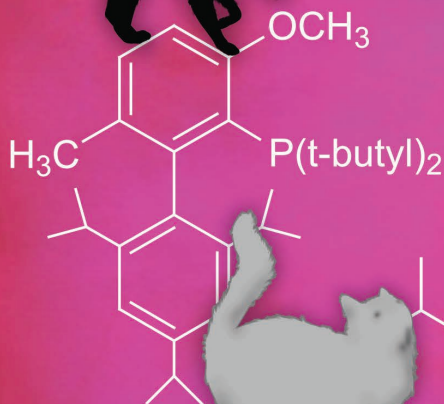


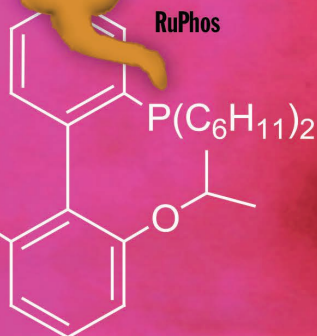
Buchwald Ligands and Precatalysts



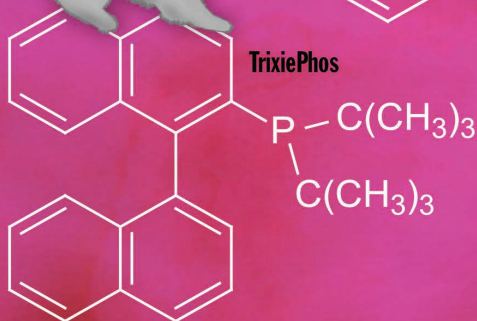
RockPhos



RuPhos



TrixiePhos



**New Palladium Precatalysts
For Cross-Coupling Reactions**

by Nicholas C. Bruno and Stephen L. Buchwald



STREM

Table of Contents

Glossary of Terms	i
Palladium Precatalysts for Cross-Coupling Reactions	1-8
(Reprinted from The Strem Chemiker Vol. XXVII No. 1, January 2014)	
<i>by Nicholas C. Bruno & Stephen L. Buchwald</i>	
Quick Reference of Buchwald Ligands.....	9-12
Quick Reference of Buchwald Precatalysts.....	13-20
Gold Catalysts (from Buchwald Ligands).....	21-24
Buchwald Precatalysts - Includes technical notes and complete product details.	25-53
Buchwald Ligands - Includes technical notes and complete product details.....	54-78
Buchwald Ligands Kits	79-83
Buchwald Precatalysts Kits	84-87
Additional Kits containing Buchwald products.....	88-89
Related Product	90
Available Booklets	92

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About Our Cover:

Our booklet cover was inspired by Professor Stephen Buchwald's cat "Rufus" after whom RuPhos is named. Also shown are TrixiePhos and RockPhos, ligands that were named in honor of two more of his beloved cats, Trixie (who passed away in 2013) and Rocket. Cover illustration by Jim Grenier of Renegade Studios.

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Chem. Sci., **2011**, 2, 27-50.
Acc. Chem. Res., **2008**, 41, 1461-1473.
Angew. Chem. Int. Ed., **2008**, 47, 6338-6361.



Buchwald 02/18

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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

New Palladium Precatalysts For Cross-Coupling Reactions

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Cambridge, MA 02139

Introduction

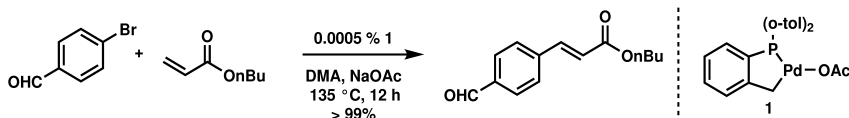
Palladium-catalyzed cross-coupling reactions have become common tools for C-C and C-X bond formation in academic and industrial settings.¹⁻² Privileged ligand scaffolds have emerged that can effectively support a vast range of transformations.³ However, as more complex cross-coupling reactions are explored, the method for generation of the catalytically active $L_nPd(0)$ species has often proven to be pivotal to the success of a cross-coupling reaction.

Many traditional palladium sources can have significant problems in generating active catalysts. Stable Pd(0) sources such as $Pd_0(dba)_n$ contain dibenzylideneacetone (dba) ligands that can impede the catalytic cycle.⁴ These Pd species can also contain varying degrees of free dba and palladium nanoparticles.⁵ Pd(II) sources such as $Pd(OAc)_2$ and $PdCl_2$ need to be reduced to Pd(0) *in-situ* before entering a Pd(0)-Pd(II) cross-coupling cycle. Other Pd sources such as allyl and [(cinnamyl)PdCl]₂ dimers and $Pd(PPh_3)_4$ are thermally unstable.

One solution to the issue of palladium activation is through the use of palladium precatalysts.⁶⁻⁷ Precatalysts are generally pre-formed Pd(II) and Pd(0) species such as palladacycles and $Pd^0[P(tBu)_3]_2$ that exhibit air and moisture stability. Precatalysts activate under general reaction conditions or with external additives to provide the necessary $L_nPd(0)$ species to enter the catalytic cycle.

Historical Context

In 1995 Hermann and Beller reported the synthesis and utility of palladacycle **1**, generated from the cyclometallation of $P(o-tol)_3$ with $Pd(OAc)_2$ at room temperature in toluene for 16 h.⁸⁻⁹ Palladacycle **1** exhibited unprecedented catalytic activity in Heck coupling, achieving TONs as high as 200,000 in some cases (*Scheme 1*). Employing **1** was markedly more effective than the combination of $P(o-tol)_3$ and $Pd(OAc)_2$. This was the first example of developing a palladacycle specifically for catalysis and was the first glimpse of the potential of palladacyclic precatalysts.



Scheme 1. Heck coupling of 4-bromobenzaldehyde and *n*-butyl acrylate with **1**

The work of Hermann and Beller sparked considerable interest in developing palladacycles for catalysis. As a result many palladacyclic precatalysts have emerged since 1995. Some are simply cyclopalladated ligands such as **2**¹⁰ and **3**¹¹ which are effective in Heck coupling and C-N cross-coupling, respectively. Others are palladacycles of 2-(dimethylamino)biphenyl **4**¹² and N, N-dimethylbenzyl amine **5**,¹³ which could be ligated with various phosphine and N-heterocyclic carbene (NHC) ligands (*Figure 1*). All of these precatalysts exhibited good reactivity in coupling reactions but required one catalytic cycle, β -hydride elimination, or an exogenous additive to activate.

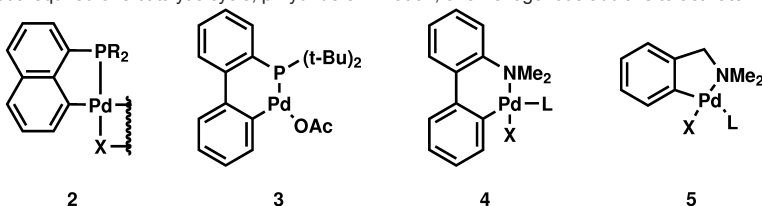
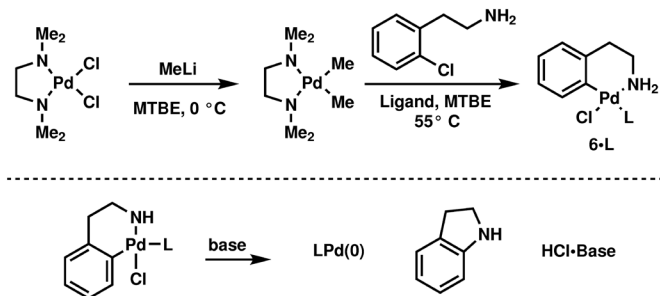


Figure 1. Representative palladacycles utilized in Pd cross-coupling reactions.

First Generation Precatalysts

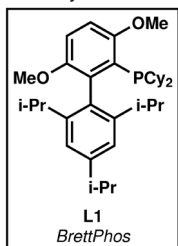
In 2007, we isolated a stable, primary amine-bound oxidative addition complex.¹⁴ Inspired by this discovery and the success of palladacyclic precatalysts, we endeavored to develop a general precatalyst compatible with a broad spectrum of ligands. This led to the development of **6**, an intramolecularly amine-coordinated oxidative addition complex that could bear a variety of phosphine ligands.¹⁵ The success of **6** to generate the desired LPd(0) species was contingent on the deprotonation of the palladium-bound amine, which occurred readily, followed by subsequent reductive elimination to generate LPd(0), indoline, and a salt.

The initial synthesis of **6** is depicted in Scheme 2 and involves the generation of the thermally sensitive (tmeda)PdMe₂, followed by its reaction with 2-chlorophenethylamine in the presence of ligand. Since the first published synthesis of **6**, Vicente and coworkers reported an alternative synthesis that proceeds via C-H activation, utilizing Pd(OAc)₂ and phenethylammonium triflate.¹⁶



Scheme 2. Preparation of palladacyclic precatalysts **6•L** and their mode of activation.

Precatalyst **6** in Cross-Coupling Reactions



To evaluate the performance of **6** in cross coupling reactions, its use was compared to traditional palladium sources such as [(allyl)PdCl]₂, Pd₂(dba)₃, and Pd(OAc)₂/PhB(OH)₂ in the arylation of aniline with 4-chloroanisole with **L1** as the supporting ligand. BrettPhos, **L1**, has been shown to be an effective and selective supporting ligand in the arylation of primary amines. As seen in Figure 1, **6•L1** provided an extremely active palladium source, reaching full conversion of aryl halide in 35 minutes while none of the other sources provided over 25% conversion. Further exploiting the high reactivity of precatalyst **6•L1**, aryl chlorides were combined with electron poor anilines, conventionally difficult coupling partners. A range of electron poor anilines were coupled successfully, including the first examples of 2-NO₂, 2-CO₂Et, 4-CF₃, and 4-CN anilines with aryl chlorides.



Scheme 3. Arylation of aniline with 4-chloroanisole with different Pd sources and **L1** as the supporting ligand.

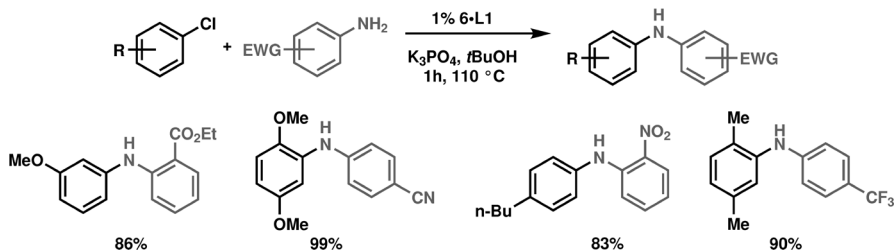
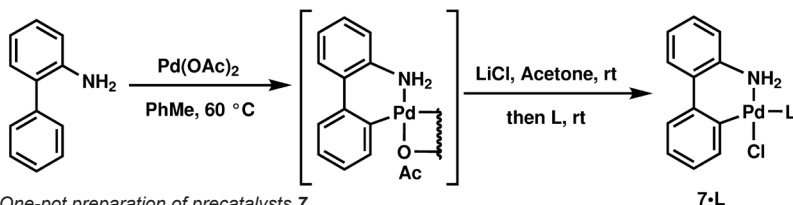


Table 1. Arylation of electron-poor anilines with aryl chlorides by **6•L1**.

Precatalysts **6** provide additional benefits in generating LPd(0) compared to traditional palladium sources. They were found to be efficient in arylations of primary and secondary amines,¹⁷ aminations of unprotected heteroaryl halides,¹⁸⁻¹⁹ α -arylations,²⁰ and continuous flow chemistry.²¹⁻²² Additionally, precatalyst activation of **6**•L and subsequent oxidative addition of aryl chlorides could occur at temperatures as low as -40°C with LHMDS. Additionally, the clean generation of LPd(0) with **6** enabled the first Hammett study of the oxidative addition of aryl chlorides with monodentate supporting ligands.¹⁵

Second Generation Precatalysts

While an improvement from traditional palladium sources, precatalysts **6** still suffered from inherent drawbacks, one of the most significant being their inability to activate with weak base at room temperature. We began investigating alternative precatalyst scaffolds that retained the stability and ease of use of **6** while allowing them to activate at lower temperature. Encouraged by the work of Albert in their development of triphenylphosphine-ligated palladacycles of 2-aminobiphenyl,²³⁻²⁴ we hypothesized that using 2-aminobiphenyl as the palladacycle backbone in place of phenethylamine, the NH_2 of the palladium precatalyst would be much more acidic, and thus, a more readily-activated palladium precatalyst. A series of precatalysts bearing biaryl dialkyl phosphines, **7**•L, were prepared in a convenient, one-pot procedure from the cyclopalladation of 2-aminobiphenyl by palladium acetate, followed by ion exchange with lithium chloride, and phosphine ligation (*Scheme 4*).²⁵ These precatalysts proved to be much more readily-activated, generating LPd(0) at room temperature with phosphate or carbonate bases.



Scheme 3. One-pot preparation of precatalysts **7**

The ready activation of precatalyst **7**•L2 and the resulting LPd(0) was utilized in the Suzuki-Miyaura coupling of the polyfluorophenylboronic acids and heteroaryl-2-boronic acids. These boronic acids represent structurally interesting coupling partners for pharmaceutical and agrochemical synthesis as well as in natural product and materials synthesis. However they are prone to rapid protodeboronation, rendering the use of higher temperatures or long reaction times problematic. With 2 – 3 mol % **7**•L2, these unstable boronic acids could be coupled to a range of structurally diverse aryl halides in short reaction times (0.5 – 2 h) under mild conditions (ambient temperature – 40°C) in good to excellent yields. The utilization of **7**•L2 was pivotal in the first general method for the Suzuki-Miyaura coupling of these structurally important boronic acids.

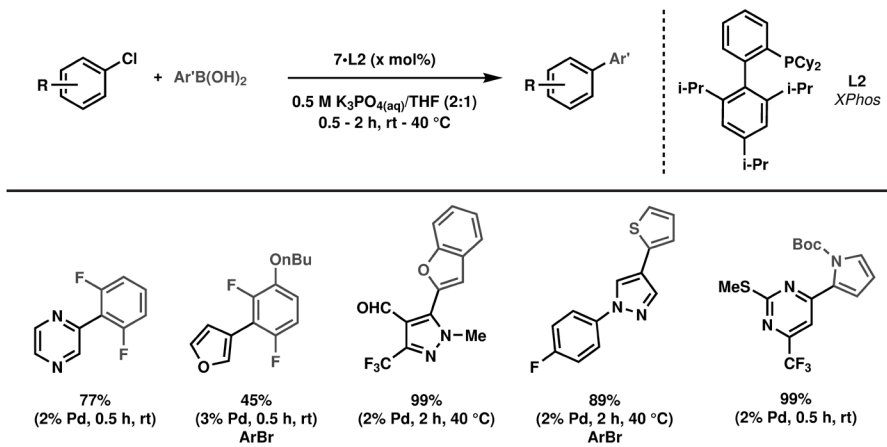


Table 2. Suzuki-Miyaura coupling of unstable boronic acids with **7**•L2

Precatalysts **7** have found use in a wide array of cross-coupling methodologies. They have been utilized in the first general method for the Suzuki-Miyaura coupling of unprotected, 5-membered heterocycles,²⁶ a myriad of Suzuki-Miyaura couplings with aryl- and alkyl- BF_3K salts,²⁷⁻²⁹ borylations of aryl halides,³⁰ alkynylations in continuous flow,³¹ and C-H arylation.³²

Third Generation Precatalysts

Generations one and two of our precatalysts were of great use in cross-coupling chemistry. However, the preparation of **6** required Schlenk techniques and the use of unstable intermediates or the use of triflic acid. Precatalyst **7** could not incorporate bulkier biaryl dialkylphosphines, including **L1**, an important ligand in C-N bond formation. As a result, we developed a third generation precatalyst to address the issues of previous generations. By replacing the chloride ligand in **7** with the non-coordinating and more electron-poor methanesulfonate ligand, a new family of precatalysts was prepared that exhibited the broadest ligand scope to date.³³ Additionally, they were highly soluble and stable in common organic solvents while still retaining the ease of preparation of **7**. Precatalysts of type **9** could all be generated from the common intermediate **8**. Complex **9** could be prepared with a range of ligands (*Table 2*) in uniformly high yields. Precatalysts **9** have also been shown to be at least as effective as previous generations of precatalysts in catalysis. Demonstrating the practicality and scalability of this procedure, μ -OMs dimer **8** has been synthesized at a 400g scale.

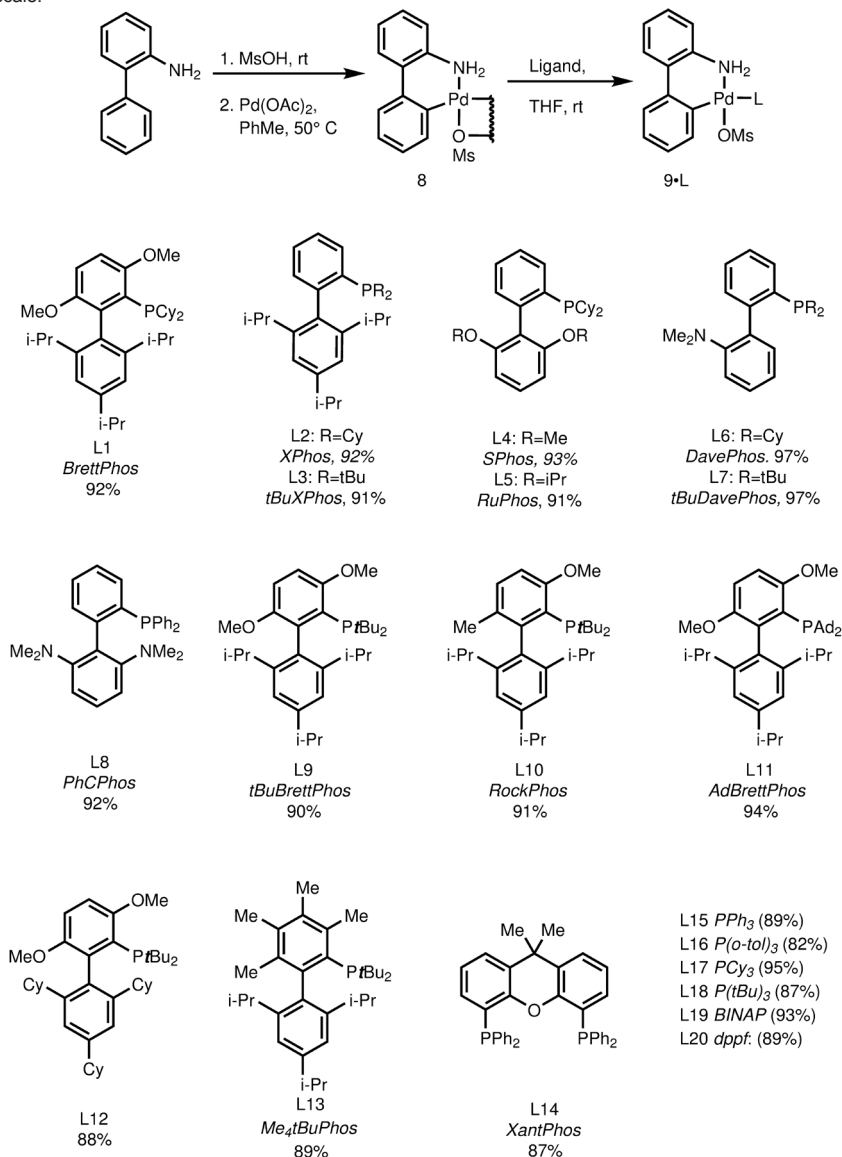
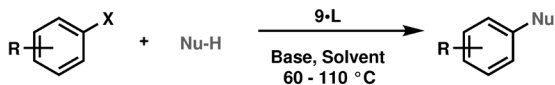


Table 3. Preparation and representative examples of precatalyst **9**

Precatalysts for Bulky Biaryl Di-tert-Butyl Phosphines

Precatalysts **9** were the first to be able to incorporate the extremely bulky biaryl di-tert-butyl phosphine ligands **L10-L14**.³⁴ Previous generations of precatalysts could not accommodate these ligands, presumably due to the combination of their steric bulk and the chloride ligands' inability to dissociate. Prior to the development of **9**, preactivation of the ligand and palladium source was necessary through water activation with Pd(OAc)₂ or prestirring the ligand with Pd₂(dba)₃ at elevated temperatures. This was not ideal as these procedures required an additional operation in an ancillary reaction vessel as well as additional equivalents of ligand relative to palladium. The use of **9-L10 – 9-L14** avoid these issues. By employing a palladium source preligated with these ligands, we see good activity in a range of C-N and C-O bond-forming reactions without preactivation or added ligand (Table 4).



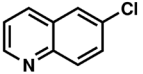
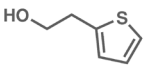
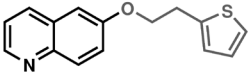
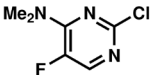
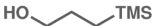
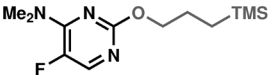
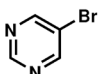
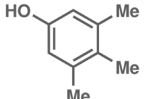
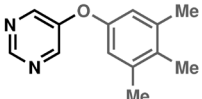
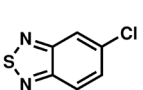
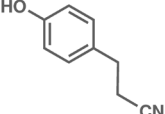
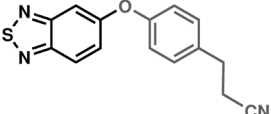
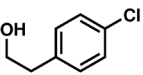
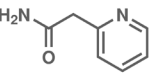
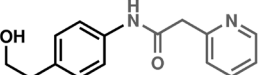
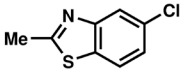
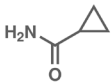
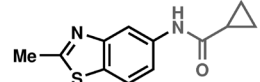
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1				2%	L10	96%
2				2%	L10	77%
3				2%	L12	90%
4				2%	L12	78%
5				1%	L9	92%
6				1%	L9	92%

Table 4. Arylation of amides and alcohols with **9-L10 – 9-L14**.

