 50mg</p>	 <p>44-7930 50mg</p>
 <p>44-7940 50mg</p>	 <p>44-7955 50mg</p>	

44-7900	Tris(2,2'-bipyridyl)ruthenium(II) chloride hexahydrate, min. 98% (50525-27-4)	250mg	See page 298
44-7910	Tris(2,2'-bipyrazine)ruthenium(II) hexafluorophosphate, 95% (80907-56-8)	50mg	See page 297
44-7930	Tris(4,4'-dimethyl-2,2'-bipyridine)ruthenium(II) hexafluorophosphate, 95%, DMBPY (83605-44-1)	50mg	See page 299
44-7940	Tris[4,4'-bis(t-butyl)-2,2'-bipyridine]ruthenium(II) hexafluorophosphate, 95% (75777-87-6)	50mg	See page 298
44-7955	Tris(1,10-phenanthroline)ruthenium(II) hexafluorophosphate, 95% (60804-75-3)	50mg	See page 299

CATALYST & ORGANOCATALYST KITS - Solvias Josiphos Nickel Catalyst Kit

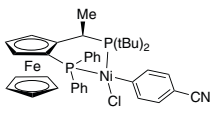
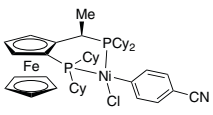
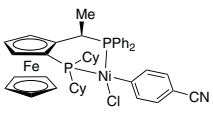
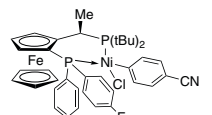
96-3660

Solvias Josiphos Nickel Catalyst Kit

NEW

Sold in collaboration with Solvias for research purposes only.

Components also available for individual sale. Contains the following:

	28-0170	100mg
	28-0172	100mg
	28-0175	100mg
	28-0178	100mg

28-0170	Chloro(4-cyanophenyl){(R)-1-[(S)-2-(diphenylphosphino)ferrocenyl]ethyl(di- <i>t</i> -butyl)phosphine} nickel(II) (2049086-34-0)	100mg	See page 98
28-0172	Chloro(4-cyanophenyl){(R)-1-[(S)-2-(dicyclohexylphosphino)ferrocenyl]ethyl (dicyclohexylphosphine)}nickel(II) (2049086-35-1)	100mg	See page 97
28-0175	Chloro(4-cyanophenyl){(R)-1-[(S)-2-(dicyclohexylphosphino)ferrocenyl]ethyl (diphenylphosphine)}nickel(II) (2049086-36-2)	100mg	See page 97
28-0178	Chloro(4-cyanophenyl){(R)-1-[(S)-2-(bis(4-fluorophenyl)phosphinoferrocenyl)ethyl(di- <i>t</i> -butylphosphine)}nickel(II) (2049086-37-3)	100mg	See page 97

CATALYST & ORGANOCATALYST KITS - SpinPHOX-Ir Catalyst Kit

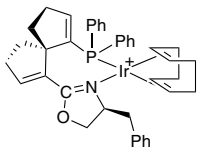
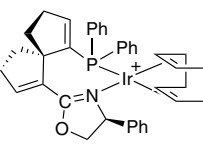
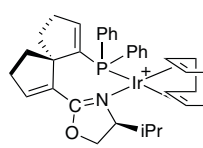
96-7710

SpinPHOX-Ir Catalyst Kit for enantioselective hydrogenation

Sold in collaboration with SIOC for research purposes only.

Patents CN200910051314.3, CN 101555259.