In-Situ Precatalyst Generation

Since precatalysts of type **9** can be formed quickly in a range of solvents and exhibit good solubility, we developed a protocol for generating them in situ for the screening of ligands in a palladium-catalyzed coupling reaction. This in-situ catalyst generation protocol was evaluated in the Suzuki-Miyaura coupling of 4-chloro-3-methylanisole and 2, 6-difluorophenylboronic acid. Vials of palladium source and ligand were aged for 10 minutes in 1 mL of THF and directly added to the reaction mixture, followed by aqueous base. As depicted in Table 3, XPhos was the optimal ligand for this reaction, with μ -OMs dimer **8** showing the highest catalytic activity, even when compared to similar 2-aminobiphenylpalladium dimers. Pd(OAc)₂ and Pd₂(dba)₃ provided little product (Table 4).³³

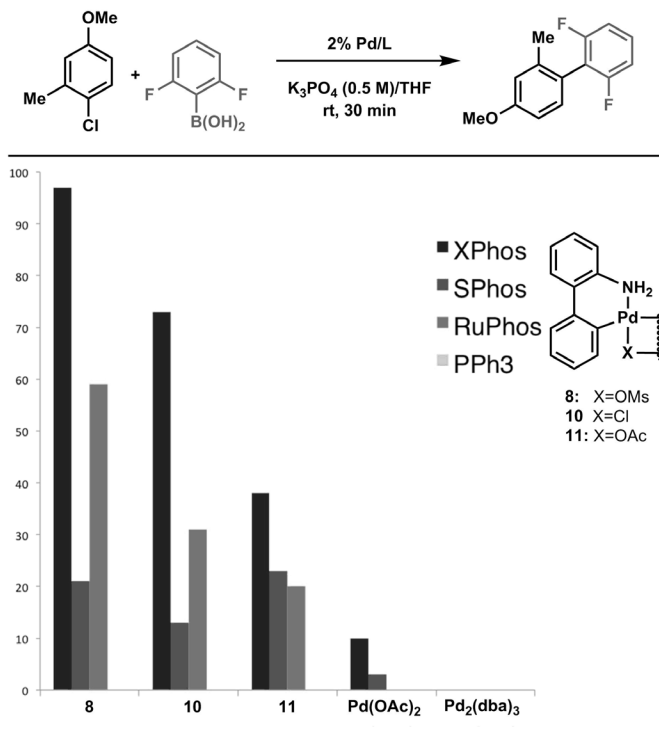


Table 5. Evaluation of palladium sources and ligands for in-situ catalyst generation in Suzuki-Miyaura coupling.

Precatalysts in Aromatic Cyanation

Aromatic nitriles are useful synthetic intermediates, pharmaceutical targets, and potential tracers for positron emission topography. We recently reported the cyanation of aryl chlorides and bromides with the non-toxic cyanide source $K_3[Fe(CN)_6]$.³⁵ While there have been previous reports of catalytic processes, they all employ long reaction times, high temperatures, and exhibit limited substrate scopes. Our procedure circumvented these limitations through the employment of precatalyst **8** and the monodentate ligands **L2**, **L3**, and **L9**, which gave much higher yields than the traditional $[(allyl)PdCl]_2$, $Pd_2(dba)_3$ and $Pd(OAc)_2$ palladium sources. The reaction showed a broad substrate scope, tolerating a range of functional groups, 5-membered heterocycles, and N-H containing heterocycles (Table 5).

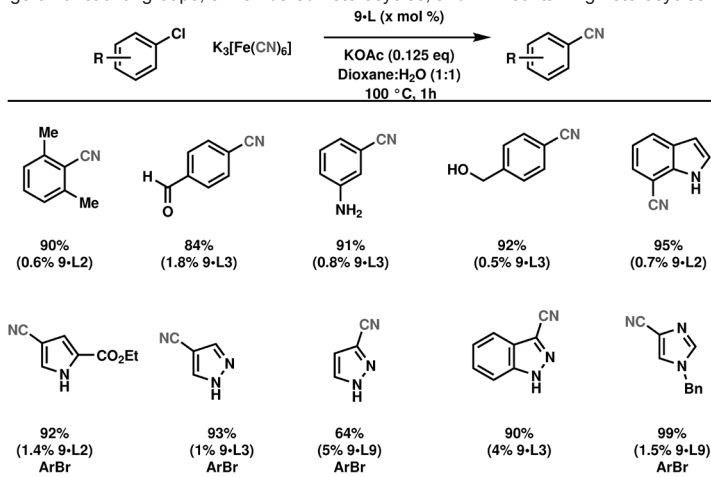
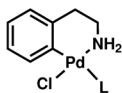


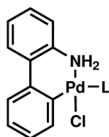
Table 5. Aromatic cyanation of aryl halides with **9**.

Palladacycle Precatalysts



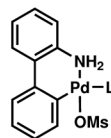
**First
Generation**

- Compatible with bulky ligands
- 3 step preparation
- unstable intermediates
- short life in solution



**Second
Generation**

- Simple one pot preparation
- Pd(OAc)₂ as Pd source
- Not compatible with bulkier ligands
- Poor Solubility and short life in solution



**Third
Generation**

- Simple preparation with stable isolable intermediate
- Compatible with bulky ligands
- Can be prepared *in-situ*
- Long solution life (≥ 1 month)

Mode of Activation



Table 6. A brief summary of precatalyst generations developed in our lab and their general mode of activation.

Conclusion

In conclusion, the use of preformed palladium precatalysts containing phosphine ligands are an efficient means to generate the desired $\text{LPd}(0)$ species compared to traditional means of catalyst generation with separate Pd and ligand sources. We have developed three generations of palladacyclic precatalysts to address the issues of catalyst activation (Table 6). Our third generation methanesulfonate precatalysts are readily activated, incorporate the broadest range of ligands to date and have a facile preparation that is amenable to large-scale synthesis. Additionally, by generating $\text{LPd}(0)$ more efficiently than traditional palladium sources, our palladacyclic precatalysts have made possible methodologies that would not otherwise be feasible. We anticipate that the implementation of precatalysts will greatly improve the scope of palladium catalyzed cross-coupling reactions.

Acknowledgments

We thank the National Institutes of Health for financial support (GM46059 and GM58160). The content of this review is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Health.

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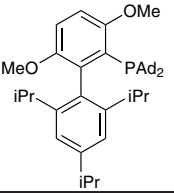
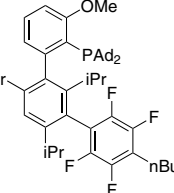
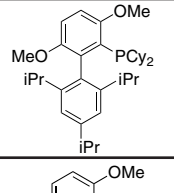
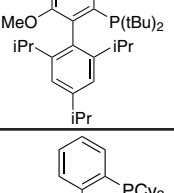
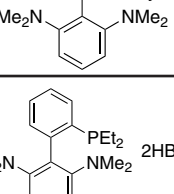
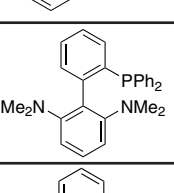
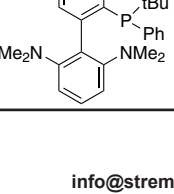
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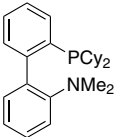
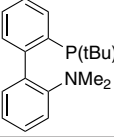
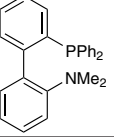
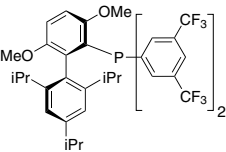
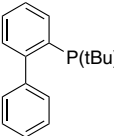
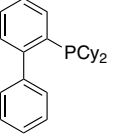
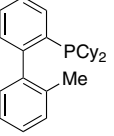
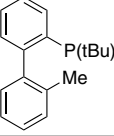
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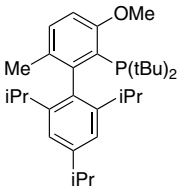
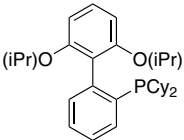
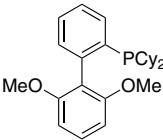
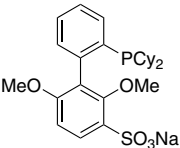
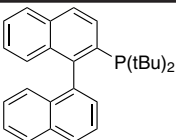
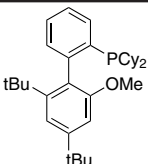
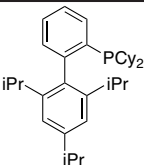
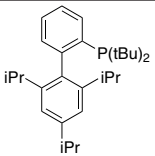
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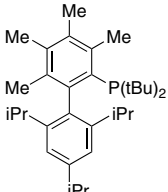
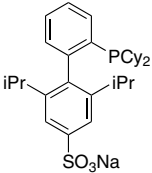
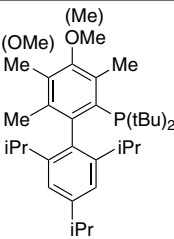
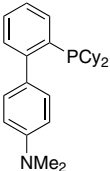
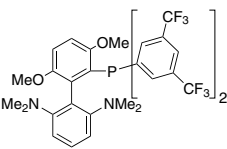
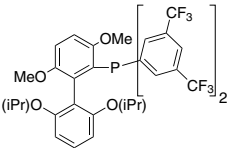
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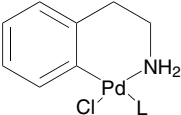
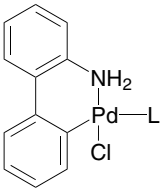
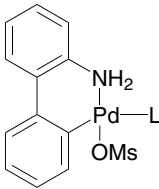
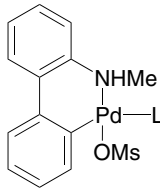
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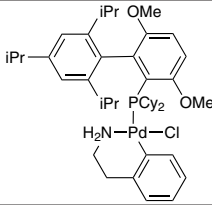
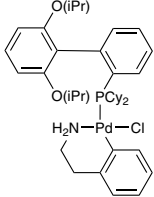
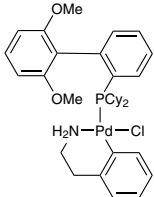
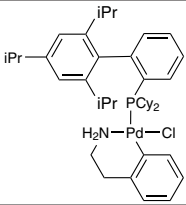
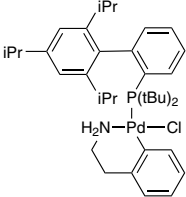
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	AlPhos	15-2065	1805783-60-1	100mg 500mg 2g
	BrettPhos	15-1152	1070663-78-3	250mg 1g 5g 25g
	t-BuBrettPhos	15-1164	1160861-53-9	100mg 500mg 2g
	CPhos	15-1147	1160556-64-8	250mg 1g 5g
	EtCPhos	15-1151	---	100mg 500mg
	PhCPhos	15-1125	1447963-71-4	100mg 500mg
	(tBu)PhCPhos	15-3010	1660153-91-2	250mg 1g 5g 25g

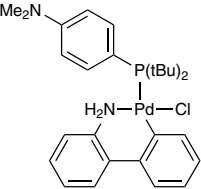
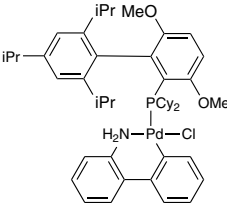
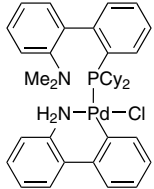
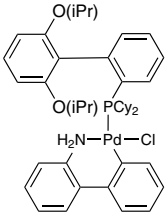
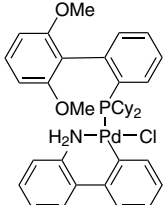
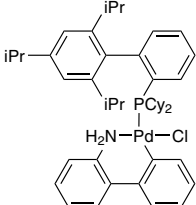
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	PhDavePhos	15-1745	240417-00-9	500mg 2g 10g
	JackiePhos	15-1157	1160861-60-8	100mg 500mg 2g
	JohnPhos	15-1045	247940-06-3	500mg 2g 10g 50g
	CyJohnPhos	15-1140	247940-06-3	1g 5g 25g 100g
	MePhos	15-1148	251320-86-2	500mg 2g 10g 50g
	tBuMePhos	15-1049	255837-9-5	500mg 5g 10g 50g

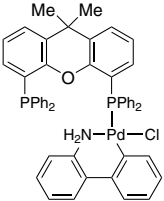
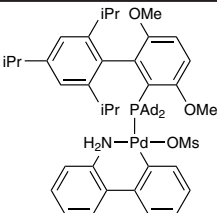
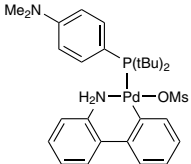
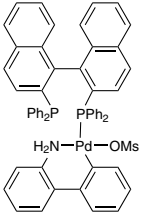
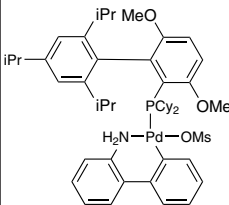
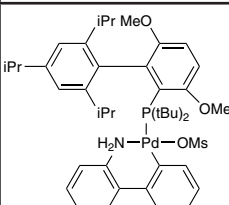
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	water soluble SPhos	15-1142	870245-75-3	500mg 2g 10g
	TrixiePhos	15-1043	255836-67-0	250mg 1g 5g
	VPhos	15-1105	1848244-75-6	250mg 1g 5g
	XPhos	15-1149	564483-18-7	500mg 2g 10g 100g 500g
	t-BuXPhos	15-1052	564483-19-8	500mg 2g 10g 50g

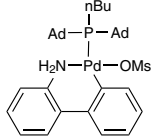
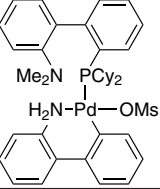
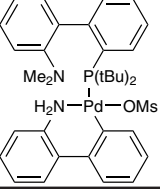
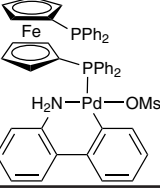
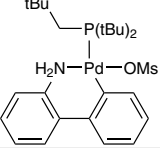
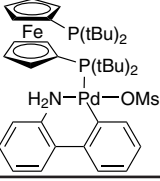
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	XPhos-SO₃Na	15-1135	870245-84-4	500mg 2g
	---	15-1063	1359986-21-2	250mg 1g 5g
	---	15-1154	1185899-00-6	250mg 1g 5g
	---	15-3015	1810068-30-4	100mg 500mg 2g
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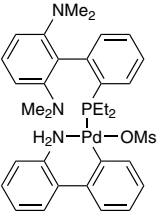
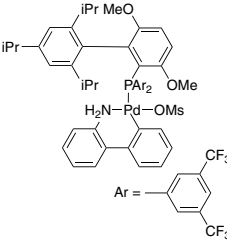
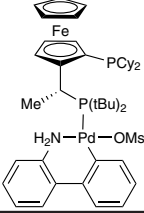
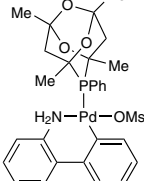
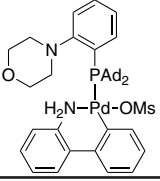
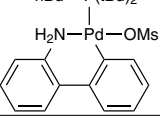
			
First Generation	Second Generation	Third Generation	Fourth Generation

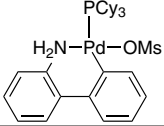
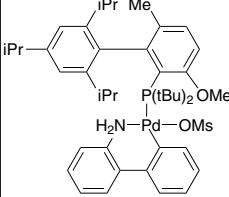
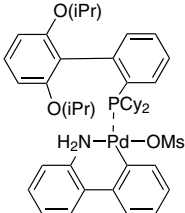
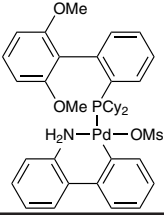
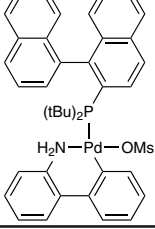
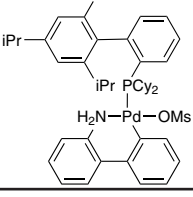
Structure	Common Name	Strem Catalog #	CAS #	Catalog Sizes
First Generation				
	BrettPhos Palladacycle <i>(from 15-1152)</i>	46-0267	1148148-01-9	100mg 500mg 2g 10g
	RuPhos Palladacycle <i>(from 15-1146)</i>	46-0266	1028206-60-1	100mg 500mg 2g 10g
	SPhos Palladacycle <i>(from 15-1143)</i>	46-0269	1028206-58-7	250mg 1g 5g
	XPhos Palladacycle <i>(from 15-1149)</i>	46-0268	1028206-56-5	250mg 1g 5g 25g
	t-BuXPhos Palladacycle <i>(from 15-1052)</i>	46-0264	1142811-12-8	100mg 500mg 2g 10g

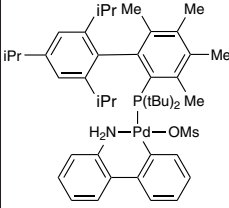
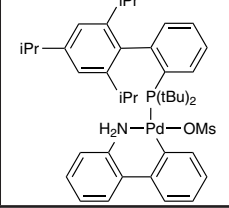
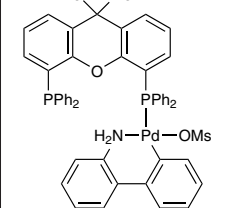
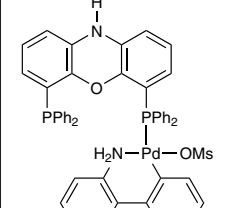
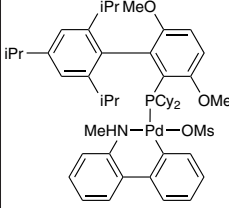
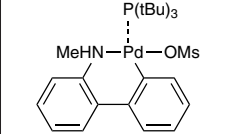
Structure	Common Name	Strem Catalog #	CAS #	Catalog Sizes
Second Generation				
	AmPhos Palladacycle <i>(from 15-1248)</i>	46-0342	---	250mg 1g
	BrettPhos Palladacycle <i>(from 15-1152)</i>	46-0292	451002-39-3	100mg 500mg 2g
	DavePhos Palladacycle <i>(from 15-1145)</i>	46-0232	---	250mg 1g
	RuPhos Palladacycle <i>(from 15-1146)</i>	46-0286	---	250mg 1g 5g
	SPhos Palladacycle <i>(from 15-1143)</i>	46-0283	1375325-64-6	250mg 1g 5g 25g
	XPhos Palladacycle <i>(from 15-1149)</i>	46-0281	1310584-14-5	250mg 1g 5g 25g

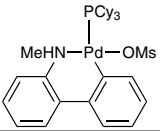
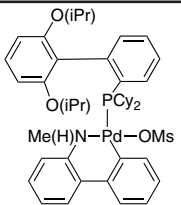
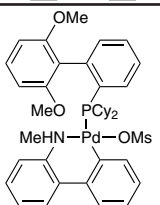
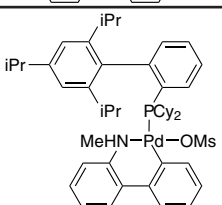
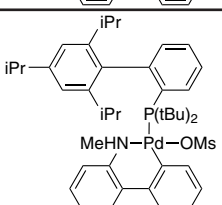
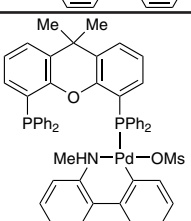
Structure	Common Name	Strem Catalog #	CAS #	Catalog Sizes
Second Generation (continued)				
	XantPhos Palladacycle <i>(from 15-1242)</i>	46-0955	1375325-77-1	500mg 2g
Third Generation				
	AdBrettPhos Palladacycle <i>(from 15-1138)</i>	46-0480	1445972-29-1	50mg 250mg 1g 5g
	AmPhos Palladacycle <i>(from 15-1248)</i>	46-0345	1820817-64-8	250mg 1g 5g
	BINAP Palladacycle <i>(from 15-0433)</i>	46-2153	---	250mg 1g 5g
	BrettPhos Palladacycle <i>(from 15-1152)</i>	46-0322	1470372-59-8	100mg 500mg 2g 10g
	t-BuBrettPhos Palladacycle <i>(from 15-1164)</i>	46-0325	1536473-72-9	100mg 500mg 2g 10g

Structure	Common Name	Strem Catalog #	CAS #	Catalog Sizes
Third Generation (continued)				
	CPhos Palladacycle <i>(from 15-1147)</i>	46-0487	1447963-73-6	100mg 500mg 2g
	cataCXium® A Palladacycle <i>(from 15-0483)</i>	46-0278	1651823-59-4	250mg 1g 5g
	DavePhos Palladacycle <i>(from 15-1145)</i>	46-0237	1445085-87-9	250mg 1g
	t-BuDavePhos Palladacycle <i>(from 15-1048)</i>	46-2135	1445085-92-6	250mg 1g 5g
	DPPF Palladacycle <i>(from 26-0270)</i>	46-2128	1445086-28-1	250mg 1g 5g
	DtBNpP Palladacycle <i>(from 15-1017)</i>	46-0358	1507403-89-5	250mg 1g 5g
	DTBPF Palladacycle <i>(from 26-0150)</i>	46-2158	---	250mg 1g 5g

Structure	Common Name	Strem Catalog #	CAS #	Catalog Sizes
Third Generation (continued)				
	EtCPhos Palladacycle <i>(from 15-1151)</i>	46-0348	---	50mg 250mg 1g
	JackiePhos Palladacycle <i>(from 15-1157)</i>	46-0340	---	100mg 500mg 2g
	Josiphos Palladacycle <i>(from 26-0975)</i>	46-0353	1702311-34-9	100mg 500mg 2g 10g
	MeCgPPh Palladacycle <i>(from 15-5355)</i>	46-0392	---	500mg 2g
	Mor-Dalpos Palladacycle <i>(from 15-1092)</i>	46-0935	---	250mg 1g
	P(t-Bu)₂(n-Bu) Palladacycle <i>(from 15-1128)</i>	46-0365	1445086-17-8	250mg 1g 5g

Structure	Common Name	Strem Catalog #	CAS #	Catalog Sizes
Third Generation (continued)				
	PCy₃ Palladacycle <i>(from 15-6150)</i>	46-0239	1445086-12-3	250mg 1g 5g
	RockPhos Palladacycle <i>(from 15-1168)</i>	46-0335	2009020-38-4	100mg 500mg 2g 10g
	RuPhos Palladacycle <i>(from 15-1146)</i>	46-0314	1445085-77-7	250mg 1g 5g
	SPhos Palladacycle <i>(from 15-1143)</i>	46-0318	1445085-82-4	250mg 1g 5g 25g
	TrixiePhos Palladacycle <i>(from 15-1043)</i>	46-0357	---	100mg 50mg 2g
	XPhos Palladacycle <i>(from 15-1149)</i>	46-0320	1445085-55-1	250mg 1g 5g

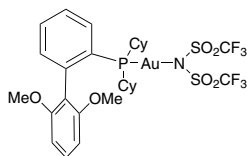
Structure	Common Name	Strem Catalog #	CAS #	Catalog Sizes
Third Generation (continued)				
	Me₄ t-BuylXPhos Palladacycle <i>(from 15-1051)</i>	46-2163	1507403-85-1	100mg 500mg 2g
	t-BuXPhos Palladacycle <i>(from 15-1052)</i>	46-0323	1447963-75-8	250mg 1g 5g
	XantPhos Palladacycle <i>(from 15-1242)</i>	46-0957	1445085-97-1	500mg 2g
	NiXantPhos Palladacycle <i>(from 15-0437)</i>	46-0959	1602922-03-1	100mg 50mg 2g
Fourth Generation				
	BrettPhos Palladacycle <i>(from 15-1152)</i>	46-0333	1599466-83-7	250mg 1g 5g
	P(t-Bu)₃ Palladacycle <i>(from 15-5810)</i>	46-0385	1621274-11-0	250mg 1g 5g

Structure	Common Name	Strem Catalog #	CAS #	Catalog Sizes
Fourth Generation (continued)				
	PCy₃ Palladacycle <i>(from 15-6150)</i>	46-0379	---	250mg 1g 5g
	RuPhos Palladacycle <i>(from 15-1146)</i>	46-0395	1599466-85-9	250mg 1g 5g
	SPhos Palladacycle <i>(from 15-1143)</i>	46-0380	1599466-87-1	250mg 1g 5g
	XPhos Palladacycle <i>(from 15-1149)</i>	46-0327	1599466-81-5	250mg 1g 5g
	t-BuXPhos Palladacycle <i>(from 15-1052)</i>	46-0330	1599466-89-3	250mg 1g 5g
	XantPhos Palladacycle <i>(from 15-1242)</i>	46-0388	1621274-19-8	250mg 1g 5g

GOLD (Compounds)

79-0230

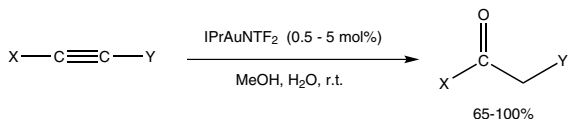
Bis(trifluoromethanesulfonyl) imide(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl) gold(I), 98% (1121960-90-4)
 $C_{28}H_{35}AuF_6NO_6P_2$; FW: 887.64;
 white to off-white solid



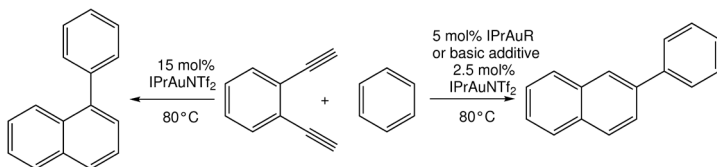
100mg
500mg

Technical Notes:

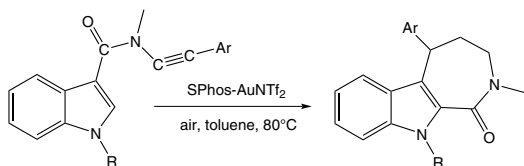
1. Catalyst used in the selective hydration of substituted alkynes at room temperatures.
2. Catalyst used in the hydroarylation/aromatization of arene-diyne.
3. Highly-efficient and regio-selective catalyst for the selective carbonyl migration in alkynyl-substituted indole-3-carboxamides.
4. Intermolecular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



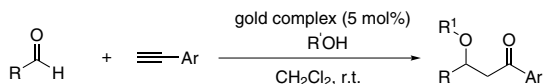
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



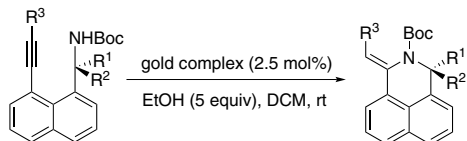
Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (6)

References:

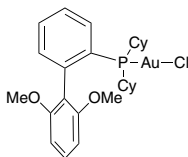
1. *J. Org. Chem.*, **2009**, 74, 2067
2. *Organometallics*, **2012**, 31, 644
3. *Adv. Synth. Catal.*, **2012**, 354, 1273
4. *Adv. Synth. Catal.*, **2012**, 354, 3451.
5. *Eur. J. Org. Chem.*, **2014**, 2014, 2668.
6. *Org. Lett.*, **2016**, 18, 4722.

GOLD (Compounds)

79-0225

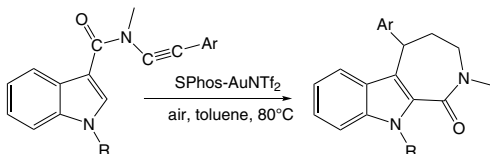
Chloro[2-(dicyclohexylphosphino)-2',6'-dimethoxy-1,1'-biphenyl]gold(I), 98% (854045-95-7)
 $C_{26}H_{35}AuClO_2P$; FW: 642.95; white powdr.

250mg
1g

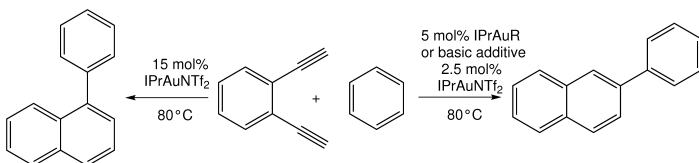


Technical Notes:

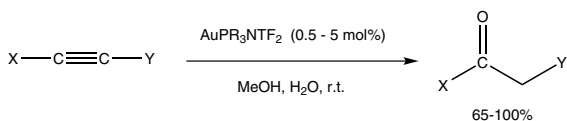
1. Highly-efficient and regio-selective catalyst for the selective carbonyl migration in alkynyl-substituted indole-3-carboxamides.
2. Catalyst used in the hydroarylation/aromatization of arene-diyne.
3. Catalyst used in the selective hydration of substituted alkynes at room temperatures.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

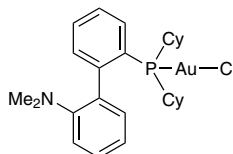
References:

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

79-0343

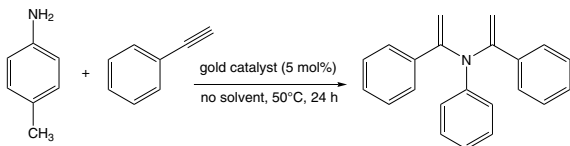
Chloro[2-(dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl]gold(I), 98% (1196707-11-5)
 $C_{26}H_{36}AuClNP$; FW: 625.96; white powdr.

250mg
1g

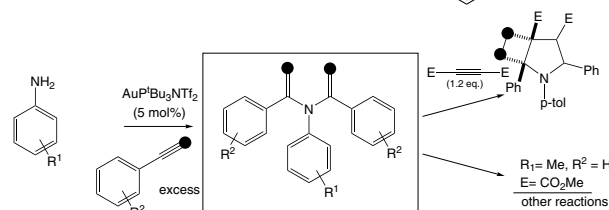


Technical Notes:

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)

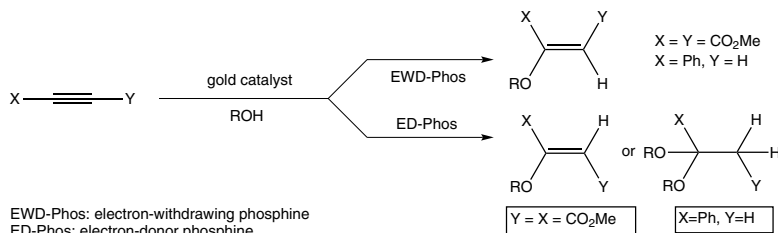


Tech. Note (2)
Ref. (1)

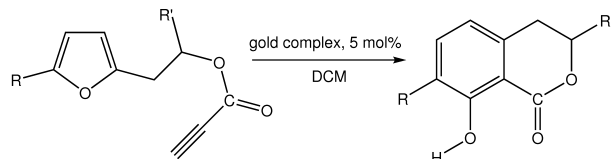
GOLD (Compounds)

79-0343
(continued)

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



Tech. Note (3)
Ref. (2)



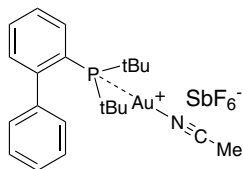
Tech. Note (4)
Ref. (3)

References:

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

79-0352

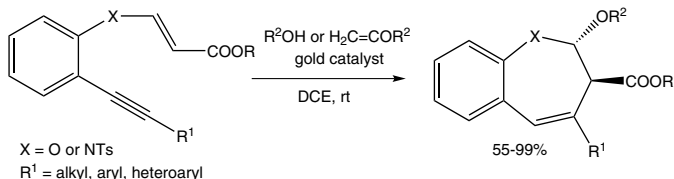
2-(Di-t-butylphosphino))-1,1'-biphenyl(acetonitrile)gold(I) hexafluoroantimonate, 99%
(866641-66-9)
 $C_{22}H_{30}F_6AuNPSb$; FW: 772.17;
white to off-white powdr.
air sensitive, moisture sensitive



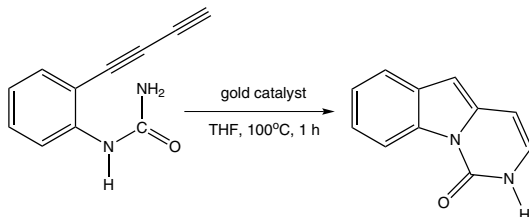
250mg
1g

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.

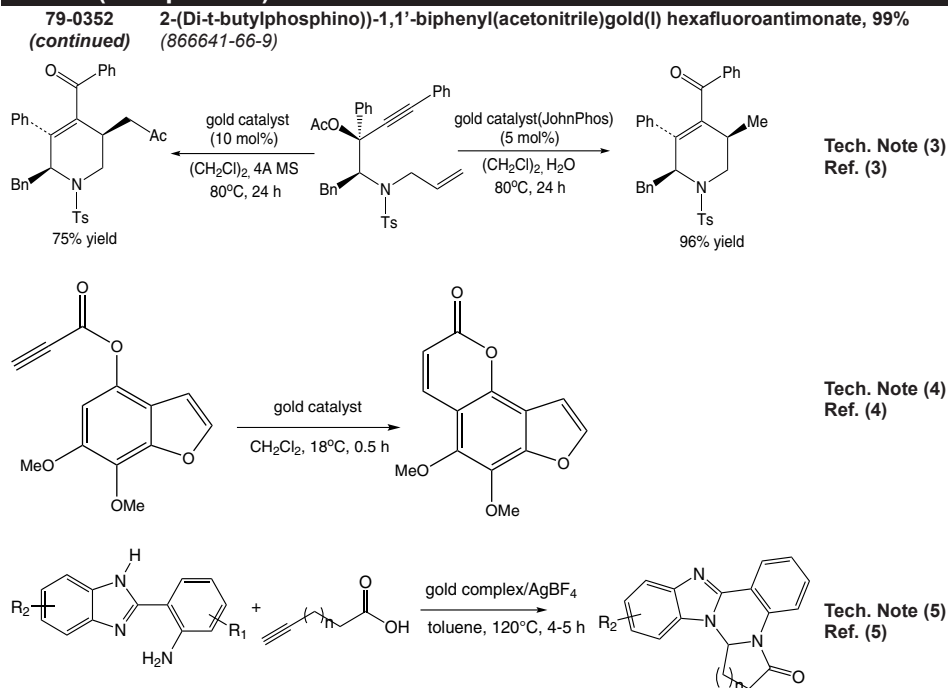


Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

GOLD (Compounds)

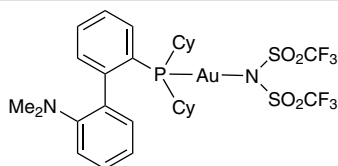


References:

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

79-0348

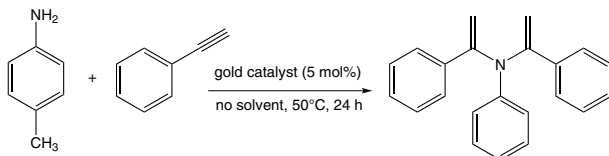
[2-(Dicyclohexylphosphino)-2'-(*N,N*-dimethylamino))-1,1'-biphenyl][bis(tri-fluoromethyl) sulfonylimido]gold(I), 98% (1188507-66-5)
C₂₈H₃₆AuF₆N₂O₄PS₂; FW: 870.66;
yellow powdr.



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

PALLADIUM (Compounds)

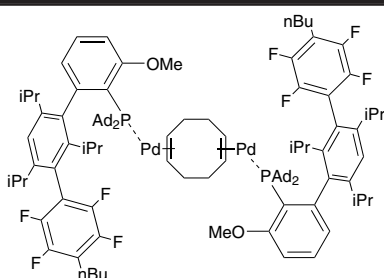
46-0241

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)}1,5-cyclooctadiene, [AlPhos Palladium complex]
(1805783-51-0)

$C_{112}H_{146}F_8O_2P_2Pd_2$; FW: 1951.13;
yellow-green solid

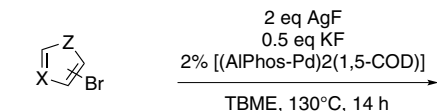
Note: Patents: US 6,395,916,
US 6,307,087



50mg
250mg

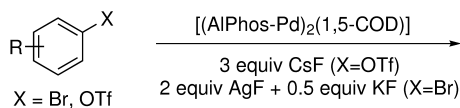
Technical Notes:

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



Z = S, O, NR
X = N, CH

Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

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

96-5503

Buchwald Palladacycle Precatalyst Kit 1
(Chloro-2-aminoethylphenyl- Palladacycles Gen. 1)
See page 84

96-5505

Buchwald Palladacycle Precatalyst Kit 2a
(Methanesulfonato-2'-amino-1,1'-biphenyl-2-yl- Palladacycles Gen. 3)
See page 85

96-5506

Buchwald Palladacycle Precatalyst Kit 2b
(Methanesulfonato-2'-amino-1,1'-biphenyl-2-yl- Palladacycles Gen. 3)
See page 86

96-5508

Buchwald Palladacycle Precatalyst Kit 3
(Chloro- 2'-amino-1,1'-biphenyl-2-yl - Palladacycles Gen. 2)
See page 84

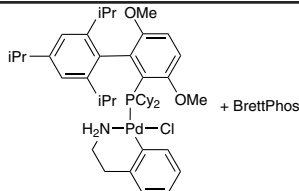
96-5512

NEW

Buchwald Palladacycle Precatalyst Kit 4
(Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4)
See page 87

46-0367

Chloro{[BrettPhos][2-(2-aminoethylphenyl) palladium(II)]/[BrettPhos] admixture
(molar Pd/P = 1:1)
white powd.
Note: Patents: US 6,395,916, US 6,307,087.



100mg
500mg

Technical Note:

1. See 46-0267. (page 29)

PALLADIUM (Compounds)

46-0435

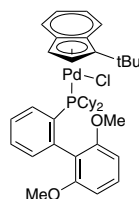
NEW

Chloro(1-t-butylindenyl)

[2-(dicyclohexylphosphino)-2',6'-dimethoxy-1,1'-biphenyl]palladium(II) (1779569-07-1)

C₃₉H₅₂ClO₂PPd; FW: 723.06; orange powdr.

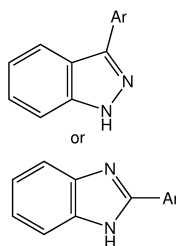
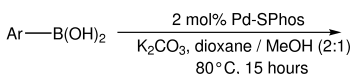
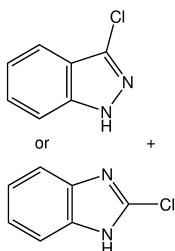
Note: For research and development only. Not for use in humans. Patents 62/061,319. US 6,395,916, US 6,307,087.



100mg
500mg

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.

46-0440

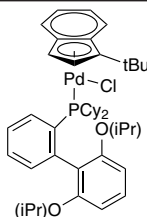
NEW

Chloro(1-t-butylindenyl)

[2-(dicyclohexylphosphino)-2',6'-di-i-propoxy-1,1'-biphenyl]palladium(II) (1779569-08-2)

C₄₃H₅₈ClO₂PPd; FW: 779.77; orange powdr.

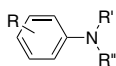
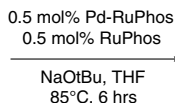
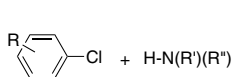
Note: For research and development only. Not for use in humans. Patents 62/061,319. US 6,395,916, US 6,307,087.



100mg
500mg

Technical Note:

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



Tech. Note (1)

References:

- ACS Catal., 2015, 5, 3680.

46-0437

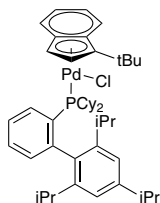
NEW

Chloro(1-t-butylindenyl)[2-

(dicyclohexylphosphino)-2',4',6'-tri-i-propyl-1,1'-biphenyl]palladium(II) (1779569-06-0)

C₄₆H₆₄ClPPd; FW: 789.85; orange powdr.

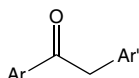
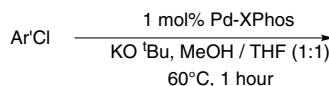
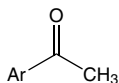
Note: For research and development only. Not for use in humans. Patents 62/061,319. US 6,395,916, US 6,307,087.



100mg
500mg

Technical Notes:

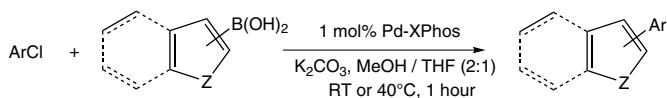
- Catalyst used in the α -arylation of ketones.
- Catalyst used in the Suzuki cross-coupling of aryl chlorides with boronic acid-substituted benzofurans.



Tech. Note (1)
Ref. (1)

PALLADIUM (Compounds)

46-0437 Chloro(1-*t*-butylindenyl)[2-(dicyclohexylphosphino)-2',4',6'-tri-*i*-propyl-1,1'-biphenyl] palladium(II) (1779569-06-0)



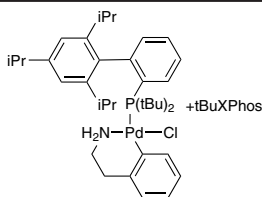
Z=O, S

Tech. Note (2)
Ref. (1)

References:

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

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

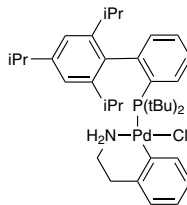


100mg
500mg

Technical Note:

1. See 46-0264. (page 27)

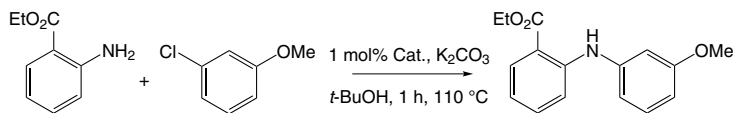
46-0264 Chloro(2-di-*t*-butylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II), min. 98%
[*t*-BuXPhos Palladacycle Gen. 1] (1142811-12-8)
C₃₇H₅₅CINPPd; FW: 686.69; white powdr.
Note: Patents: US 6,395,916, US 6,307,087.
Buchwald Palladacycle Precatalyst Kit 1 component.



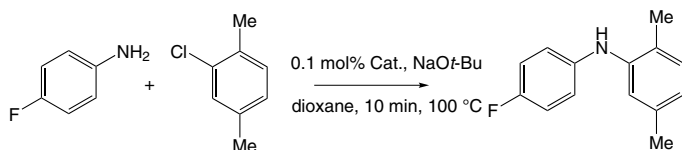
100mg
500mg
2g
10g

Technical Notes:

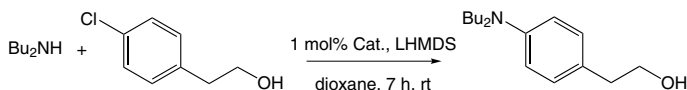
1. Catalyst for cross-coupling reactions of electron-deficient anilines with aryl chlorides.
2. Catalyst for rapid C-N bond-forming process at low catalyst loading.
3. Catalyst for C-N cross-coupling reactions, at or below room temperature.
4. Efficient Pd-catalyzed amination reactions for heterocycle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



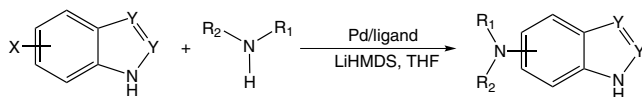
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (1)



Tech. Note (4)
Ref. (2)

References:

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

PALLADIUM (Compounds)

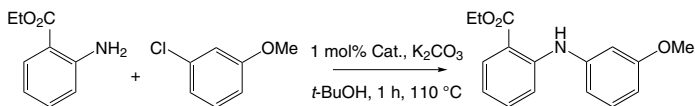
46-0283 Chloro(2-dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl) palladium(II) min. 98% [SPhos Palladacycle Gen. 2]
(1375325-64-6)
 $C_{38}H_{45}ClNO_2PPd$; FW: 720.62; white powdr.
Note: Patents: US 6,395,916, US 6,307,087.
Buchwald Palladacycle Precatalyst Kit 3 component.



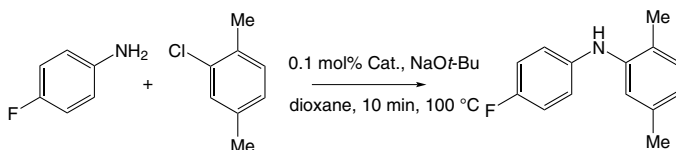
250mg
1g
5g
25g

Technical Note:

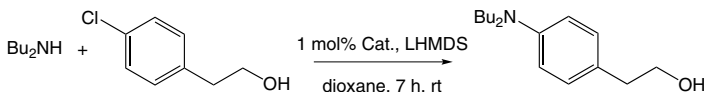
1. Palladium precatalyst for Suzuki-Miyaura coupling reactions.



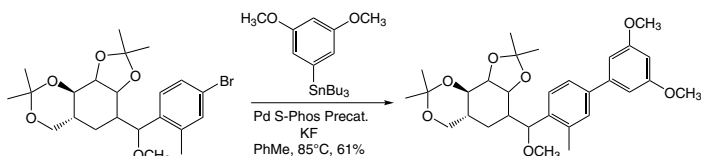
Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)

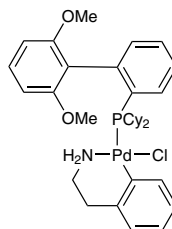


Tech. Note (1)
Ref. (2)

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)
 $C_{34}H_{45}ClNO_2PPd$; FW: 672.57; white powdr.
Note: Patents: US 6,395,916, US 6,307,087.
Buchwald Palladacycle Precatalyst Kit 1 component.



250mg
1g
5g

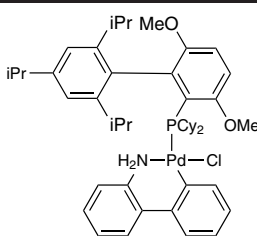
Technical Note:

1. See 46-0268. (page 32)

PALLADIUM (Compounds)

46-0292

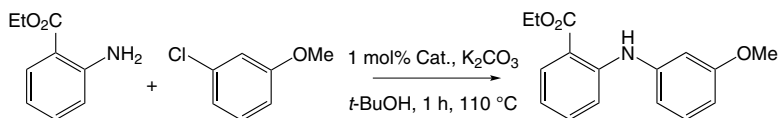
Chloro(2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl) (2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [BrettPhos Palladacycle Gen. 2] (1451002-39-3)
 $C_{47}H_{63}ClNO_2PPd$; FW: 846.86; white powdr.
 Note: Patents: US 6,395,916, US 6,307,087. Buchwald Palladacycle Precatalyst Kit 3 component.



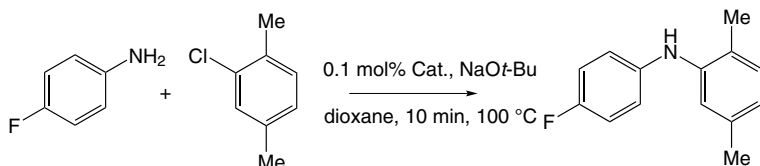
100mg
500mg
2g

Technical Notes:

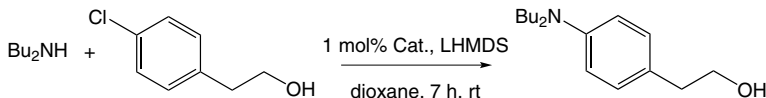
1. Palladium precatalyst for fast Buchwald-Hartwig coupling reactions.
2. Suzuki-Miyaura coupling of chloropyrazoles with boronic acids.