Components also available for individual sale. Contains the following:

	77-5040	25mg
	77-5046	25mg
	77-5050	25mg

77-5040	1,5-Cyclooctadiene((4S)-(+)-2-[(5S)-6-(diphenylphosphino)spiro[4.4]nona-1.6-dien-1-yl]-4,5-dihydro-4-benzoxazole) iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, 97% (S,S)-(COD)Ir[Bn-SpinPHOX] (1194050-19-5)	25mg	See page 63
77-5046	1,5-Cyclooctadiene((4S)-(+)-2-[(5S)-6-(diphenylphosphino)spiro[4.4]nona-1.6-dien-1-yl]-4,5-dihydro-4-phenyloxazole) iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, 97% (S,S)-(COD)Ir[Ph-SpinPHOX] (1194050-21-9)	25mg	See page 63
77-5047	1,5-Cyclooctadiene((4S)-(-)-2-[(5S)-6-(diphenylphosphino)spiro[4.4]nona-1.6-dien-1-yl]-4,5-dihydro-4-phenyloxazole) iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, 97% (R,S)-(COD)Ir[Ph-SpinPHOX] (1195511-59-1)	25mg	See page 63
77-5050	1,5-Cyclooctadiene((4S)-(+)-2-[(5S)-6-(diphenylphosphino)spiro[4.4]nona-1.6-dien-1-yl]-4,5-dihydro-4-(<i>i</i> -propyl)oxazole) iridium(I) tetrakis[3,5-bis(trifluoromethyl)phenyl]borate, 97% (S,S)-(COD)Ir[<i>i</i> Pr-SpinPHOX] (1194050-23-1)	25mg	See page 64

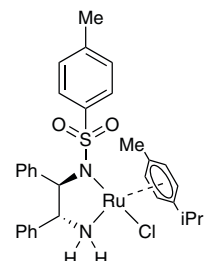
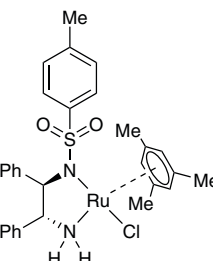
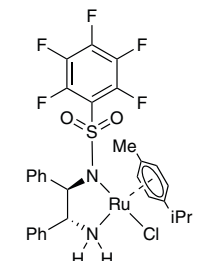
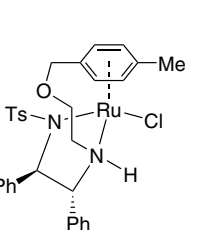
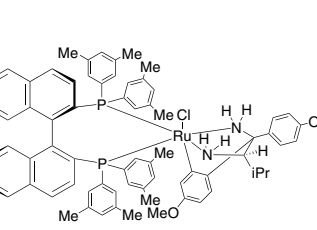
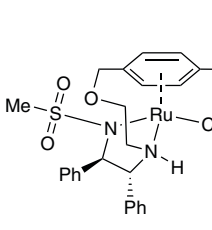
CATALYST & ORGANOCATALYST KITS - Takasago ATH Catalyst Kit

96-6955

Takasago ATH (Asymmetric Transfer Hydrogenation) Catalyst Kit

Manufactured under license of Takasago patent US7129367B2.

Components also available for individual sale. Contains the following:

 <p>44-0148 250mg RuCl[(R,R)-Tsdpen](p-cymene) 44-0149 RuCl[(S,S)-Tsdpen](p-cymene)</p>	 <p>44-0154 250mg RuCl[(R,R)-Tsdpen](mesitylene) 44-0155 RuCl[(S,S)-Tsdpen](mesitylene)</p>	 <p>44-0156 250mg RuCl[(R,R)-Fsdpen](p-cymene) 44-0157 RuCl[(S,S)-Fsdpen](p-cymene)</p>
 <p>44-0185 250mg (R,R)-Ts-DENEb™ 44-0186 (S,S)-Ts-DENEb™</p>	 <p>44-0217 250mg (R)-RUCY™-XylBINAP 44-0218 (S)-RUCY™-XylBINAP</p>	 <p>44-0255 250mg Ru-(R,R)-Ms-DENEb 44-0256 Ru-(S,S)-Ms-DENEb</p>