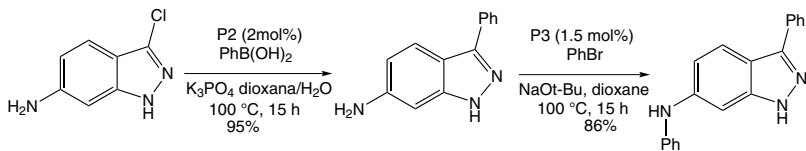
Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



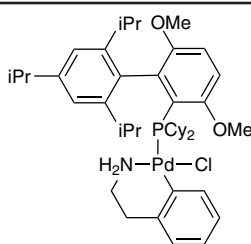
Tech. Note (1)
Ref. (2)

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.



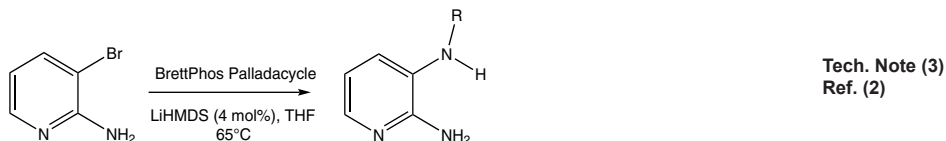
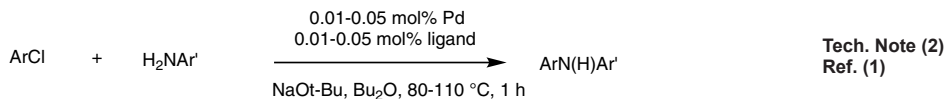
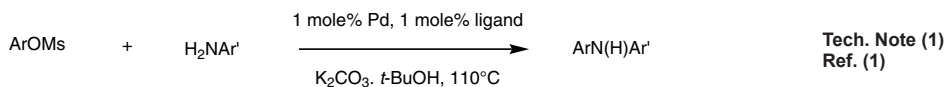
100mg
500mg
2g
10g

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.

PALLADIUM (Compounds)

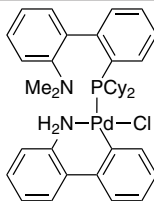
46-0267 Chloro[2-(dicyclohexylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl][2-(2-aminoethyl)phenyl]palladium(II), min. 98% [BrettPhos Palladacycle Gen. 1] (1148148-01-9)



References:

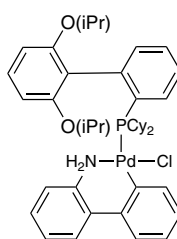
1. *J. Am. Chem. Soc.*, **2008**, *130*, 13552
2. *Org. Lett.*, **2011**, *13*, 1984

46-0232 Chloro[2-(dicyclohexylphosphino)-2'-(*N,N*-dimethylamino)-1,1'-biphenyl](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [DavePhos Palladacycle Gen. 2]
C₃₈H₄₆ClN₂PPd; FW: 703.63; white powdr.
Note: Patents: US 6,395,916, US 6,307,087.



250mg
1g

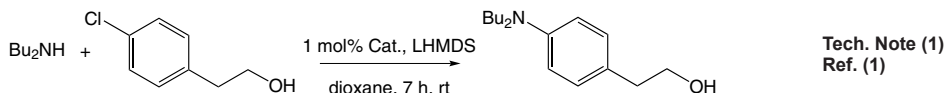
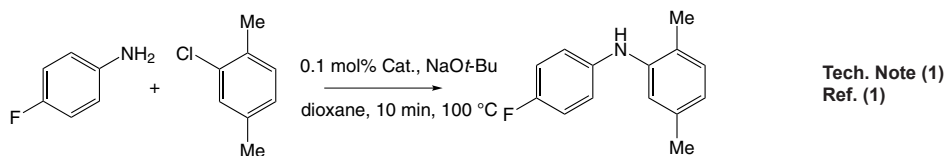
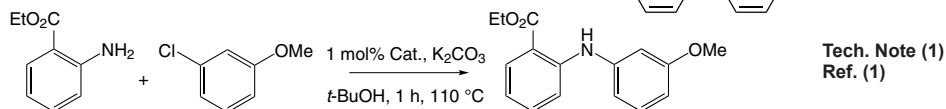
46-0286 Chloro(2-dicyclohexylphosphino-2',6'-di-*i*-propoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 2] (1375325-68-0)
C₄₂H₅₃ClINO₂PPd; FW: 776.72; white powdr.
Note: Patents: US 6,395,916, US 6,307,087.
Buchwald Palladacycle Precatalyst Kit 3 component.



250mg
1g
5g

Technical Note:

1. Palladium precatalyst for Suzuki-Miyaura coupling reactions.



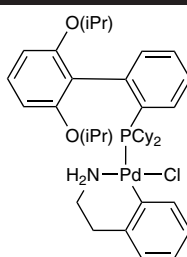
References:

1. *J. Am. Chem. Soc.*, **2010**, *132*, 14073

PALLADIUM (Compounds)

46-0266

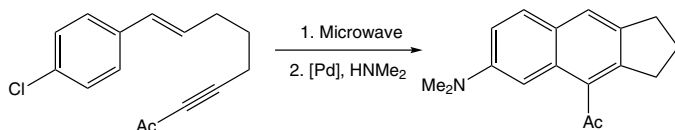
**Chloro(2-dicyclohexylphosphino-2',6'-di-*i*-propoxy-1,1'-biphenyl)[2-(2-aminoethylphenyl)] palladium(II), methyl-*t*-butylether adduct, min. 98% [RuPhos Palladacycle Gen. 1] (1028206-60-1)
C₃₈H₅₃ClINO₂PPd; FW: 728.68;
off-white to beige pwdr.
Note: Patents: US 6,395,916, US 6,307,087.
Buchwald Palladacycle Precatalyst Kit 1 component.**



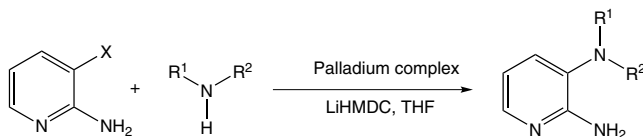
100mg
500mg
2g
10g

Technical Notes:

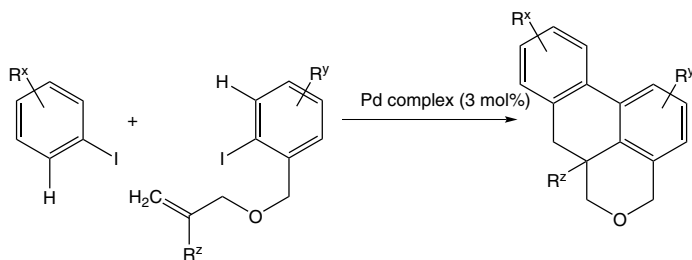
1. Catalyst used in the thermal dehydrogenative Diels-Alder reaction of styrenes.
2. Catalyst used for the CN-cross coupling reactions of 3-halo-2-aminopyridines.
3. Catalyst used for the domino reaction of two aryl iodides, involving two C-H functionalizations.



Tech. Note (1)
Ref. (1)



Tech. Note (2)



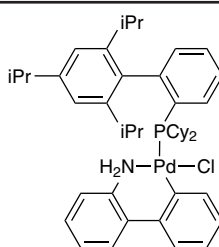
Tech. Note (3)
Ref. (3)

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)
C₄₅H₅₀CINPPd; FW: 786.80; white pwdr.
Note: Patents: US 6,395,916, US 6,307,087.
Buchwald Palladacycle Precatalyst Kit 3 component.**

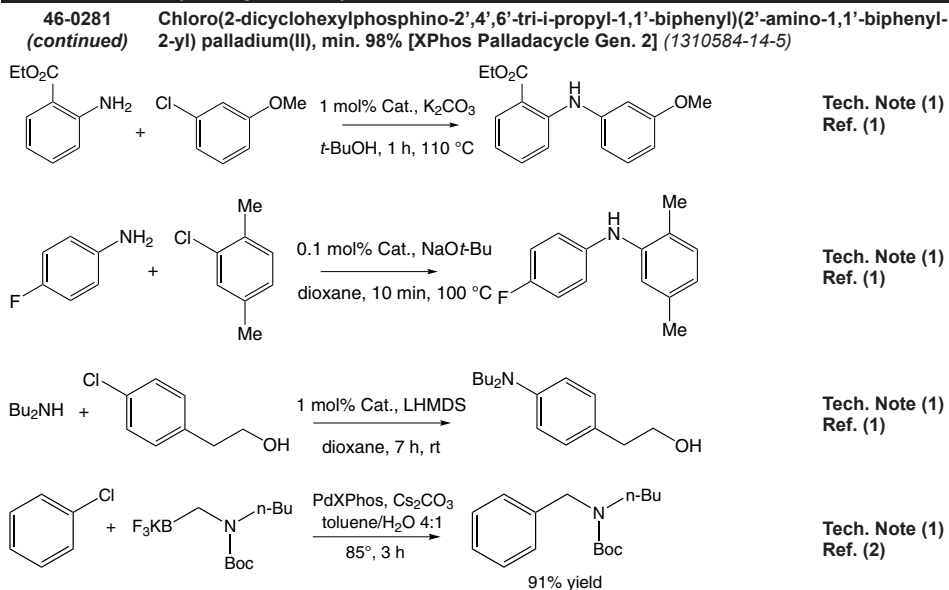


250mg
1g
5g
25g

Technical Note:

1. Palladium precatalyst for Buchwald/Hartwig coupling reactions.

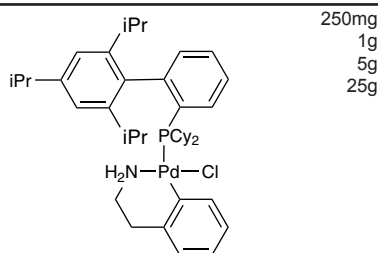
PALLADIUM (Compounds)



References:

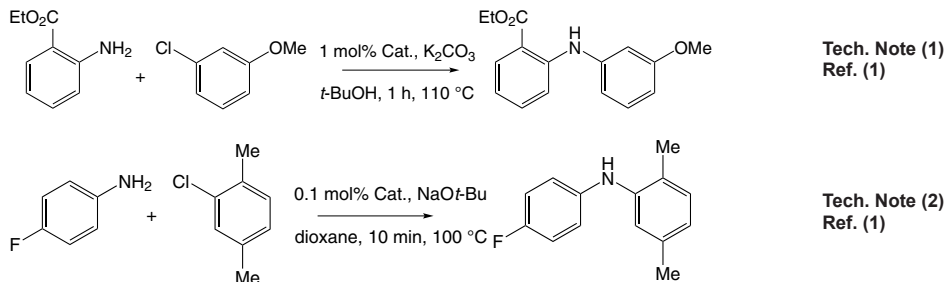
1. *J. Am. Chem. Soc.*, **2010**, 132, 14073
2. *Org. Lett.*, **2013**, 15, 5818

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 pwdr.
 Note: Patents: US 6,395,916, US 6,307,087.
 Buchwald Palladacycle Precatalyst Kit 1 component.



Technical Notes:

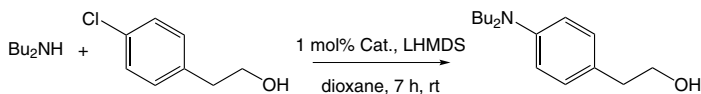
1. Catalyst for cross-coupling reactions of electron-deficient anilines with aryl chlorides.
2. Catalyst for rapid C-N bond-forming process at low catalyst loading.
3. Catalyst for C-N cross-coupling reactions, at or below room temperature.
4. Catalyst for the synthesis of tetracyclic indoles via intermolecular α -arylation of ketones.
5. Catalyst for the cross-coupling of benzyl chlorides with cyclopropanol-derived ketone homoenolates



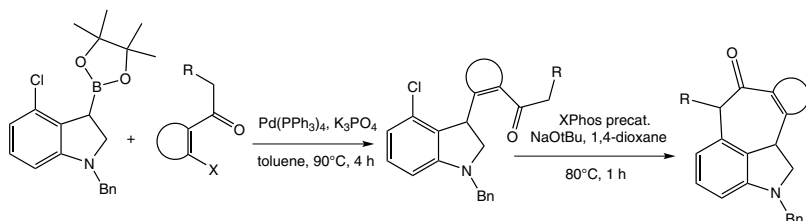
PALLADIUM (Compounds)

46-0268
(continued)

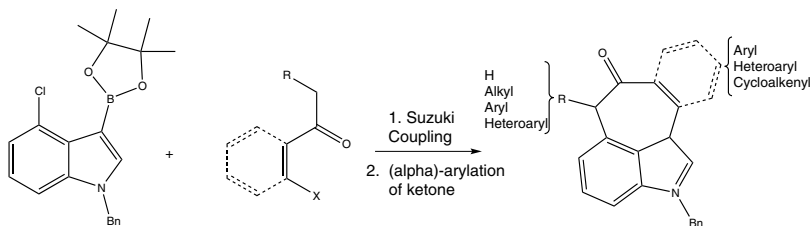
Chloro(2-dicyclohexylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)[2-(2-aminoethyl)phenyl] palladium(II) methyl-*t*-butylether adduct, min. 98% [XPhos Palladacycle Gen. 1] (1028206-56-5)



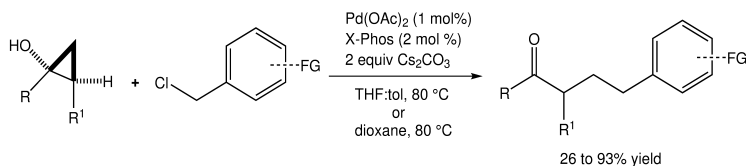
Tech. Note (3)
Ref. (1)



Tech. Note (4)
Ref. (2)



Tech. Note (4)
Ref. (2)



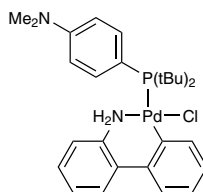
Tech. Note (5)
Ref. (3)

References:

1. *J. Am. Chem. Soc.*, **2008**, 130, 6686.
2. *J. Org. Chem.*, **2012**, 77, 4123.
3. *Org. Lett.*, **2014**, 55, 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 powdr.
Note: Patents: US 6,395,916, US 6,307,087

250mg
1g

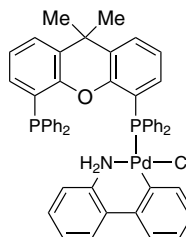


Technical Note:

1. See 15-1242. (visit www.strem.com)

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)
C₅₁H₄₂ClNOP₂Pd; FW: 888.71; pale yellow powdr.
Note: Patents: US 6,395,916, US 6,307,087.

500mg
2g

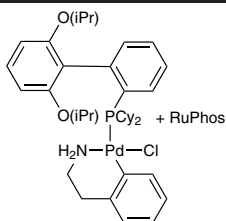


Technical Note:

1. See 15-1242. (visit www.strem.com)

PALLADIUM (Compounds)

46-0366 **Chloro{[RuPhos][2-(2-aminoethylphenyl) palladium(II)]/[RuPhos] admixture**
(molar PdP/P = 1:1)
white powdr.
Note: Patents: US 6,395,916, US 6,307,087

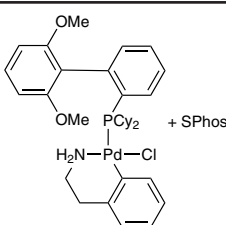


100mg
500mg

Technical Note:

1. See 46-0266. (page 31)

46-0369 **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.

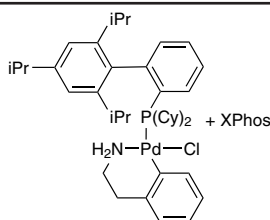


250mg
1g

Technical Note:

1. See 46-0269. (page 28)

46-0368 **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.



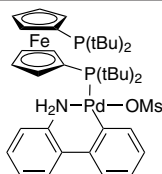
250mg
1g

Technical Note:

1. See 46-0268. (page 32)

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]
 $C_{39}H_{57}FeNO_3P_2PdS$; FW: 844.16; orange powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620

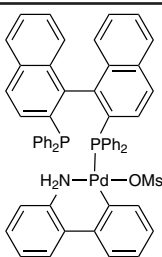
NEW



250mg
1g
5g

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]
 $C_{57}H_{45}NO_3P_2PdS$; FW: 992.41; off-white powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.

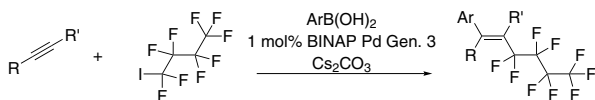
NEW



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:

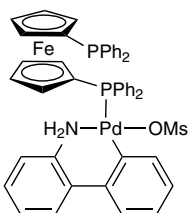
1. ACS Catal., 2016, 6, 3452.

PALLADIUM (Compounds)

46-2128

NEW

Methanesulfonato[1,1'-bis(diphenylphosphino)ferrocene]](2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [DPPF Palladacycle Gen. 3] (1445086-28-1)
 $C_{47}H_{41}FeNO_3P_2PdS$; FW: 924.11; yellow powdr.
 Note: Patents: PCT/US2013/030779,
 US Serial No. 13/799620



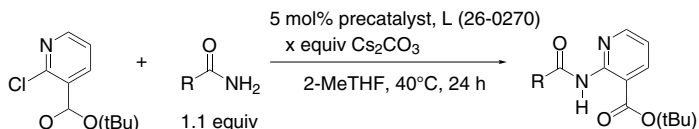
250mg

1g

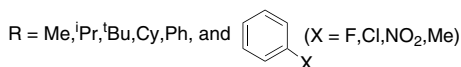
5g

Technical Notes:

- Design and preparation of new palladium precatalysts for C-C and C-N cross-coupling reactions.



Tech. Note (1)
 Ref. (1)



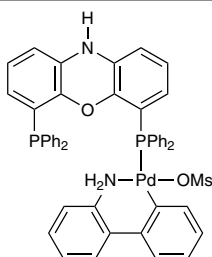
References:

- 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)
 $C_{46}H_{40}N_2O_4P_2PdS$; FW: 921.29;
 light green yellow solid
 Note: Patents: PCT/US2013/030779,
 US Serial No. 13/799620



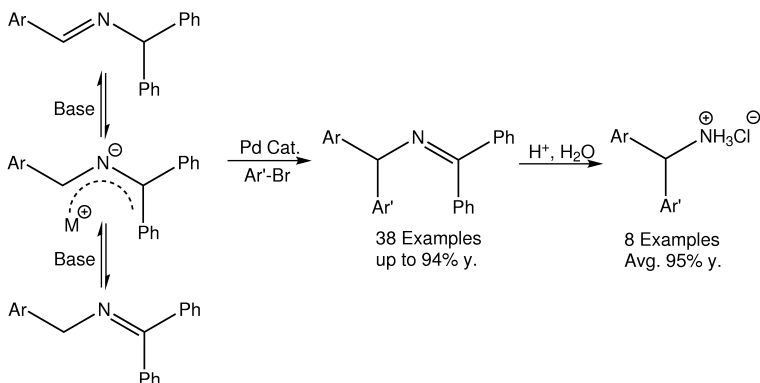
100mg

500mg

2g

Technical Notes:

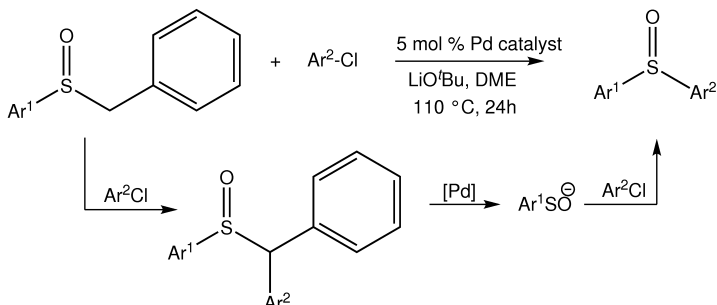
- Synthesis of diarylmethylamines via palladium-catalyzed arylation of 1,1,3-triaryl-2-azaallyl anions.
- Catalyst used in the generation of diaryl sulfoxides from aryl benzyl sulfoxides and aryl chlorides.



Tech. Note (1)
 Ref. (1)

PALLADIUM (Compounds)

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)
(continued)



Tech. Note (2)
Ref. (2)

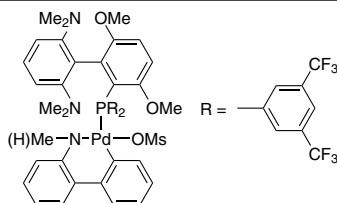
References:

1. *Chem Sci.* **2014**, 5, 2383
2. *Org. Lett.*, **2015**, 17, 1168

46-0347

NEW

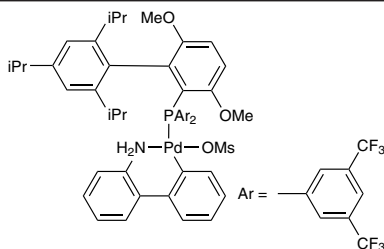
Methanesulfonato[2-bis(3,5-di(trifluoromethyl)phenylphosphino)-3,6-dimethoxy-2',6'-bis(dimethylamino)-1,1'-biphenyl] (2'-methylamino-1,1'-biphenyl-2-yl) palladium(II) [Palladacycle Gen. 4] (1810068-35-9)
C₄₈H₄₄F₁₂N₆O₃PPdS; FW: 1140.32; yellow to orange solid
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620



100mg
500mg

46-0340

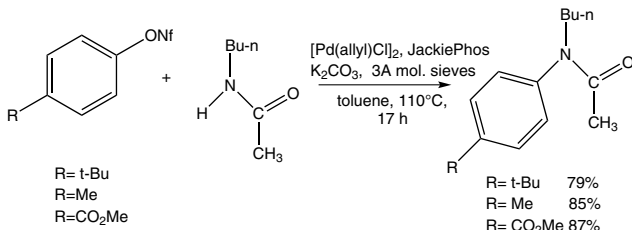
Methanesulfonato[2-bis(3,5-di(trifluoromethyl)phenylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl] (2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [JackiePhos Palladacycle Gen. 3]
C₅₂H₅₀F₁₂NO₃PPdS; FW: 1166.39; white powd.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.



100mg
500mg
2g

Technical Notes:

1. Ligand used in the Pd-catalyzed coupling of aryl nonaflates and triflates with secondary amides.
2. Ligand used in the Pd-catalyzed coupling of aryl nonaflates and triflates with secondary ureas, carbamates, and sulfonamides.
3. Ligand used in the Pd-catalyzed coupling of aryl chlorides with secondary amides, carbamates, and sulfonamides.
4. Ligand used in the Pd-catalyzed coupling of secondary alkyl stannanes with aryl halides.



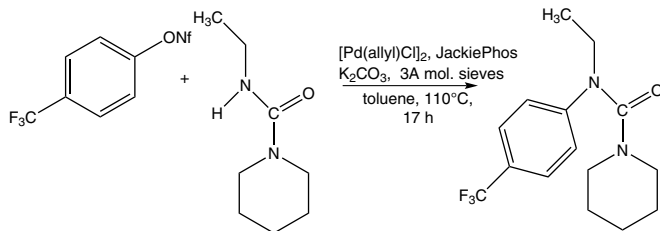
Tech. Note (1)
Ref. (1)

PALLADIUM (Compounds)

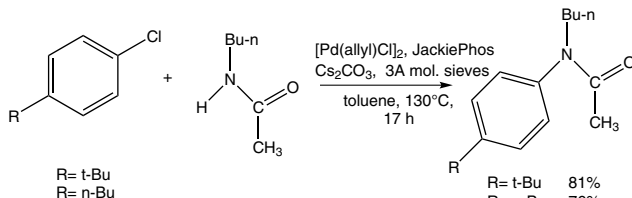
46-0340

(continued)

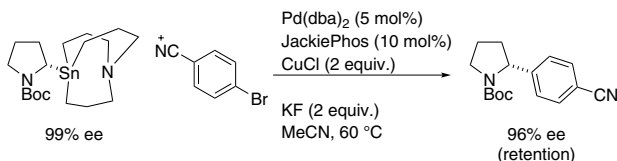
Methanesulfonato[2-bis(3,5-di(trifluoromethyl)phenylphosphino)-3,6-dimethoxy-2',4',6'-tri-
i-propyl-1,1'-biphenyl][2'-amino-1,1'-biphenyl-2-yl]palladium(II), min. 98%
[JackiePhos Palladacycle Gen. 3]



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (1)



Tech. Note (4)
Ref. (3)

References:

1. *J. Am. Chem. Soc.*, **2009**, 131, 16720.
2. *Chem. Sci.*, **2011**, 2, 27-50.
3. *Nat. Chem.*, **2013**, 5, 607.

46-0278

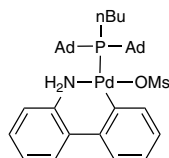
NEW

Methanesulfonato(diadamantyl-n-butylphosphino)-2'-amino-1,1'-biphenyl-2-yl) palladium(II) dichloromethane adduct, min. 95%
[cataCXium® A Palladacycle Gen. 3]

C₃₇H₅₂NO₃PPdS; FW: 728.27; off-white powdr.

Note: Patents: PCT/US2013/030779,

US Serial No. 13/799620. Patent WO 0210178.



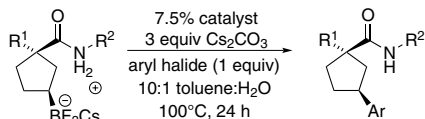
250mg

1g

5g

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.

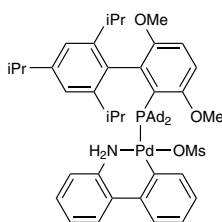
PALLADIUM (Compounds)

46-0480

NEW

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)

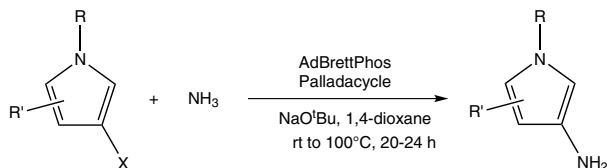
$C_{56}H_{74}NO_5PPdS$; FW: 1010.65;
brown to green solid
Note: Patents: PCT/US2013/030779,
US Serial No. 13/799620



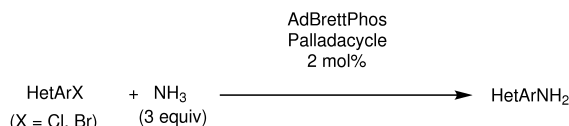
50mg
250mg
1g
5g

Technical Note:

1. Palladium catalyst used in the highly selective monoarylation of ammonia.



Tech. Note (1)
Ref. (2)



Tech. Note (1)
Ref. (2)

References:

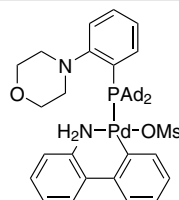
1. *Org.Lett.*, **2013**, *15*, 3734
2. *ACS Catal.*, **2015**, *5*, 1386

46-0935

NEW

Methanesulfonato{N-[2-(di-1-adamantylphosphino)phenyl]morpholine}(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [Mor-Dalphos 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



250mg
1g

Technical Note:

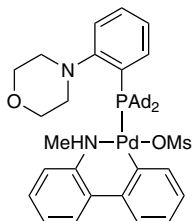
1. See 46-0940. (page 38)

46-0940

NEW

Methanesulfonato{N-[2-(di-1-adamantylphosphino)phenyl]morpholine}(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [MorDalphos Palladacycle Gen. 4]

$C_{44}H_{57}N_2O_4PPdS$; FW: 847.39;
off-white to gray solid
Note: Patents: PCT/US2013/030779,
US Serial No. 13/799620.



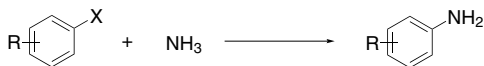
250mg
1g

Technical Note:

1. Palladium catalyst for ammonia arylation.
2. Palladium catalyst for multicomponent one-pot synthesis of indoles.
3. Palladium catalyst for primary aliphatic amination of aryl mesylates.
4. Palladium catalyst for ketone mono- α -arylation of aryl mesylates.

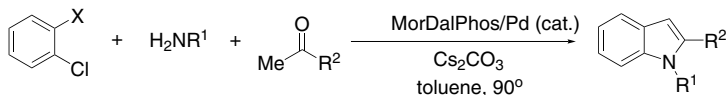
PALLADIUM (Compounds)

46-0940 Methanesulfonato{N-[2-(di-1-adamantylphosphino)phenyl]morpholine}(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98%
[MorDalPhos Palladacycle Gen. 4]

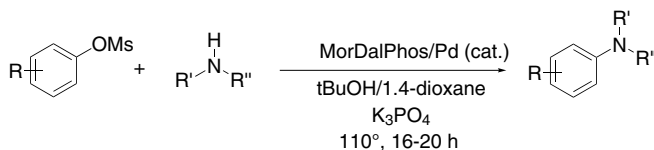


X = Cl or OTs
R = electron-donating
or withdrawing group

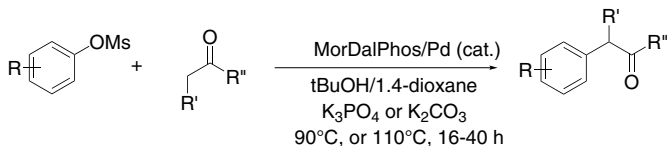
Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)



Tech. Note (4)
Ref. (3)

References:

1. *Chem. Sci.*, **2013**, 4, 916.
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) C₂₅H₄₀NO₃PPdS; FW: 572.05; white to off-white powdr. Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.	$\begin{array}{c} \text{nBu}-\text{P}(\text{tBu})_2 \\ | \\ \text{H}_2\text{N}-\text{Pd}-\text{OMs} \\ | \\ \text{C}_6\text{H}_4-\text{C}_6\text{H}_4 \end{array}$	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) C₂₆H₄₂NO₃PPdS; FW: 586.08; white to off-white powdr. Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.	$\begin{array}{c} \text{tBu}-\text{P}(\text{tBu})_2 \\ | \\ \text{H}_2\text{N}-\text{Pd}-\text{OMs} \\ | \\ \text{C}_6\text{H}_4-\text{C}_6\text{H}_4 \end{array}$	250mg 1g 5g

PALLADIUM (Compounds)

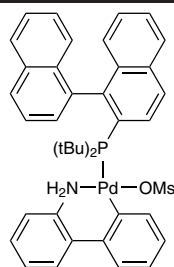
46-0357

NEW

Methanesulfonato(2-di-*t*-butylphosphino-1,1'-binaphthyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 95% [TrixiePhos Palladacycle Gen. 3]

$C_{44}H_{44}NO_3PPdS$; FW: 768.25; white to off-white powdr.

Note: Patents: PCT/US2013/030779, US Serial No. 13/799620



100mg
500mg
2g

Technical Note:

- See 15-1043 (page 57)

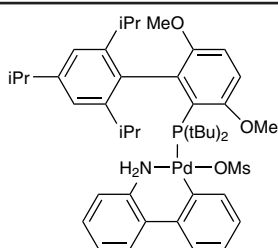
46-0325

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)

$C_{44}H_{62}NO_3PPdS$; FW: 854.43; brown-green solid

Note: Patents: PCT/US2013/030779,

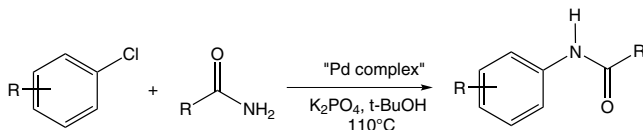
US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.



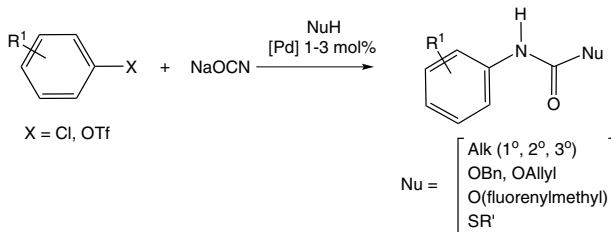
100mg
500mg
2g
10g

Technical Notes:

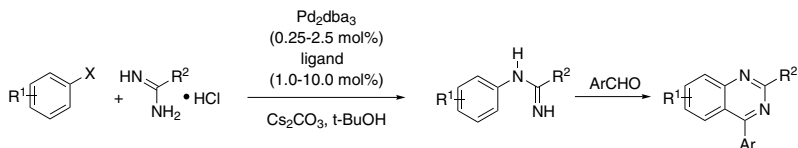
- Palladium catalyst used for the arylation of primary amides.
- Palladium catalyst used for the synthesis of N-aryl carbamates.
- Palladium catalyst used for the N-monoarylation of amidines.
- Palladium catalyst used for the cross-coupling of aryl chlorides and triflates with sodium cyanate – a practical synthesis of unsymmetrical ureas.
- Palladium catalyst used in the synthesis of imidazo[4,5-*b*]pyridines and imidazo[4,5-*b*]pyrazines through amidation of 2-chloro-3-amino-heterocycles.
- Palladium catalyst used in the N-arylation of 2-aminothiazoles
- Palladium catalyst used in the synthesis of diarylethers under mild conditions.
- Palladium catalyst used in the hydroxylation of aryl and heteroaryl halides.



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



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

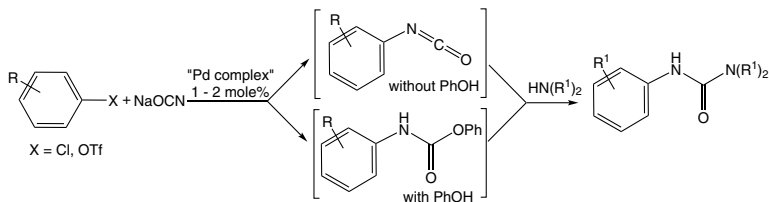


**Tech. Note (3)
Ref. (3)**

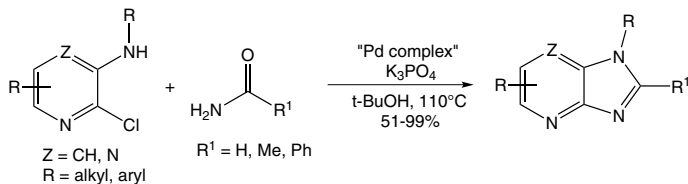
PALLADIUM (Compounds)

46-0325
(continued)

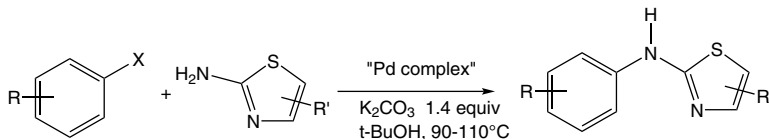
Methanesulfonato(2-(di-*t*-butylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)
(2'-amino-1,1'-biphenyl-2-yl)palladium(II), dichloromethane adduct, min. 98%
[*t*-BuBrettPhos Palladacycle Gen. 3]



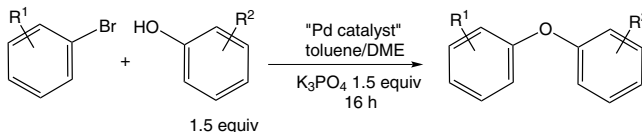
Tech. Note (4)
Ref. (4)



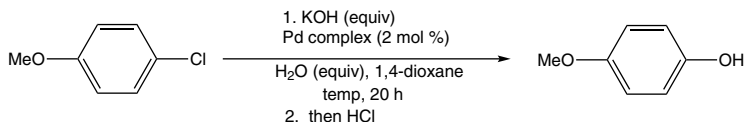
Tech. Note (5)
Ref. (5)



Tech. Note (6)
Ref. (6)



Tech. Note (7)
Ref. (7)



Tech. Note (8)
Ref. (8)

References:

1. *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

PALLADIUM (Compounds)

46-2135

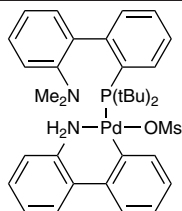
NEW

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



250mg

1g

5g

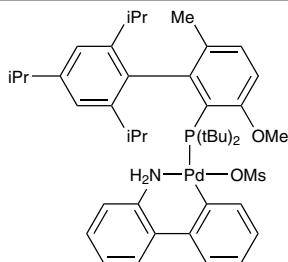
46-0335

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 powdr.

Note: Patents: PCT/US2013/030779,
US Serial No. 13/799620. Buchwald
Palladacycle Precatalyst Kit 2 component.



100mg

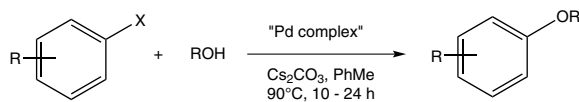
500mg

2g

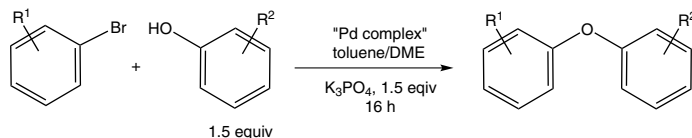
10g

Technical Notes:

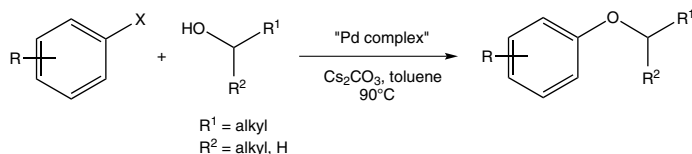
1. Palladium precatalyst used for the arylation of aliphatic alcohols.
2. Palladium precatalyst used for the synthesis of diaryl ethers under mild conditions.
3. Palladium precatalyst used for the intermolecular C-O bond formation with secondary and primary alcohols.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

References:

1. *Org. Lett.*, **2013**, 15, 2876
2. *Org. Lett.*, **2012**, 14, 170
3. *Angew. Chem. Int. Ed.*, **2011**, 50, 9943

PALLADIUM (Compounds)

46-2163

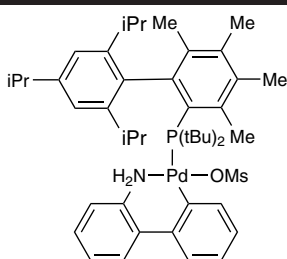
NEW

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-BuXPhos Palladacycle Gen. 3]
(1507403-85-1)

C₄₆H₆₆NO₃PPdS; FW: 850.48;
dark green powdr.

Note: Patents: PCT/US2013/030779,
US Serial No. 13/799620



100mg

500mg

2g

Technical Note:

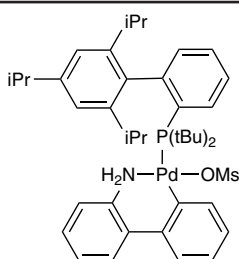
- See 15-1051 (page 64)

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.

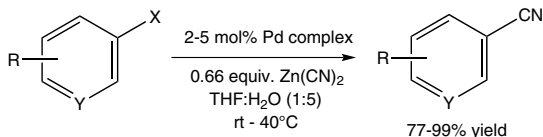


250mg

1g

Technical Note:

- Mild palladium-catalyzed cyanation of (hetero)aryl halides and triflates in aqueous media.



Tech. Note (1)
Ref. (1)

References:

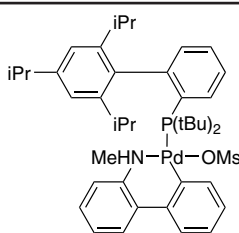
- Org. Lett., 2015, 17, 202.

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 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.



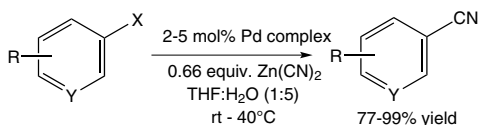
250mg

1g

5g

Technical Note:

- Alternative N-methyl catalyst for mild palladium-catalyzed cyanation of (hetero)aryl halides and triflates in aqueous media.



Tech. Note (1)
Ref. (1)

References:

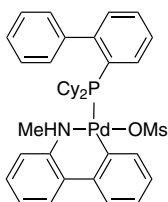
- Org. Lett., 2015, 17, 202. (Note this reference is for the non-methylated palladacycle, 46-0323, with the same ligand.)

PALLADIUM (Compounds)

46-0980

NEW

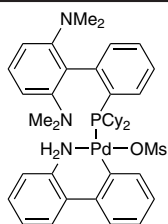
Methanesulfonato(2-dicyclohexylphosphino-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% CyJohnphos Palladacycle Gen4
 $C_{38}H_{48}NO_3PPdS$; FW: 734.24;
 light brown solid
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620

250mg
1g

46-0487

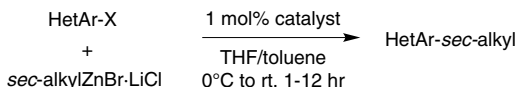
NEW

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)
 $C_{41}H_{54}N_4O_3PPdS$; FW: 806.35;
 white to off-white powdr.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.

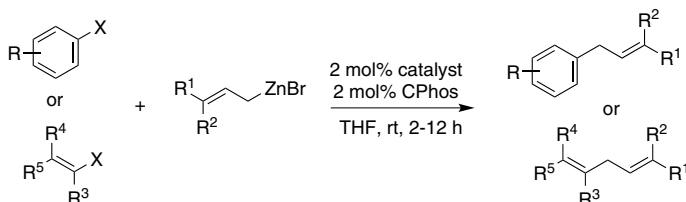
100mg
500mg
2g

Technical Notes:

1. Catalyst for the highly selective cross-coupling of secondary alkylzinc reagents with heteroaryl halides
2. Catalyst for the completely linear-selective Negishi cross-coupling of allylzinc halides with aryl and vinyl electrophiles



Tech. Note (1)
Ref. (1)



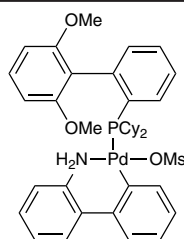
Tech. Note (2)
Ref. (2)

References:

1. *Org. Lett.*, **2014**, 16, 4638
2. *Angew. Chem. Int. Ed.*, **2013**, 52, 14098

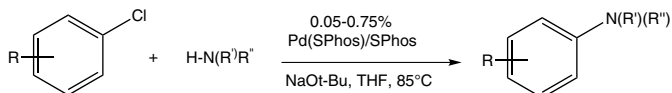
46-0318

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)
 $C_{39}H_{48}NO_3PPdS$; 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

PALLADIUM (Compounds)

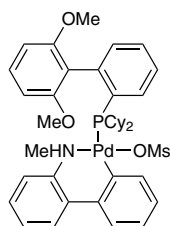
46-0380

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)

$C_{40}H_{50}NO_3PPdS$; FW: 794.29; off-white to tan powd.

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.



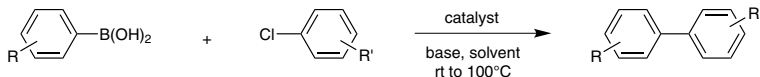
250mg

1g

5g

Technical Note:

1. Alternative Catalyst for the Suzuki-Miyaura Cross-Coupling reaction



Tech. Note (1)
Ref. (1)

References:

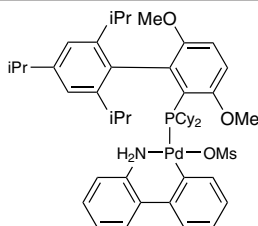
1. *J. Am. Chem. Soc.*, **2005**, 127, 4685. (Note this reference is for $Pd_2(dba)_3$ and *SPhos*.)

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)

$C_{48}H_{66}NO_3PPdS$; FW: 906.50; yellow to beige powd.

Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.



100mg

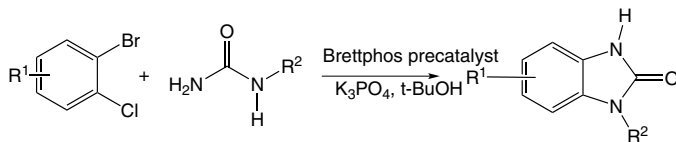
500mg

2g

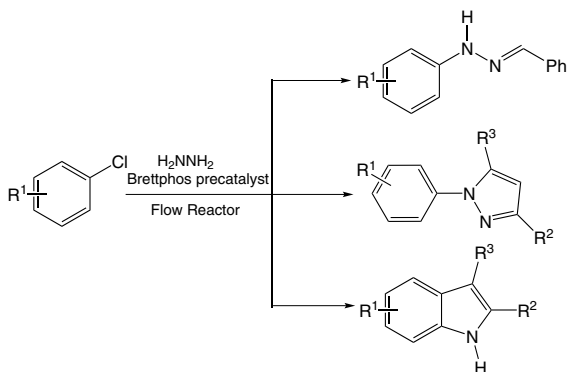
10g

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)



Tech. Note (2)
Ref. (2)

References:

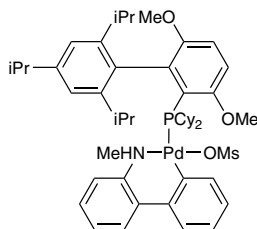
1. *Org. Lett.*, **2014**, 16, 3844
2. *Angew. Chem. Int. Ed.*, **2013**, 52, 3434

PALLADIUM (Compounds)

46-0333

NEW

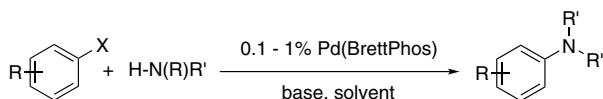
Methanesulfonato[2-dicyclohexylphosphino-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl] (2'-methylamino-1,1'-biphenyl-2-yl) palladium(II), min. 98% [BrettPhos Palladacycle Gen. 4] (1599466-83-7)
 $C_{49}H_{68}NO_5PPdS$; FW: 920.53;
 off-white to beige pwdr.
 Note: Patents: PCT/US2013/030779, US 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.