44-0148	Chloro{[(1R,2R)-(-)-2-amino-1,2-diphenylethyl] (4-toluenesulfonyl)amido}(p-cymene)ruthenium(II), min. 95% RuCl[(R,R)-Tsdpen](p-cymene) (192139-92-7)	250mg	See page 240
44-0149	Chloro{[(1S,2S)-(+)-2-amino-1,2-diphenylethyl] (4-toluenesulfonyl)amido}(p-cymene)ruthenium(II), min. 90% RuCl[(S,S)-Tsdpen](p-cymene) (192139-90-5)	250mg	See page 240
44-0154	Chloro{[(1R,2R)-(-)-2-amino-1,2-diphenylethyl] (4-toluenesulfonyl)amido}(mesitylene)ruthenium(II), min. 90% RuCl[(R,R)-Tsdpen](mesitylene) (174813-82-2)	250mg	See page 241
44-0155	Chloro{[(1S,2S)-(+)-2-amino-1,2-diphenylethyl] (4-toluenesulfonyl)amido}(mesitylene)ruthenium(II), min. 90% RuCl[(S,S)-Tsdpen](mesitylene) (174813-81-1)	250mg	See page 241
44-0156	Chloro{[(1R,2R)-(-)-2-amino-1,2-diphenylethyl] (pentafluorophenylsulfonyl)amido}(p-cymene)ruthenium(II), min. 90% RuCl[(R,R)-Fsdpen](p-cymene) (1026995-71-0)	250mg	See page 239
44-0157	Chloro{[(1S,2S)-(+)-2-amino-1,2-diphenylethyl] (pentafluorophenylsulfonyl)amido}(p-cymene)ruthenium(II), min. 90% RuCl[(S,S)-Fsdpen](p-cymene) (1026995-72-1)	250mg	See page 239
44-0185	Chloro{N-[(1R,2R)-1,2-diphenyl-2-(2-(4-methylbenzyloxy)ethylamino)-ethyl]-4-methylbenzene sulfonamide(chloro)ruthenium(II) (R,R)-Ts-DENEb™ (1333981-84-2)	250mg	See page 253

CATALYST & ORGANOCATALYST KITS - Takasago ATH Catalyst Kit

96-6955 (continued)	Takasago ATH (Asymmetric Transfer Hydrogenation) Catalyst Kit		
44-0186	N-[(1S,2S)-1,2-Diphenyl-2-(2-(4-methylbenzyloxy)ethylamino)-ethyl]-4-methylbenzene sulfonamide(chloro) ruthenium(II) (S,S)-Ts-DENE TM (1384974-37-1)	250mg	See page 287
44-0217	Chloro((R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl) [(2R)-(-)-1-(4-methoxyphenyl)-1'-(4-methoxyphenyl-kC)-3-methyl-1,2-butanediamine]ruthenium(II) (R)-RUCY TM -XylBINAP (1384974-38-2)	250mg	See page 248
44-0218	Chloro((S)-(-)-2,2'-bis[di(3,5-xylyl) phosphino]-1,1'-binaphthyl)[(2S)- (+)-1-(4-methoxyphenyl)-1'-(4-methoxyphenyl-kC)-3-methyl-1,2-butanediamine] ruthenium(II) (S)-RUCY TM -XylBINAP (1312713-89-5)	250mg	See page 248
44-0255	Chloro{N-[(1R,2R)-2-[(S)-2-[[1,2,3,4,5,6-η)-4-methylphenyl]methoxy]ethyl]amino]-1,2-diphenylethylmethanesulfonamidato}ruthenium(II) Ru-(R,R)-Ms-DENE ^B (1333981-86-4)	250mg	See page 255
44-0256	Chloro{N-[(1S,2S)-2-[(R)-2-[[1,2,3,4,5,6-η)-4-methylphenyl]methoxy]ethyl]amino]-1,2-diphenylethylmethanesulfonamidato}ruthenium(II) Ru-(S,S)-Ms-DENE ^B (1361318-83-3)	250mg	See page 255

CATALYST & ORGANOCATALYST KITS - Takasago BINAP Ru Acetate Catalyst Kit

96-6953 Takasago BINAP Ru Acetate Catalyst Kit
 Manufactured under license of Takasago patent.
 Components also available for individual sale. Contains the following:

 44-0152 Ru(OAc) ₂ [(R)-binap] 44-0153 Ru(OAc) ₂ [(S)-binap]	250mg	 44-0162 Ru(OAc) ₂ [(R)-tolbinap] 44-0163 Ru(OAc) ₂ [(S)-tolbinap]	250mg	 44-0164 Ru(OAc) ₂ [(R)-xylbinap] 44-0164 Ru(OAc) ₂ [(S)-xylbinap]	250mg
44-0152	Diacetato[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl] ruthenium(II) Ru(OAc) ₂ [(R)-binap] (325146-81-4)	250mg	See page 258		
44-0153	Diacetato[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl] ruthenium(II) Ru(OAc) ₂ [(S)-binap] (261948-85-0)	250mg	See page 259		
44-0162	Diacetato[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl] ruthenium(II) Ru(OAc) ₂ [(R)-tolbinap] (116128-29-1)	250mg	See page 260		
44-0163	Diacetato[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl] ruthenium(II) Ru(OAc) ₂ [(S)-tolbinap] (106681-15-6)	250mg	See page 260		
44-0164	Diacetato[(R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl]ruthenium(II) Ru(OAc) ₂ [(R)-xylbinap] (374067-50-2)	250mg	See page 261		
44-0165	Diacetato[(S)-(-)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl] ruthenium(II) Ru(OAc) ₂ [(S)-xylbinap] (374067-49-9)	250mg	See page 262		

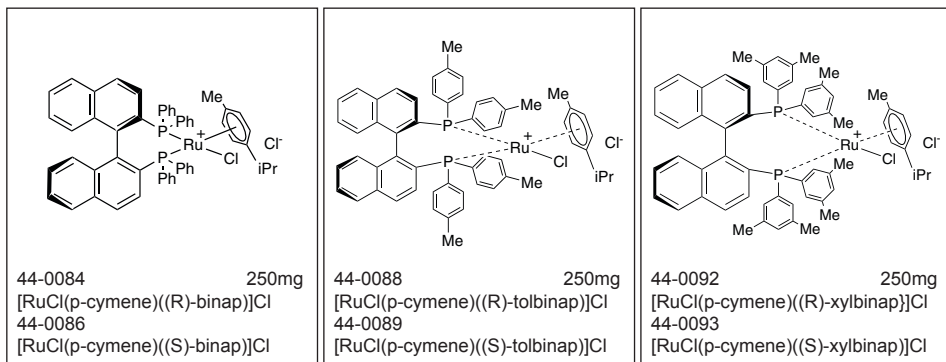
CATALYST & ORGANOCATALYST KITS - Takasago BINAP Ru Cymene Catalyst Kit

96-6951

Takasago BINAP Ru Cymene Catalyst Kit

Manufactured under license of Takasago patent.

Components also available for individual sale. Contains the following:



44-0084	Chloro[(R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl] (p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-binap)]Cl (145926-28-9)	250mg	See page 244
44-0086	Chloro[(S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl] (p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((S)-binap)]Cl (130004-33-0)	250mg	See page 244
44-0088	Chloro[(R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl] (p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-tolbinap)]Cl (131614-43-2)	250mg	See page 246
44-0089	Chloro[(S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl] (p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((S)-tolbinap)]Cl (228120-95-4)	250mg	See page 247
44-0092	Chloro[(R)-(+)-2,2'-bis[di(3,5-xyllyl)phosphino]-1,1'-binaphthyl] (p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-xylbinap)]Cl (944451-24-5)	250mg	See page 248
44-0093	Chloro[(S)-(-)-2,2'-bis[di(3,5-xyllyl)phosphino]-1,1'-binaphthyl] (p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((S)-xylbinap)]Cl (944451-25-6)	250mg	See page 248