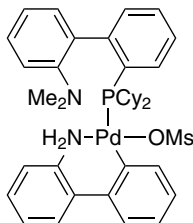
Tech. Note (1)
Ref. (1)

References:

1. *J. Org. Chem.*, **2014**, 79, 4161
2. *Chem. Sci.* **2013**, 4, 916

46-0237

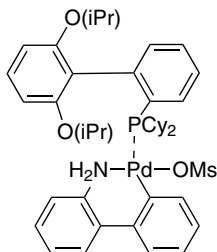
Methanesulfonato[2-(dicyclohexylphosphino)-2'-(*N,N*-dimethylamino)-1,1'-biphenyl] (2'-amino-1,1'-biphenyl-2-yl)palladium(II) CH_2Cl_2 adduct, min. 98% [DavePhos Palladacycle Gen. 3] (1445085-87-9)
 $C_{30}H_{49}N_2O_3PPdS$; FW: 763.28; white pwdr.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.



250mg
1g

46-0314

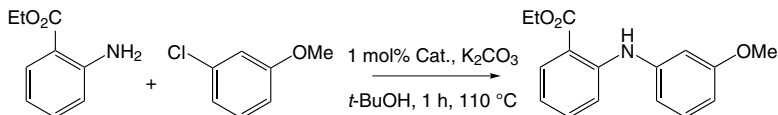
Methanesulfonato[2-dicyclohexylphosphino-2',6'-di-*i*-propoxy-1,1'-biphenyl] (2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 3] (1445085-77-7)
 $C_{43}H_{56}NO_5PPdS$; FW: 836.37; white pwdr.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.



250mg
1g
5g

Technical Notes:

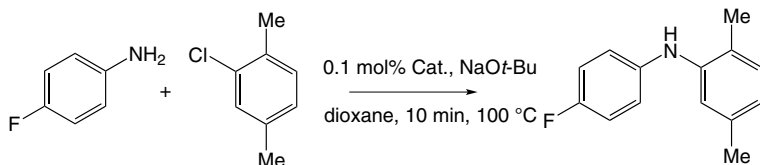
1. Palladium catalyst used for facile, C-N cross-coupling reactions.
2. A practical synthesis of indoles via a Pd-catalyzed C-N ring formation.



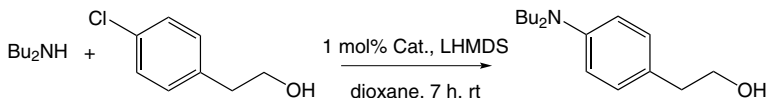
Tech. Note (1)
Ref. (1)

PALLADIUM (Compounds)

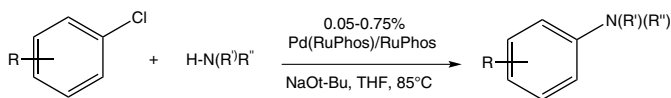
46-0314 Methanesulfonato(2-dicyclohexylphosphino-2',6'-di-*i*-propoxy-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 3] (1445085-77-7)
(continued)



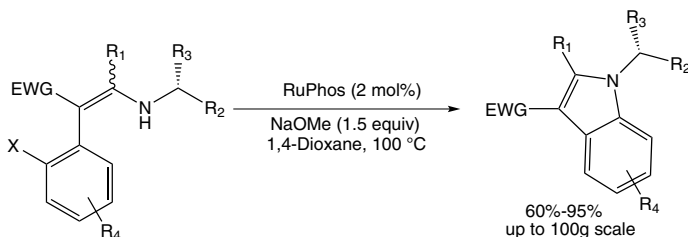
Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (2)



Tech. Note (1)
Ref. (2)



Tech. Note (2)
Ref. (3)

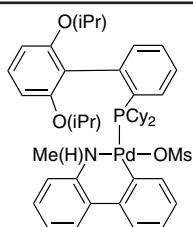
References:

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

46-0395

NEW

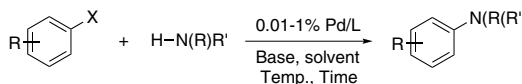
Methanesulfonato(2-dicyclohexylphosphino-2',6'-di-*i*-propoxy-1,1'-biphenyl)(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II), min. 98% [RuPhos Palladacycle Gen. 4] (1599466-85-9)
C₄₄H₅₈NO₅PPdS; FW: 850.40; white powdr.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620 Buchwald Palladacycle Precatalyst Kit 4 (Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4) component.



250mg
1g
5g

Technical Note:

1. Catalyst for the Buchwald-Hartwig Cross-Coupling Reaction



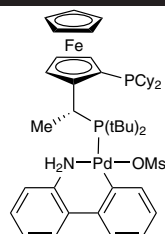
Tech. Note (1)
Ref. (1)

References:

1. *J. Org. Chem.*, **2014**, 79, 4161

PALLADIUM (Compounds)

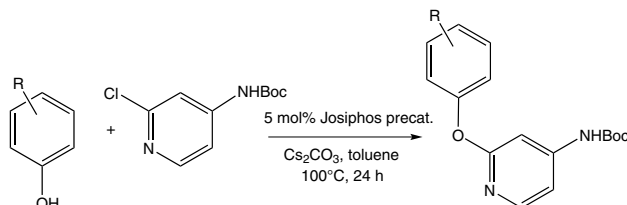
46-0353 Methanesulfonato((R)-(-)-1-[(S)-2-(dicyclohexylphosphino)ferrocenyl]ethyl-di-*t*-butylphosphine)(2'-amino-1,1'-biphenyl-2-yl) palladium(II), min. 98%
[Josiphos Palladacycle Gen. 3] (1702311-34-9)
 $C_{45}H_{65}FeNO_3P_2PdS$; FW: 924.28; red-orange solid
Note: Patents: PCT/US2013/030779, US Serial 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.

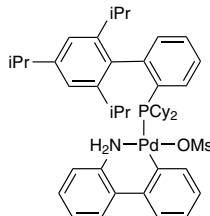


Tech. Note (1)
Ref. (1)

References:

1. *Tetrahedron Lett.*, **2015**, 56, 2329

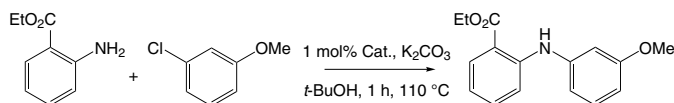
46-0320 Methanesulfonato(2-dicyclohexylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [Xphos Palladacycle Gen. 3] (1445085-55-1)
 $C_{46}H_{62}NO_3PPdS$; FW: 846.45; white to off-white powder.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 2 component.



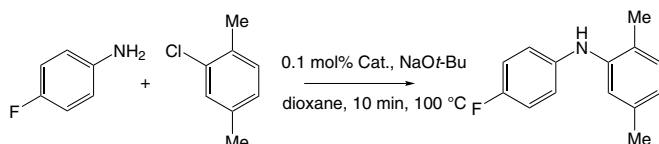
250mg
1g
5g

Technical Notes:

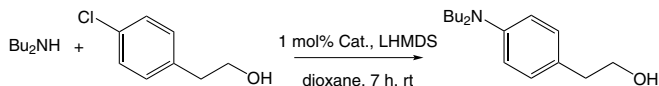
1. Palladium precatalyst for facile C-N cross-coupling reactions.



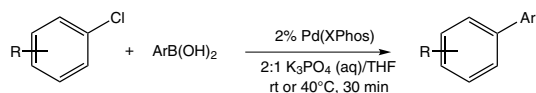
Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (2)

References:

1. *J. Am. Chem. Soc.*, **2008**, 130, 6686
2. *Chem. Sci.*, **2013**, 4, 916

PALLADIUM (Compounds)

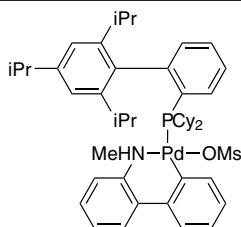
46-0327

NEW

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)

C₄₇H₆₄N₃O₃PPdS; 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.



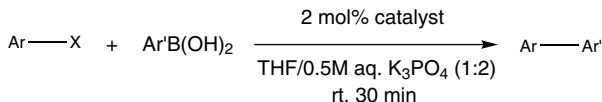
250mg

1g

5g

Technical Note:

1. Palladium catalyst used in the Suzuki-Miyaura coupling of unstable boronic acids



Tech. Note (1)
Ref. (1)

References:

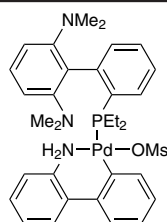
1. *J. Org. Chem.*, **2014**, *79*, 4161

46-0348

NEW

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



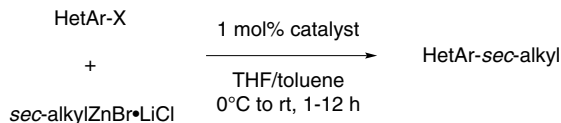
50mg

250mg

1g

Technical Note:

1. Palladium catalyst for the cross-coupling of secondary alkylzinc reagents with heteroaryl halides



Tech. Note (1)
Ref. (1)

*excellent selectivity
for non-rearranged products*

References:

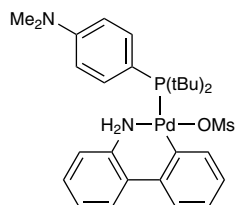
1. *Org. Lett.*, **2014**, *16*, 4638

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)

C₂₉H₄₁N₂O₃PPdS; FW: 635.11; beige to tan powder.
Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.



250mg

1g

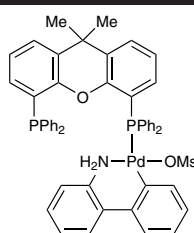
5g

Technical Note:

1. See 15-1242. (visit www.strem.com)

PALLADIUM (Compounds)

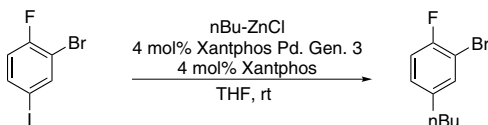
46-0957 Methanesulfonato[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene][2'-amino-1,1'-biphenyl] palladium(II) dichloromethane adduct, min. 98% [Xantphos Palladacycle Gen. 3] (1445085-97-1)
 $C_{52}H_{45}NO_4P_2S$; FW: 948.35; pale yellow powder.
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620.



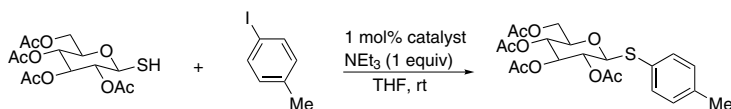
500mg
2g

Technical Notes:

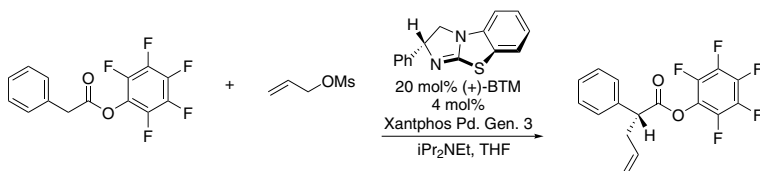
1. Catalyst for the Negishi coupling of aryl halides and alkylzinc reagents.
2. Catalyst for the synthesis of tetraacetylated p-tolyl thioglucose.
3. Cooperative catalyst for the direct asymmetric α -allylation of acyclic esters.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

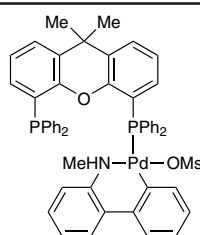


Tech. Note (3)
Ref. (3)

References:

1. *J. Am. Chem. Soc.*, **2014**, 136, 15757.
2. *Chem. Eur. J.*, **2015**, 21, 8375.
3. *J. Am. Chem. Soc.*, **2016**, 138, 5214.

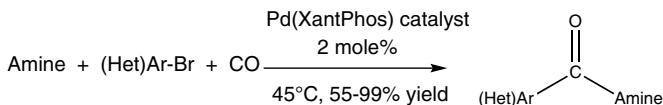
46-0388 Methanesulfonato[9,9-dimethyl-4,5-bis(diphenylphosphino)xanthene][2'-methylamino-1,1'-biphenyl-2-yl]palladium(II), 98% [Xantphos Palladacycle Gen. 4] (1621274-19-8)
 $C_{53}H_{47}NO_4P_2S$; FW: 962.38; yellow solid
 Note: Patents: PCT/US2013/030779, US Serial No. 13/799620. Buchwald Palladacycle Precatalyst Kit 4 (Methanesulfonato-2'-methylamino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4) component.



250mg
1g
5g

Technical Notes:

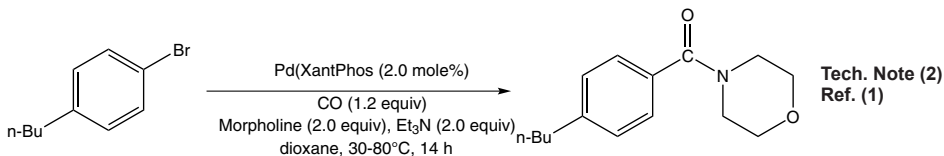
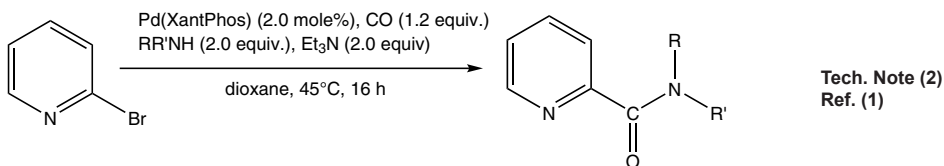
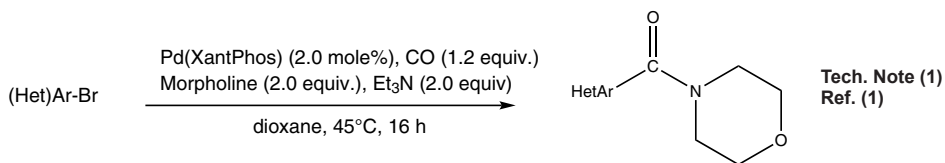
1. Catalyst used for the aminocarbonylation of (hetero)aryl bromides.
2. Catalyst used in the aminocarbonylation of bromopyridine and alkyl-substituted bromobenzene.



Tech. Note (1)
Ref. (1)

PALLADIUM (Compounds)

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)



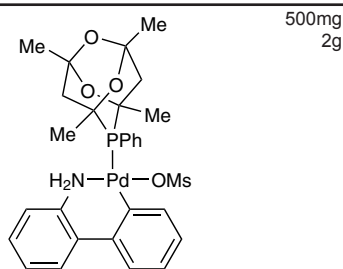
References:

1. *Org. Lett.*, **2014**,**16**, 4296

46-0392

NEW

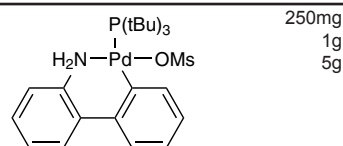
Methanesulfonato(1,3,5,7-tetramethyl-8-phenyl-2,4,6-trioxa-8-phosphaadamantane)(2'-amino-1,1'-biphenyl-2-yl)palladium(II) dichloromethane adduct, min. 98% [MeCgPPh Palladacycle Gen. 3]
C₂₉H₃₄NO₆PPdS·CH₂Cl₂; FW: 662.04;
white to tan powdr.
air sensitive, moisture sensitive
Note: Patents: PCT/US2013/030779,
US Serial No. 13/799620



46-0387

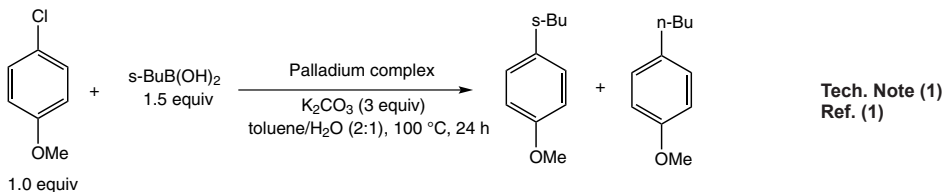
NEW

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.



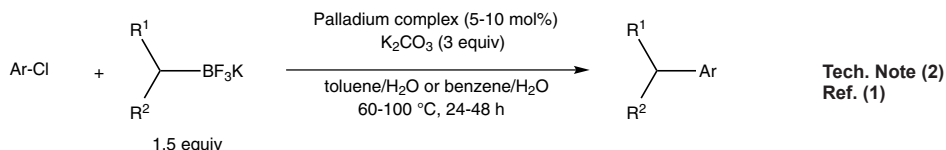
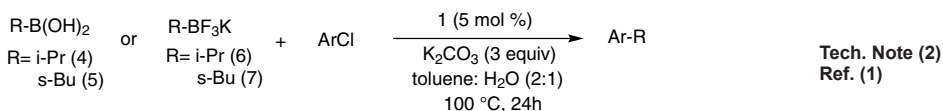
Technical Notes:

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



PALLADIUM (Compounds)

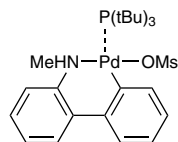
46-0387 Methanesulfonato(tri-*t*-butylphosphino)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), 98%
(continued) [P(*t*-Bu)₃ Palladacycle Gen. 3] (1445086-17-8)



References:

1. *J. Am. Chem. Soc.*, **2014**, 136, 14027

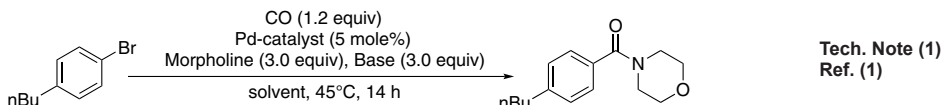
46-0385 Methanesulfonato(tri-*t*-butylphosphino)
(2'-methylamino-1,1'-biphenyl-2-yl)palladium(II),
NEW 98% [P(*t*-Bu)₃ Palladacycle Gen. 4] (1621274-11-0)
C₂₆H₄₂NO₃PPdS; FW: 586.08; tan to yellow powdr.
Note: Patents: PCT/US2013/030779,
US Serial No. 13/799620 Buchwald Palladacycle
Precatalyst Kit 4 (Methanesulfonato-2'-methyl-
amino-1,1'-biphenyl-2-yl- Palladacycles Gen. 4)
component.



250mg
1g
5g

Technical Notes:

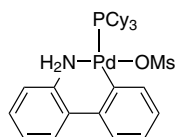
1. Mild Pd-catalyzed aminocarbonylation of (hetero)aryl bromides with a palladacycle precatalyst.



References:

1. *Org. Letters*, **2014**, 16, 4296.

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:

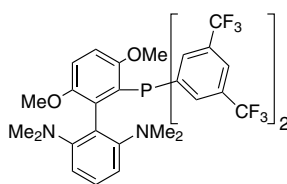
1. *Chem. Sci.*, **2013**, 4, 916

PHOSPHORUS (Compounds)

15-3015

NEW

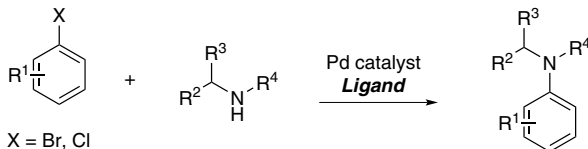
2-[Bis(3,5-trifluoromethylphenylphosphino)-3,6-dimethoxy]-2',6'-dimethylamino-1,1'-biphenyl, 98% (1810068-30-4)
 $C_{34}H_{29}F_{12}N_2O_2P$; FW: 756.56;
 white to off-white pwdr.
 Note: Patents: US 6,395,916, US 6,307,087



100mg
 500mg
 2g

Technical Note:

- Ligand for the Palladium-catalyzed arylation of α -Branched Secondary Amines



X = Br, Cl

References:

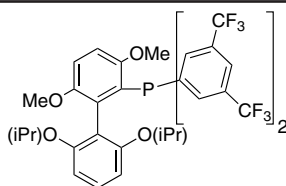
- Angew. Chem. Int. Ed.*, **2015**, 54, 8259

Tech. Note (1)
 Ref. (1)

15-3020

NEW

2-[Bis(3,5-trifluoromethylphenylphosphino)-3,6-dimethoxy]-2',6'-di-*i*-propoxy-1,1'-biphenyl, 98% (1810068-31-5)
 $C_{36}H_{31}F_{12}O_4P$; FW: 786.58;
 white to off-white pwdr.
 Note: Patents: US 6,395,916, US 6,307,087



250mg
 1g
 5g

Technical Note:

- See 15-3015 (page 54)

96-5500

Buchwald Biaryl Phosphine Ligand Master Kit for Aromatic Carbon-Heteroatom Bond Formation, Suzuki Coupling and Negishi Cross-coupling
 See page 79

96-5485

Buchwald Biaryl Phosphine Ligand Mini Kit 1 for Aromatic Carbon-Heteroatom Bond Formation, Suzuki Coupling and Negishi Cross-coupling
 See page 81

96-5490

Buchwald Biaryl Phosphine Ligand Mini Kit 2 for Aromatic Carbon-Heteroatom Bond Formation, Suzuki Coupling and Negishi Cross-coupling
 See page 82

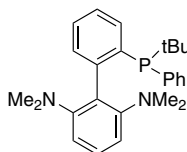
96-5495

Buchwald Biaryl Phosphine Ligand Mini Kit 3 for Aromatic Carbon-Heteroatom Bond Formation, Suzuki Coupling and Negishi Cross-coupling
 See page 83

15-3010

NEW

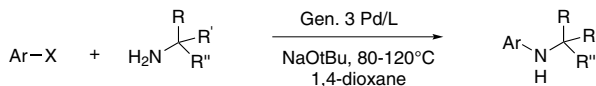
2-(*t*-Butylphenylphosphino)-2',6'-dimethylamino-1,1'-biphenyl, 98% (*t*-Bu)PhCPhos
 (1660153-91-2)
 $C_{26}H_{33}N_2P$; FW: 404.53; white to off-white pwdr.
 Note: Patents: US 6,395,916, US 6,307,087



250mg
 1g
 5g
 25g

Technical Note:

- Ligand for the Palladium-catalyzed Buchwald-Hartwig cross-coupling of hindered primary amines and aryl halides



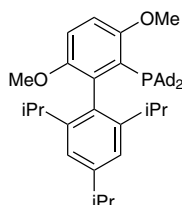
Tech. Note (1)
 Ref. (1)

References:

- J. Am. Chem. Soc.*, **2015**, 137, 3085

PHOSPHORUS (Compounds)

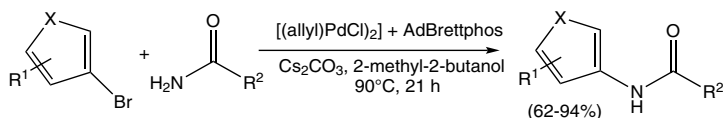
15-1138 **2-(Di-1-adamantylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl, min. 95% AdBrettPhos (1160861-59-5)**
 $C_{43}H_{61}O_2P$; FW: 640.92;
 off-white to pale yellow powdr.
 Note: Buchwald Biaryl Phosphine Ligand Master Kit component. Buchwald Biaryl Phosphine Ligand Mini Kit 1 component. Patents: US 6,395,916, US 6,307,087.



100mg
500mg
2g

Technical Note:

- Ligand used in the palladium-catalyzed amidation of five-membered heterocycles as electrophiles.



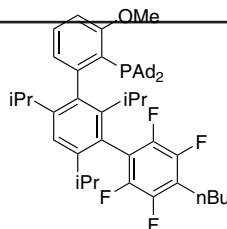
Tech. Note (1)
Ref. (1)

References:

- J. Am. Chem. Soc.*, **2012**, *134*, 19922.

15-2065 **2-(Diadamantylphosphino)-3-methoxy-2',4',6'-tri-*i*-propyl-3'-(2,3,5,6-tetrafluoro-4-butylphenyl)-1,1'-biphenyl, AlPhos (1805783-60-1)**
 $C_{52}H_{67}F_4OP$; FW: 815.06;
 white to yellow powdr.
air sensitive
 Note: Patents: US 6,395,916, US 6,307,087

NEW

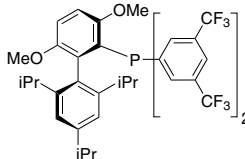


100mg
500mg
2g

Technical Note:

- See 46-0241 (page 25)

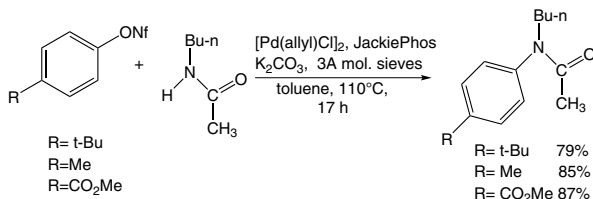
15-1157 **2-Di[3,5-bis(trifluoromethyl)phenyl]phosphino]-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl, min. 98% JackiePhos (1160861-60-8)**
 $C_{39}H_{37}F_{12}O_2P$; FW: 796.66; white xtl.;
 m.p. 185-190°
 Note: Buchwald Biaryl Phosphine Ligand Master Kit component.. Buchwald Biaryl Phosphine Ligand Mini Kit 1 component..
 Patents: US 6,395,916, US 6,307,087.



100mg
500mg
2g
10g

Technical Notes:

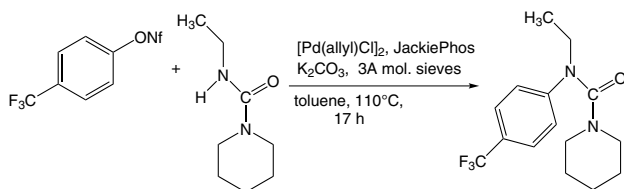
- Ligand used in the Pd-catalyzed coupling of aryl nonaflates and triflates with secondary amides.
- Ligand used in the Pd-catalyzed coupling of aryl nonaflates and triflates with secondary ureas, carbamates, and sulfonamides.
- Ligand used in the Pd-catalyzed coupling of aryl chlorides with secondary amides, carbamates, and sulfonamides.



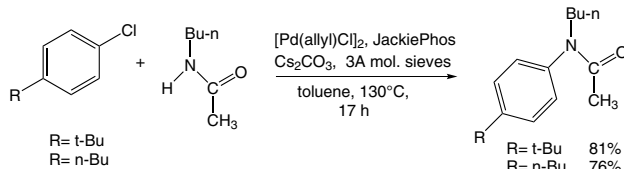
Tech. Note (1)
Ref. (1)

PHOSPHORUS (Compounds)

15-1157 2-Di[3,5-bis(trifluoromethyl)phenylphosphino]-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl, min. 98% JackiePhos (1160861-60-8)



Tech. Note (2)
Ref. (1)

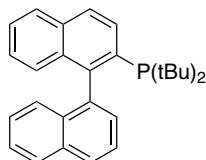


Tech. Note (3)
Ref. (1)

References:

1. *J. Am. Chem. Soc.*, **2009**, *131*, 16720.

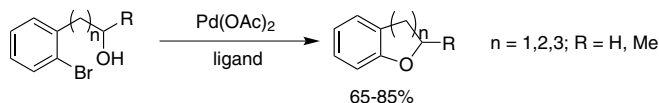
15-1043 **racemic-2-Di-*t*-butylphosphino-1, 1'-binaphthyl, 98% TrixiePhos (255836-67-0)**
 $C_{28}H_{31}P$; FW: 398.53; white xtl.; m.p. 147-149°
 Note: Buchwald Biaryl Phosphine Ligand Master Kit component.. Buchwald Biaryl Phosphine Ligand Mini Kit 2 component.
 Patents: US 6,395,916, US 6,307,087.



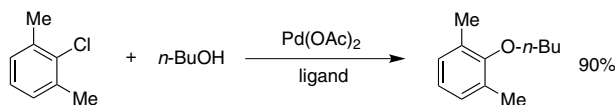
250mg
1g
5g

Technical Notes:

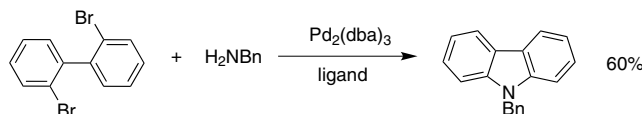
1. Ligand for the Pd-catalyzed formation of oxygen heterocycles.
2. Ligand for the intermolecular Pd-catalyzed synthesis of aryl ethers.
3. Ligand for the intramolecular Pd-catalyzed synthesis of aryl ethers.
4. Ligand for the synthesis of carbazoles by Pd-catalyzed double N-arylation reaction.
5. Ligand for the Pd-catalyzed cyanation of (hetero)arylchlorides.
6. Ligand for the Pd-catalyzed intramolecular synthesis of carbazoles via C-H functionalization.



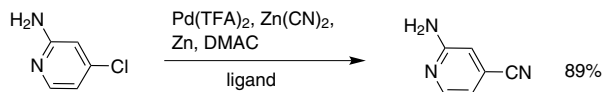
Tech. Note (1)
Ref. (1)



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



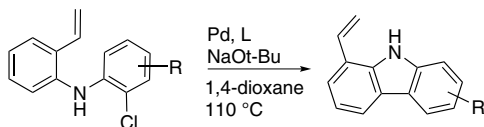
Tech. Note (4)
Ref. (4)



Tech. Note (5)
Ref. (5)

PHOSPHORUS (Compounds)

15-1043 racemic-2-Di-t-butylphosphino-1, 1'-binaphthyl, 98% TrixiePhos (255836-67-0)
(continued)



Tech. Note (6)
Ref. (6)

References:

1. *J. Am. Chem. Soc.*, **2000**, 122, 12907.
2. *J. Am. Chem. Soc.*, **2001**, 123, 10770.
3. *J. Am. Chem. Soc.*, **2001**, 123, 12202.
4. *Tetrahedron*, **2006**, 62, 6792.
5. *Org. Lett.*, **2007**, 9, 1711.
6. *J. Am. Chem. Soc.*, **2010**, 132, 14048.
7. *Chem. Sci.*, **2011**, 2, 27-50.

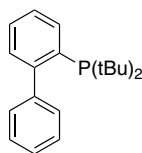
15-1045 2-(Di-t-butylphosphino))-1,1'-biphenyl, 99%
JohnPhos (224311-51-7)

C₂₀H₂₇P; FW: 298.41; white xtl.; m.p. 85°

Note: Phosphine Ligand Kit component. Note:

Buchwald Biaryl Phosphine Ligand Master Kit component. Buchwald Biaryl Phosphine Ligand Mini

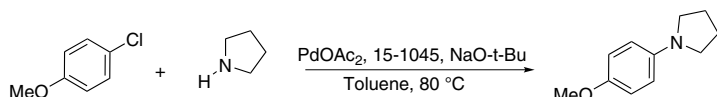
Kit 2 component. Patents: US 6,395,916, US 6,307,087.



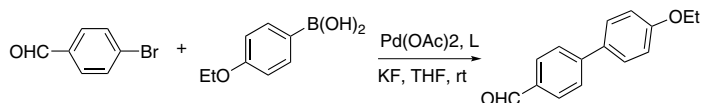
500mg
2g
10g
50g

Technical Notes:

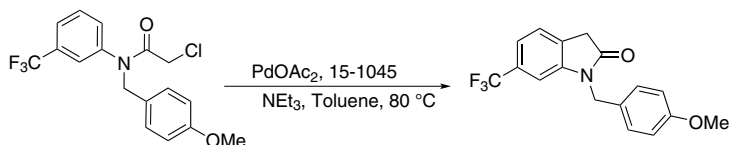
1. Ligand used in the palladium-catalyzed synthesis of aromatic amines from aryl chlorides, bromides and triflates.
2. Ligand employed in a very active and general catalyst for Suzuki coupling reactions using aryl chlorides, bromides and triflates.
3. Ligand used in palladium-catalyzed synthesis of oxindoles from α -chloroacetanilides.
4. Effective ligand used in palladium-catalyzed arylation of thiazoles.
5. Used in the formation of 2-benzylindolines via sequential palladium-catalyzed N-arylation/cyclization/C-arylation.
6. Selective in the palladium-catalyzed arylation of silyl enol ethers formed from copper-catalyzed reduction of enones.
7. Ligand used in the palladium-catalyzed vinylation of aryl bromides.
8. Ligand used in the platinum-catalyzed synthesis of indolizines.
9. Ligand used in the palladium-catalyzed diarylation of thiophenes.
10. Ligand used in the amination of vinyl halides by carbazates.
11. Ligand used in the regioselective synthesis of 2,4-disubstituted syloles.
12. Ligand used in the gold-catalyzed hydrophenoxylation of phenols with diphenylacetylene.
13. Ligand used in the palladium-catalyzed tandem allenyl and aryl C-N bond formation.
14. Ligand used in the copper-catalyzed electrophilic amination of arylsilanes with hydroxylamines.



Tech. Note (1)
Ref. (2)



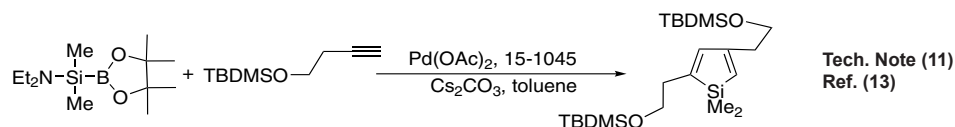
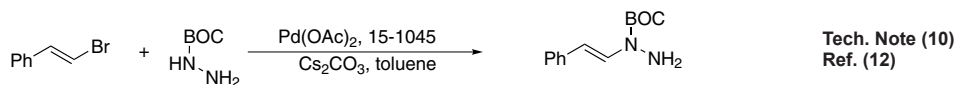
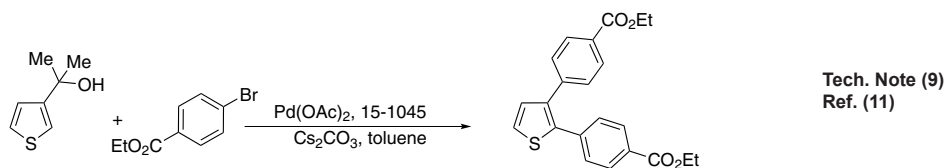
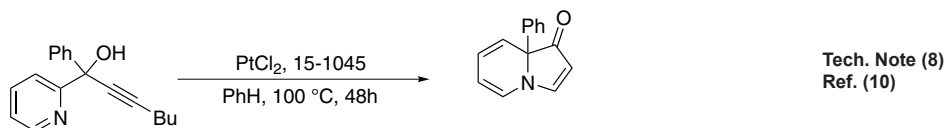
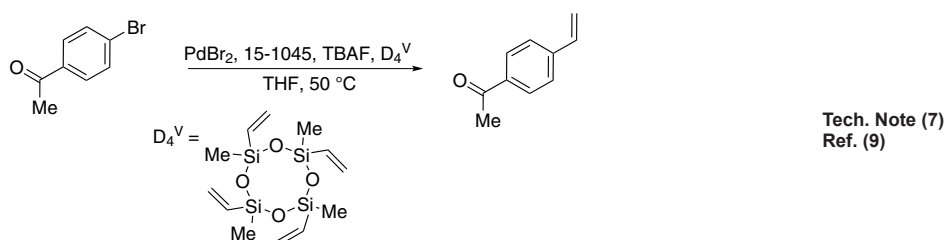
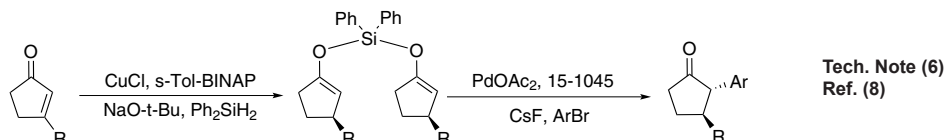
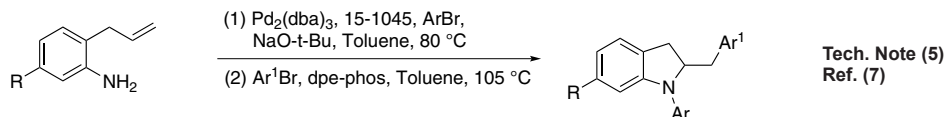
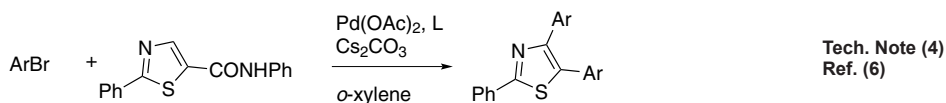
Tech. Note (2)
Ref. (3)



Tech. Note (3)
Ref. (4-5)

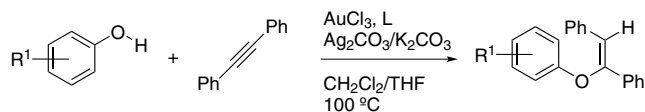
PHOSPHORUS (Compounds)

15-1045 2-(Di-*t*-butylphosphino))-1,1'-biphenyl, 99% JohnPhos (224311-51-7)
(continued)

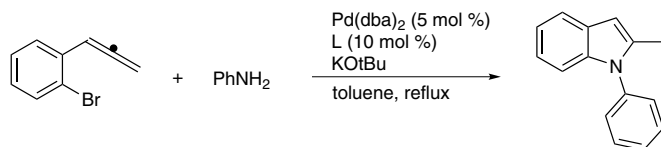


PHOSPHORUS (Compounds)

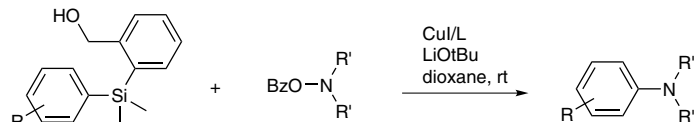
15-1045 2-(Di-*t*-butylphosphino))-1,1'-biphenyl, 99% JohnPhos (224311-51-7)
(continued)



Tech. Note (12)
Ref. (14)



Tech. Note (13)
Ref. (16)

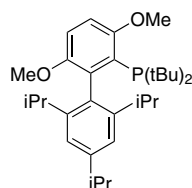


Tech. Note (14)
Ref. (17)

References:

1. *Angew. Chem. Int. Ed.*, **1999**, 38, 2413.
2. *J. Org. Chem.*, **2000**, 65, 1158.
3. *J. Am. Chem. Soc.*, **1999**, 121, 9550.
4. *J. Am. Chem. Soc.*, **2003**, 125, 12084.
5. *Org. Process Res. Dev.*, **2012**, 16, 255
6. *Tetrahedron*, **2003**, 59, 5685.
7. *J. Am. Chem. Soc.*, **2004**, 126, 13906.
8. *Org. Lett.*, **2004**, 6, 4809.
9. *Org. Lett.*, **2006**, 7, 63.
10. *Org. Lett.*, **2007**, 9, 1169.
11. *J. Org. Chem.*, **2006**, 71, 8309.
12. *Org. Lett.*, **2007**, 9, 275.
13. *J. Am. Chem. Soc.*, **2008**, 130, 1526.
14. *J. Org. Chem.*, **2010**, 75, 2247.
15. *Chem. Sci.*, **2011**, 2, 27-50.
16. *Org. Lett.*, **2012**, 14, 4398.
17. *Org. Lett.*, **2013**, 15, 172.

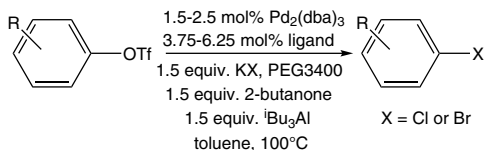
15-1164 2-(Di-*t*-butylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl, min. 98% t-BuBrettPhos (1160861-53-9)
C₃₁H₄₉O₂P; FW: 484.69; white xtl.
Note: Buchwald Biaryl Phosphine Ligand Master Kit component.. Buchwald Biaryl Phosphine Ligand Mini Kit 1 component.. Patents: US 6,395,916, US 6,307,087.



100mg
500mg
2g
10g
50g

Technical Notes:

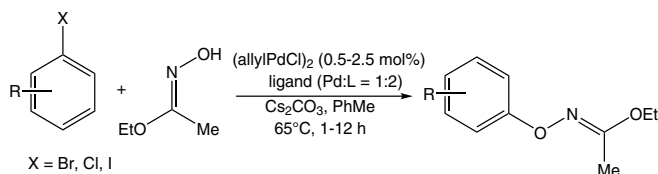
1. Ligand used in the Pd-catalyzed conversion of aryl and vinyl triflates to bromides and chlorides.
2. Ligand used in the Pd-catalyzed O-arylation of ethyl acetohydroximates.
3. Ligand used in the Pd-catalyzed conversion of aryl chlorides, triflates, and nonaflates to nitroaromatics.
4. Ligand used in the Pd-catalyzed cross-coupling of amides and aryl mesylates.



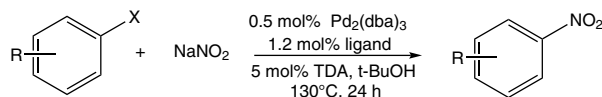
Tech. Note (1)
Ref. (1)

PHOSPHORUS (Compounds)

15-1164 **2-(Di-*t*-butylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl, min. 98%**
(continued) **t-BuBrettPhos (1160861-53-9)**

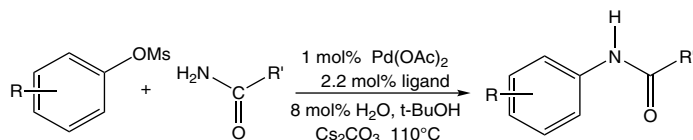


Tech. Note (2)
Ref. (2)



X = Cl, triflate, nonaflates

Tech. Note (3)
Ref. (3)

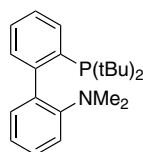


Tech. Note (4)
Ref. (4)

References:

1. *J. Am. Chem. Soc.*, **2010**, 132, 14076.
2. *J. Am. Chem. Soc.*, **2010**, 132, 9990.
3. *J. Am. Chem. Soc.*, **2009**, 131, 12898.
4. *Org. Lett.*, **2010**, 12(10), 2350.

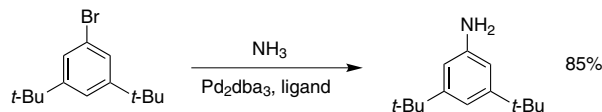
15-1048 **2-Di-*t*-butylphosphino-2'-(*N,N*-dimethylamino))-1,1'-bi-phenyl, 98% tBuDavePhos (224311-49-3)**
 $(\text{CH}_3)_2\text{NC}_6\text{H}_4\text{C}_6\text{H}_4\text{P}(\text{C}_4\text{H}_9)_2$; FW: 341.47; white xtl.
 Note: Buchwald Biaryl Phosphine Ligand Master Kit component.. Buchwald Biaryl Phosphine Ligand Mini Kit 2 component.. Patents: US 6,395,916, US 6,307,087.



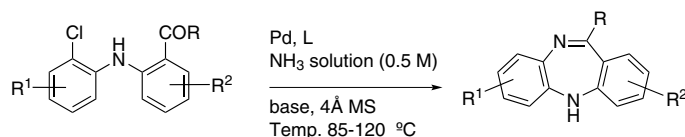
500mg
 2g
 10g

Technical Notes:

1. Useful ligand for Pd-catalyzed carbon-oxygen bond forming reactions.
2. Ligand used selective Pd-catalyzed arylation of ammonia. Application to the synthesis of dibenzodiazepines.
3. Ligand used for selective Pd-catalyzed silylation of aryl chlorides.
4. Ligand used for Pd(0)-catalyzed direct dehydrative coupling of terminal alkynes with allylic alcohols to access 1,4-enynes.



Tech. Note (2)
Ref. (2)



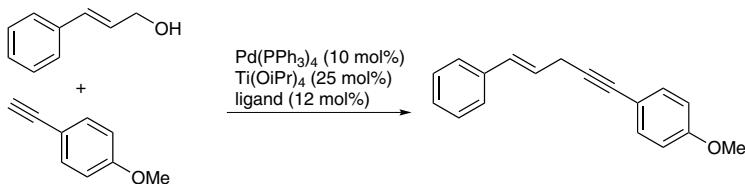
Tech. Note (2)
Ref. (3)



Tech. Note (3)
Ref. (4)

PHOSPHORUS (Compounds)

15-1048 **2-Di-t-butylphosphino-2'-(N,N-dimethylamino)-1,1'-biphenyl, 98% tBuDavePhos**
(continued) (224311-49-3)

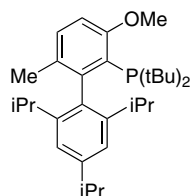


Tech. Note (4)
Ref. (6)

References:

1. *J. Am. Chem. Soc.*, **2001**, 123, 12202.
2. *J. Am. Chem. Soc.*, **2007**, 129, 10354.
3. *J. Am. Chem. Soc.*, **2011**, 133, 14228.
4. *Org. Lett.*, **2007**, 9, 3785.
5. *Chem. Sci.*, **2011**, 2, 27.
6. *J. Am. Chem. Soc.*, **2013**, 135, 12536.

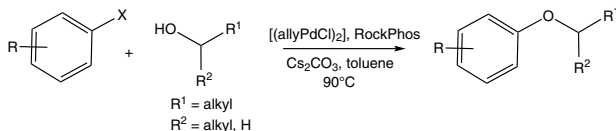
15-1168 **2-(Di-t-butylphosphino)-3-methoxy-6-methyl-2',4',6'-tri-i-propyl-1,1'-biphenyl, min. 98% RockPhos (1262046-34-3)**
 $\text{C}_{31}\text{H}_{49}\text{OP}$; FW: 468.69; white xtl.; m.p. 129-130°
Note: Patents: US 6,395,916, US 6,307,087.