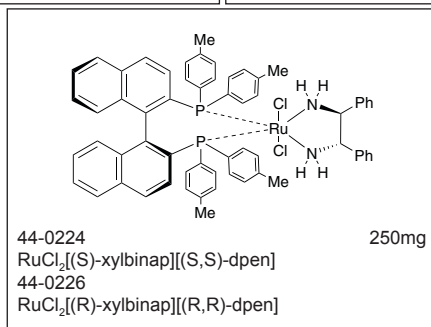
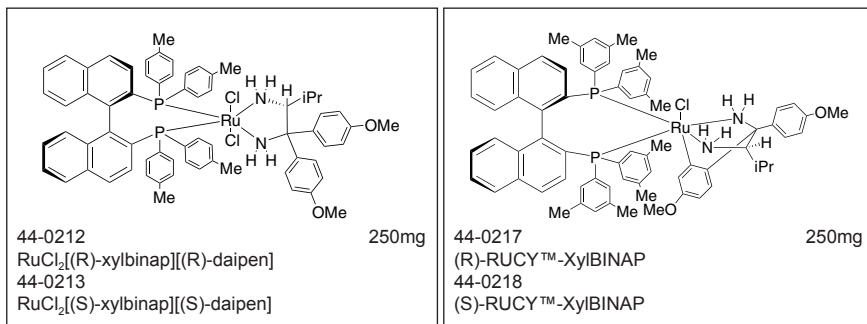
CATALYST & ORGANOCATALYST KITS - Takasago BINAP Ru Diamine Catalyst Kit

96-6954

Takasago BINAP Ru Diamine Catalyst Kit

Manufactured under license of Takasago patent.

Components also available for individual sale. Contains the following:



44-0212	Dichloro{(R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl}[(2R)-(-)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) RuCl ₂ [(R)-xylbinap][(R)-daipen] (220114-32-9)	250mg	See page 274
44-0213	Dichloro{(S)-(-)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl}[(2S)-(+)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanediamine]ruthenium(II) RuCl ₂ [(S)-xylbinap][(S)-daipen] (220114-01-2)	250mg	See page 275
44-0217	Chloro{(R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl} [(2R)-(-)-1-(4-methoxyphenyl)-1'-(4-methoxyphenyl-kC)-3-methyl-1,2-butanediamine]ruthenium(II) (R)-RUCY™-XylBINAP (1384974-38-2)	250mg	See page 248
44-0218	Chloro{(S)-(-)-2,2'-bis[di(3,5-xylyl) phosphino]-1,1'-binaphthyl} [(2S)- (+)-1-(4-methoxyphenyl)-1'-(4-methoxyphenyl-kC)-3-methyl-1,2-butanediamine]ruthenium(II) (S)-RUCY™-XylBINAP (1312713-89-5)	250mg	See page 248
44-0224	Dichloro{(S)-(-)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl} [(1S,2S)-(-)-1,2-diphenylethylenediamine]ruthenium(II) RuCl ₂ [(S)-xylbinap][(S,S)-dpen] (220114-03-4)	250mg	See page 275
44-0226	Dichloro{(R)-(+)-2,2'-bis[di(3,5-xylyl)phosphino]-1,1'-binaphthyl} [(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II) RuCl ₂ [(R)-xylbinap][(R,R)-dpen] (220114-38-5)	250mg	See page 275

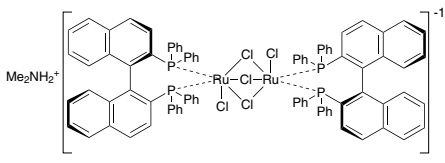
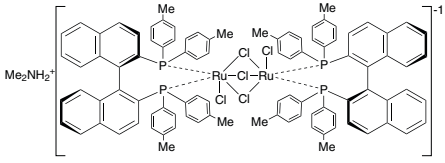
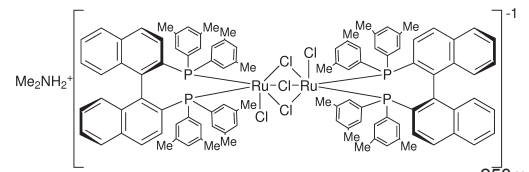
CATALYST & ORGANOCATALYST KITS - Takasago BINAP Ru Dimer Catalyst Kit

96-6952

Takasago BINAP Ru Dimer Catalyst Kit

Manufactured under license of Takasago patent.

Components also available for individual sale. Contains the following:

 <p>44-0510 44-0511</p>	<p>[NH₂Me₂][{RuCl((R)-binap)}₂(μ-Cl)₃] [NH₂Me₂][{RuCl((S)-binap)}₂(μ-Cl)₃]</p> <p>250mg</p>	 <p>44-0512 44-0513</p>	<p>[NH₂Me₂][{RuCl((R)-tolbinap)}₂(μ-Cl)₃] [NH₂Me₂][{RuCl((S)-tolbinap)}₂(μ-Cl)₃]</p> <p>250mg</p>
 <p>44-0514 44-0515</p> <p>[NH₂Me₂][{RuCl((R)-xylbinap)}₂(μ-Cl)₃] [NH₂Me₂][{RuCl((S)-xylbinap)}₂(μ-Cl)₃]</p> <p>250mg</p>			
<p>44-0510</p>	<p>Dimethylammonium dichlorotri(μ-chloro)bis((R)-(+)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl)diruthenate(II) [NH₂Me₂][{RuCl((R)-binap)}₂(μ-Cl)₃] (199684-47-4)</p>	<p>250mg</p>	<p>See page 283</p>
<p>44-0511</p>	<p>Dimethylammonium dichlorotri(μ-chloro)bis((S)-(-)-2,2'-bis(diphenylphosphino)-1,1'-binaphthyl)diruthenate(II) [NH₂Me₂][{RuCl((S)-binap)}₂(μ-Cl)₃] (199541-17-8)</p>	<p>250mg</p>	<p>See page 285</p>
<p>44-0512</p>	<p>Dimethylammonium dichlorotri(μ-chloro)bis((R)-(+)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl)diruthenate(II) [NH₂Me₂][{RuCl((R)-tolbinap)}₂(μ-Cl)₃] (749935-02-2)</p>	<p>250mg</p>	<p>See page 286</p>
<p>44-0513</p>	<p>Dimethylammonium dichlorotri(μ-chloro)bis((S)-(-)-2,2'-bis(di-p-tolylphosphino)-1,1'-binaphthyl)diruthenate(II) [NH₂Me₂][{RuCl((S)-tolbinap)}₂(μ-Cl)₃] (309735-86-2)</p>	<p>250mg</p>	<p>See page 286</p>
<p>44-0514</p>	<p>Dimethylammonium dichlorotri(μ-chloro)bis((R)-(+)-2,2'-bis(di(3,5-xyllyl)phosphino)-1,1'-binaphthyl)diruthenate(II) [NH₂Me₂][{RuCl((R)-xylbinap)}₂(μ-Cl)₃] (944451-08-5)</p>	<p>250mg</p>	<p>See page 282</p>
<p>44-0515</p>	<p>Dimethylammonium dichlorotri(μ-chloro)bis((S)-(-)-2,2'-bis(di(3,5-xyllyl)phosphino)-1,1'-binaphthyl)diruthenate(II) [NH₂Me₂][{RuCl((S)-xylbinap)}₂(μ-Cl)₃] (944451-10-9)</p>	<p>250mg</p>	<p>See page 282</p>

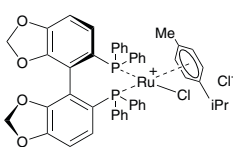
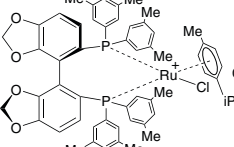
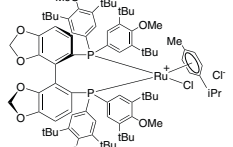
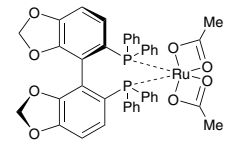
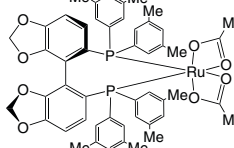
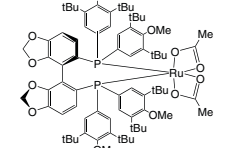
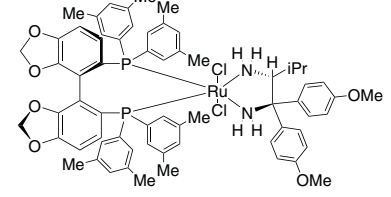
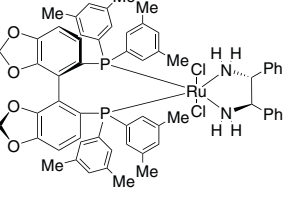
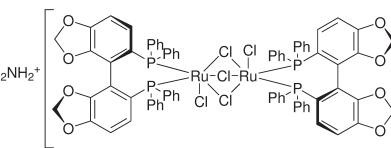
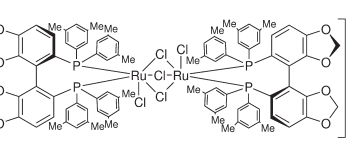
CATALYST & ORGANOCATALYST KITS - Takasago SEGPHOS® Ru Catalyst Kit

96-6901

Takasago SEGPHOS® Ru Catalyst Kit

Manufactured under license of Takasago patent.

Components also available for individual sale. Contains the following:

 <p>44-0096 250mg [RuCl(p-cymene)((R)-segphos®)Cl 44-0097 [RuCl(p-cymene)((S)-segphos®)Cl</p>	 <p>44-0098 250mg [RuCl(p-cymene)((R)-dm-segphos®)Cl 44-0099 [RuCl(p-cymene)((S)-dm-segphos®)Cl</p>	 <p>44-0102 250mg [RuCl(p-cymene)((R)-dtbm-segphos®)Cl 44-0103 [RuCl(p-cymene)((S)-dtbm-segphos®)Cl</p>
 <p>44-0168 250mg Ru(OAc)₂[(R)-segphos®] 44-0169 Ru(OAc)₂[(S)-segphos®]</p>	 <p>44-0174 250mg Ru(OAc)₂[(R)-dm-segphos®] 44-0176 Ru(OAc)₂[(S)-dm-segphos®]</p>	 <p>44-0180 250mg Ru(OAc)₂[(R)-dtbm-segphos®] 44-0181 Ru(OAc)₂[(S)-dtbm-segphos®]</p>
 <p>44-0214 250mg RuCl₂[(R)-dm-segphos®][(R)-daipen] 44-0215 RuCl₂[(S)-dm-segphos®][(S)-daipen]</p>	 <p>44-0228 250mg RuCl₂[(R)-dm-segphos®][(R,R)-dppe] 44-0229 RuCl₂[(S)-dm-segphos®][(S,S)-dppe]</p>	
 <p>44-0518 250mg [NH₂Me₂][{RuCl((R)-segphos®)₂(μ-Cl)₃] 44-0519 [NH₂Me₂][{RuCl((S)-segphos®)₂(μ-Cl)₃]</p>	 <p>44-0520 250mg [NH₂Me₂][{RuCl((R)-dm-segphos®)₂(μ-Cl)₃] 44-0521 [NH₂Me₂][{RuCl((S)-dm-segphos®)₂(μ-Cl)₃]</p>	

CATALYST & ORGANOCATALYST KITS - Takasago SEGPHOS® Ru Catalyst Kit

96-6901 (continued)	Takasago SEGPHOS® Ru Catalyst Kit		
44-0096	Chloro{(R)-(+) -5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-segphos®)]Cl (944451-28-9)	250mg	See page 242
44-0097	Chloro{(S)-(-) -5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((S)-segphos®)]Cl (944451-29-0)	250mg	See page 242
44-0098	Chloro{(R)-(+) -5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-dm-segphos®)]Cl (944451-30-3)	250mg	See page 247
44-0099	Chloro{(S)-(-) -5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((S)-dm-segphos®)]Cl (944451-31-4)	250mg	See page 247
44-0102	Chloro{(R)-(-) -5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((R)-dtbm-segphos®)]Cl (944451-32-5)	250mg	See page 241
44-0103	Chloro{(S)-(+)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}(p-cymene)ruthenium(II) chloride [RuCl(p-cymene)((S)-dtbm-segphos®)]Cl (944451-33-6)	250mg	See page 242
44-0168	Diacetato{(R)-(+) -5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(R)-segphos®] (944450-48-0)	250mg	See page 258
44-0169	Diacetato{(S)-(-) -5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(S)-segphos®] (373650-12-5)	250mg	See page 258
44-0174	Diacetato{(R)-(+) -5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(R)-dm-segphos®] (944450-49-1)	250mg	See page 260
44-0176	Diacetato{(S)-(-) -5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(S)-dm-segphos®] (944450-50-4)	250mg	See page 261
44-0180	Diacetato{(R)-(-) -5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(R)-dtbm-segphos®] (1025477-38-6)	250mg	See page 257
44-0181	Diacetato{(S)-(+)-5,5'-bis[di(3,5-di-t-butyl-4-methoxyphenyl)phosphino]-4,4'-bi-1,3-benzodioxole}ruthenium(II) Ru(OAc) ₂ [(S)-dtbm-segphos®] (1025476-84-9)	250mg	See page 258
44-0214	Dichloro{(R)-(+) -5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole]}(2R)-(-)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanedi-amine}ruthenium(II) RuCl ₂ [(R)-dm-segphos®] [(R)-daipen] (944450-43-5)	250mg	See page 273
44-0215	Dichloro{(S)-(-) -5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole]}(2S)-(+)-1,1-bis(4-methoxyphenyl)-3-methyl-1,2-butanedi-amine}ruthenium(II) RuCl ₂ [(S)-dm-segphos®] [(S)-daipen] (944450-44-6)	250mg	See page 273
44-0228	Dichloro{(R)-(+) -5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole]}[(1R,2R)-(+)-1,2-diphenylethylenediamine]ruthenium(II) RuCl ₂ [(R)-dm-segphos®] [(R,R)-dpem] (944450-45-7)	250mg	See page 273

CATALYST & ORGANOCATALYST KITS - Takasago SEGPHOS® Ru Catalyst Kit

96-6901 (continued)	Takasago SEGPHOS® Ru Catalyst Kit		
44-0229	Dichloro{(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole}[(1S,2S)-(-)-1,2-diphenylethylenediamine] ruthenium(II) RuCl ₂ [(S)-dm-segphos®][(S,S)-dpen] (944450-46-8)	250mg	See page 274
44-0518	Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole] diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-segphos®)} ₂ (μ-Cl) ₃] (346457-41-8)	250mg	See page 282
44-0519	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-5,5'-bis(diphenylphosphino)-4,4'-bi-1,3-benzodioxole] diruthenate(II) [NH ₂ Me ₂][{RuCl((S)-segphos®)} ₂ (μ-Cl) ₃] (488809-34-3)	250mg	See page 283
44-0520	Dimethylammonium dichlorotri(μ-chloro)bis[(R)-(+)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole] diruthenate(II) [NH ₂ Me ₂][{RuCl((R)-dm-segphos®)} ₂ (μ-Cl) ₃] (935449-46-0)	250mg	See page 281
44-0521	Dimethylammonium dichlorotri(μ-chloro)bis[(S)-(-)-5,5'-bis[di(3,5-xylyl)phosphino]-4,4'-bi-1,3-benzodioxole] diruthenate(II) [NH ₂ Me ₂][{RuCl((S)-dm-segphos®)} ₂ (μ-Cl) ₃] (944451-14-3)	250mg	See page 282

OTHER KITS - Enzyme carrier Lifetech™ ECRKIT1

96-0255

Enzyme carrier Lifetech™ ECRKIT1

NEW

Store in dry conditions (2-20°C). Do not freeze. Shelf Life: 5 years; This enzyme carrier kit allows rapid screening of different methods of enzyme immobilization. Sold in collaboration with Purolite for research purposes only.

Components also available for individual sale. Contains the following:

06-0810	Enzyme carrier Lifetech™ ECR8204F	50g	See page 5
06-0828	Enzyme carrier Lifetech™ ECR8285	50g	See page 8
06-0913	Enzyme carrier Lifetech™ ECR1090M	50g	See page 5
06-0925	Enzyme carrier Lifetech™ ECR1030M	50g	See page 3
07-1512	Enzyme carrier Lifetech™ ECR8309F	50g	See page 6
07-1532	Enzyme carrier Lifetech™ ECR8806F	50g	See page 7

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