100mg
500mg
2g

Technical Note:

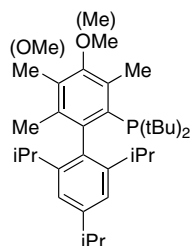
1. Ligand used in the palladium-catalyzed C-O bond forming reactions of secondary and primary alcohols with a range of arylhalides. Heterocyclic halides and, for the first time, electron-rich aryl halides can be coupled with secondary alcohols.



References:

1. *Angew. Chem. Int. Ed.*, **2011**, 50, 9943.

15-1063 **2-Di-t-butylphosphino-4-methoxy-3,5,6-trimethyl-2',4',6'-tri-i-propyl-1,1'-biphenyl, min. 98% [~1:1 mixture with regioisomer, 2-Di-t-butylphosphino-5-methoxy-3,4,6-trimethyl-2',4',6'-tri-i-propylbiphenyl] (1359986-21-2)**
 $\text{C}_{33}\text{H}_{53}\text{OP}$; FW: 496.75; white powdr.
Note: Patents: US 6,395,916, US 6,307,087



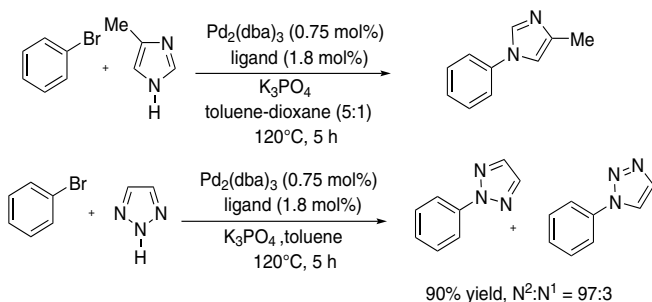
250mg
1g
5g

Technical Note:

1. A surrogate ligand for Me4tBuXPhos in palladium-catalyzed C-N and C-O bond-forming reactions.

PHOSPHORUS (Compounds)

15-1063 **2-Di-t-butylphosphino-4-methoxy-3,5,6-trimethyl-2',4',6'-tri-i-propyl-1,1'-biphenyl, min.**
(continued) **98%** [~1:1 mixture with regioisomer, **2-Di-t-butylphosphino-5-methoxy-3,4,6-trimethyl-2',4',6'-tri-i-propylbiphenyl**] (1359986-21-2)

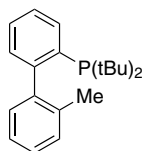


Tech. Note (1)
Ref. (1)

References:

1. *J. Org. Chem.*, **2012**, 77, 2543.

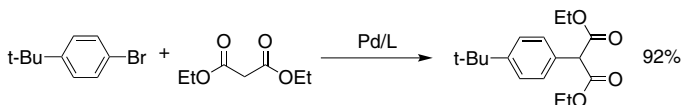
15-1049 **2-Di-t-butylphosphino-2'-methyl-1,1'-biphenyl, 99%**
t-BuMePhos (255837-19-5)
 C₂₁H₂₉P; FW: 312.43; white xtl.
 Note: Buchwald Biaryl Phosphine Ligand Master Kit component.. Buchwald Biaryl Phosphine Ligand Mini Kit 2 component.. Patents: US 6,395,916, US 6,307,087.



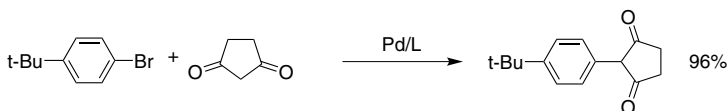
500mg
2g
10g
50g

Technical Notes:

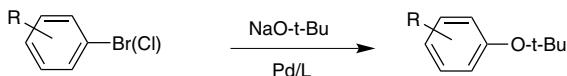
1. Ligand used in the Pd-catalyzed arylations of malonate esters and 1,3-diketones.
2. Ligand used in the Pd-catalyzed formation of t-butyl ethers from unactivated aryl halides.
3. Ligand used in the Pd-catalyzed α-arylations of nitroalkanes.



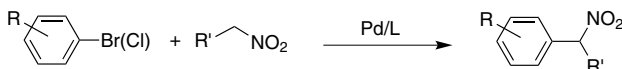
Tech. Note (1)
Ref. (1)



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



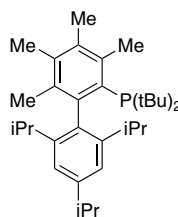
Tech. Note (3)
Ref. (3)

References:

1. *J. Am. Chem. Soc.*, **2000**, 122, 1360.
2. *J. Org. Chem.*, **2001**, 66, 2498.
3. *J. Org. Chem.*, **2002**, 67, 106.
4. *Chem. Sci.*, **2011**, 2, 27-50.

PHOSPHORUS (Compounds)

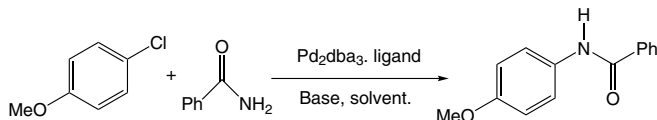
15-1051 **2-Di-t-butylphosphino-3,4,5,6-tetramethyl-2',4',6'-tri-i-propyl-1,1'-biphenyl, min. 98%**
Me₄ t-BuXPhos (857356-94-6)
 C₃₃H₅₃P; FW: 480.75; white microxtl.; m.p. 166-168°
 Note: Buchwald Biaryl Phosphine Ligand Master Kit component.. Buchwald Biaryl Phosphine Ligand Mini Kit 1 component.. Patents: US 6,395,916, US 6,307,087.



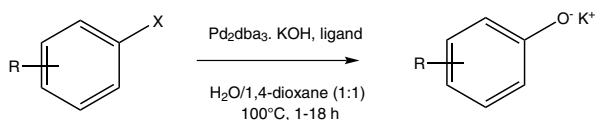
250mg
1g
5g
25g

Technical Notes:

1. Ligand for the palladium-catalyzed amidation of aryl chlorides.
2. Ligand for the palladium-catalyzed synthesis of phenols from aryl halides.
3. Ligand for the palladium-catalyzed coupling of aryl halides and secondary alcohols.

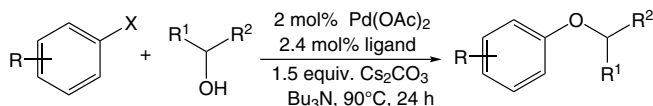


Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

X = Br, Cl

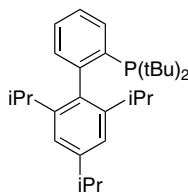


Tech. Note (3)
Ref. (3)

References:

1. *J. Am. Chem. Soc.*, **2007**, 129, 13001.
2. *J. Am. Chem. Soc.*, **2006**, 128, 10894.
3. *J. Am. Chem. Soc.*, **2005**, 127, 8146.

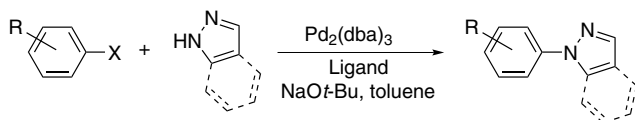
15-1052 **2-Di-t-butylphosphino-2',4',6'-tri-i-propyl-1,1'-biphenyl, min. 98% t-BuXPhos (564483-19-8)**
 C₂₉H₄₅P; FW: 424.64; white xtl.; m.p. 147-149°
 Note: Buchwald Biaryl Phosphine Ligand Master Kit component.. Buchwald Biaryl Phosphine Ligand Mini Kit 1 component.. Patents: US 6,395,916, US 6,307,087.



500mg
2g
10g
50g
250g

Technical Notes:

1. Effective ligand for the Pd-catalyzed arylation of pyrazoles, indazoles and amino heterocycles.
2. Ligand used in the Pd-catalyzed synthesis of phenols from aryl halides and KOH.
3. Ligand used in the Pd-catalyzed of benzoic acids from aryl halides and CO₂.
4. Ligand used in the Pd-catalyzed trifluoromethylation of vinyl sulfonates.
5. Ligand used in the Pd-catalyzed arylation of nitroacetates.
6. Ligand used in the Pd-catalyzed Suzuki-Miyaura cross-coupling of allylboronates and aryl halides.
7. Ligand used in the Pd-catalyzed cyanation of (hetero)arylchlorides and bromides.
8. Ligand used in the Pd-catalyzed C-N cross coupling of sulfonamides and aryl halides.
9. Ligand used in the Pd-catalyzed arylation of cyanamides.



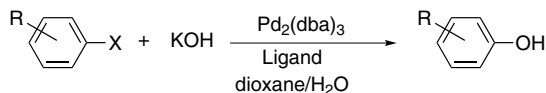
Tech. Note (1)
Ref. (1)

PHOSPHORUS (Compounds)

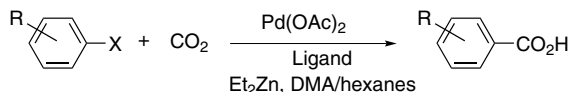
15-1052

2-Di-t-butylphosphino-2',4',6'-tri-*i*-propyl-1,1'-biphenyl, min. 98% t-BuXPhos (564483-19-8)

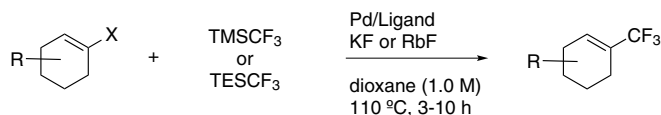
(continued)



Tech. Note (2)
Ref. (2)

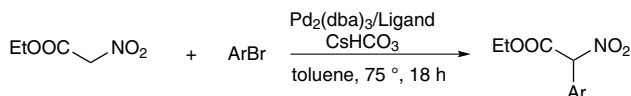


Tech. Note (3)
Ref. (3)

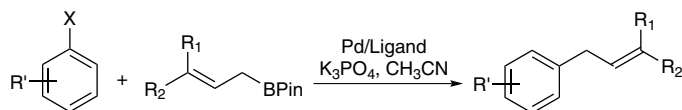


Tech. Note (4)
Ref. (4)

X = OTf or ONf

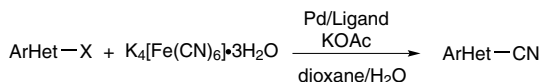


Tech. Note (5)
Ref. (5,6)

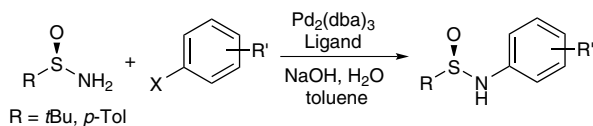


Tech. Note (6)
Ref. (7)

X = Cl, Br, OTf

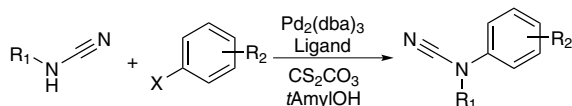


Tech. Note (7)
Ref. (8)



Tech. Note (8)
Ref. (9)

R = *t*Bu, *p*-Tol



Tech. Note (9)
Ref. (10)

References:

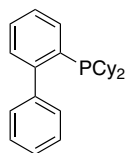
1. *Angew. Chem., Int. Ed.*, **2006**, 45, 6523.
2. *J. Am. Chem. Soc.*, **2006**, 128, 10694.
3. *J. Am. Chem. Soc.*, **2009**, 131, 15974.
4. *Org. Lett.*, **2011**, 13, 6552.
5. *Chem. Sci.*, **2011**, 2, 27-50.
6. *Org. Lett.*, **2012**, 14, 760.
7. *J. Am. Chem. Soc.*, **2013**, 135, 10642.
8. *Angew. Chem., Int. Ed.*, **2013**, 52, 10035.
9. *J. Org. Chem.*, **2012**, 77, 4454.
10. *Org. Lett.*, **2012**, 14, 322.

PHOSPHORUS (Compounds)

15-1140

2-(Dicyclohexylphosphino))-1,1'-biphenyl, 98%**CyJohnPhos (247940-06-3)**C₂₄H₃₁P; FW: 350.49; white xtl.; m.p. 103°

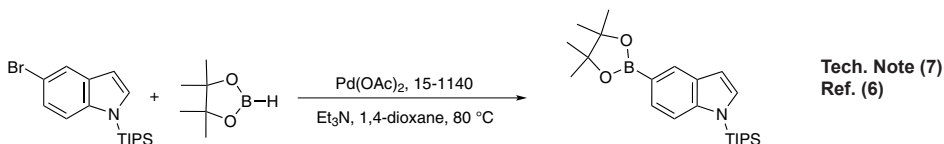
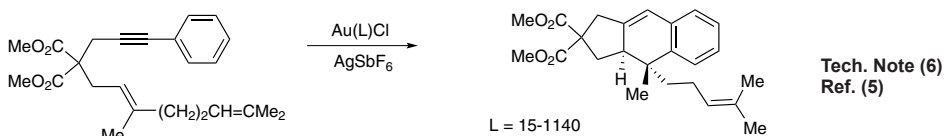
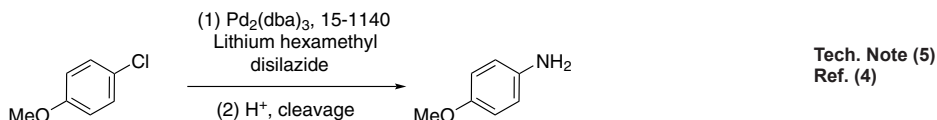
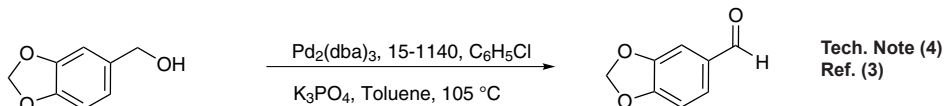
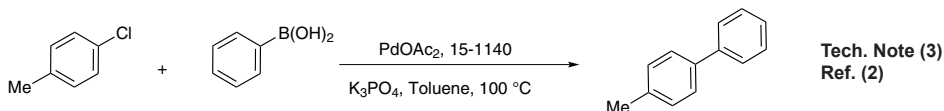
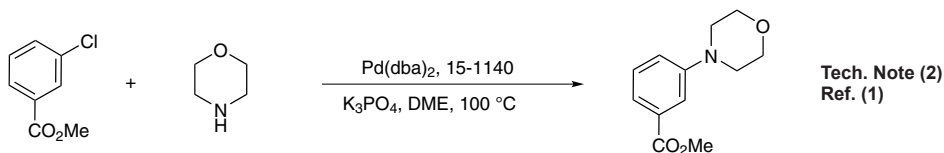
Note: Buchwald Biaryl Phosphine Ligand Master Kit component.. Buchwald Biaryl Phosphine Ligand Mini Kit 2 component.. Patents: US 6,395,916, US 6,307,087.



1g
5g
25g
100g

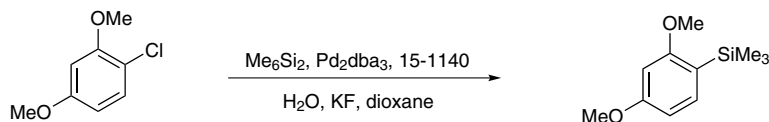
Technical Notes:

1. See 15-1045.
2. Ligand used in the palladium-catalyzed synthesis of aromatic amines from aryl chlorides, bromides & triflates.
3. Ligand employed in Suzuki coupling reactions involving aryl chlorides, bromides and triflates.
4. Useful ligand for the Pd-catalyzed oxidation of alcohols in the presence of chlorobenzenes.
5. Useful ligand for the Pd-catalyzed amination with ammonia equivalents
6. Ligand for the gold(I)-catalyzed intramolecular [4+2] cycloadditions involving 1,3-enynes and arylalkynes with alkenes
7. Ligand used in the palladium-catalyzed borylation of aryl bromides.
8. Ligand used in the palladium-catalyzed silylation of aryl chlorides.



PHOSPHORUS (Compounds)

15-1140 2-(Dicyclohexylphosphino))-1,1'-biphenyl, 98% CyJohnPhos (247940-06-3)
(continued)

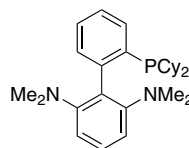


Tech. Note (8)
Ref. (7)

References:

1. *J. Org. Chem.*, **2000**, 65, 1158.
2. *J. Am. Chem. Soc.*, **1999**, 121, 9550.
3. *Org. Lett.*, **2003**, 5, 2485.
4. *Org. Lett.*, **2001**, 3, 3417.
5. *J. Am. Chem. Soc.*, **2005**, 127, 6178.
6. *Helv. Chim. Acta.*, **2006**, 89, 936.
7. *Org. Lett.*, **2007**, 9, 3785.
8. *Chem. Sci.*, **2011**, 2, 27.

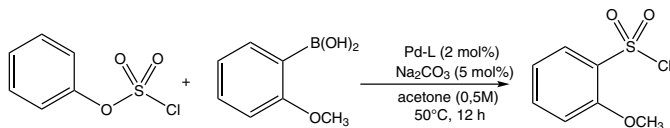
15-1147 2-Dicyclohexylphosphino-2',6'-bis(dimethylamino)-1,1'-biphenyl, min. 98% CPhos (1160556-64-8)
C₂₈H₄₁N₂P; FW: 436.61; yellow-orange xtl.;
m.p. 111-113°
Note: Patents: US 6,395,916, US 6,307,087



250mg
1g
5g

Technical Note:

1. Preparation of aryl sulfonamides via palladium-catalyzed chlorosulfonylation of arylboronic acids.

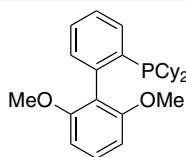


Tech. Note (1)
Ref. (1)

References:

1. *J. Am. Chem. Soc.*, **2013**, 135, 10638.

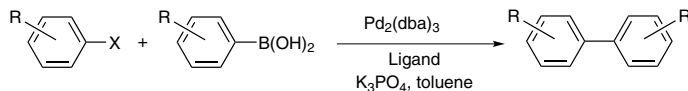
15-1143 2-Dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl, min. 98% SPhos (657408-07-6)
C₂₈H₃₅O₂P; FW: 410.53; white xtl.; m.p. 164-166°
Note: Buchwald Biaryl Phosphine Ligand Master Kit component. Buchwald Biaryl Phosphine Ligand Mini Kit 1 component. Patents: US 6,395,916, US 6,307,087.



500mg
2g
10g
50g

Technical Notes:

1. Ligand/palladium catalyst for general Suzuki-Miyaura cross-coupling reactions.
2. Ligand/palladium catalyst for the Suzuki-Miyaura coupling of aryltrifluoroborates with aryl chlorides.
3. Ligand/palladium catalyst for the Suzuki-Miyaura reaction of heteroaryl halides and heteroaryl boronic acids and esters.
4. Ligand/palladium catalyst for the Kumada-Corriu cross-coupling reaction.
5. Ligand/palladium catalyst for the borylation of aryl halides with pinacol borane.
6. Suzuki couplings involving amino acids. Synthesis of biaryl derivatives of 4-hydroxyphenyl glycine, tyrosine and tryptophan.
7. Synthesis of substituted adamantylzinc reagents using Mg-insertion in the presence of zinc chloride.
8. Highly efficient catalyst for the palladium-catalyzed Suzuki-Miyaura reaction of heteroaryl halides and heteroaryl boronic acids and esters.



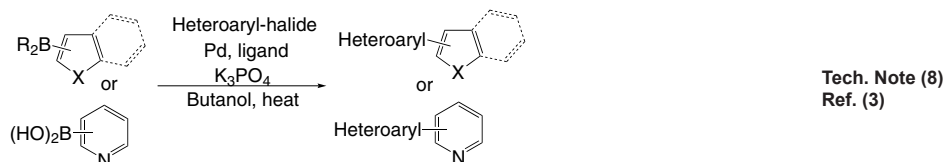
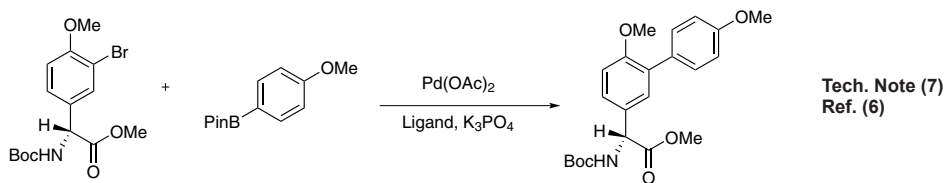
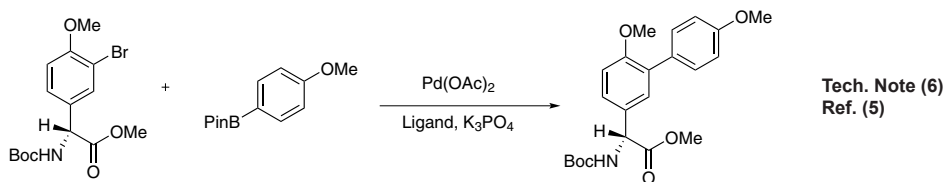
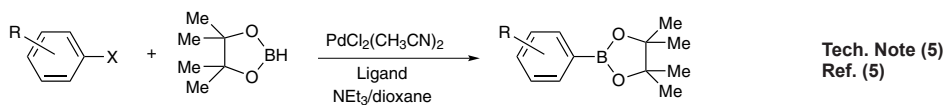
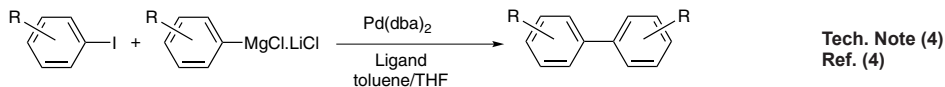
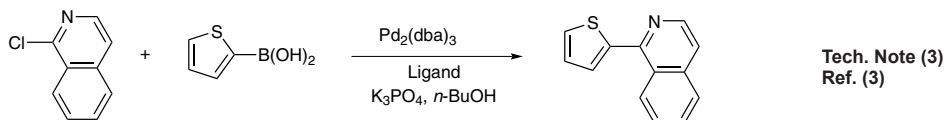
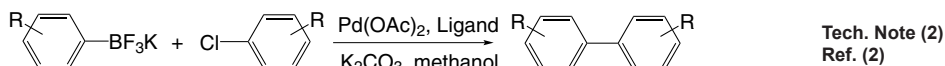
Tech. Note (1)
Ref. (1)

PHOSPHORUS (Compounds)

15-1143

2-Dicyclohexylphosphino-2',6'-dimethoxy-1,1'-biphenyl, min. 98% SPhos (657408-07-6)

(continued)

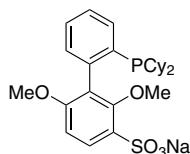


References:

1. *Angew. Chem., Int. Ed.*, **2004**, 43, 1871.
2. *Org. Lett.*, **2004**, 6, 2649.
3. *J. Am. Chem. Soc.*, **2007**, 129, 3358.
4. *J. Am. Chem. Soc.*, **2008**, 129, 3844.
5. *J. Org. Chem.*, **2008**, 73, 5589.
6. *Org. Lett.*, **2014**, 16, 2418.

PHOSPHORUS (Compounds)

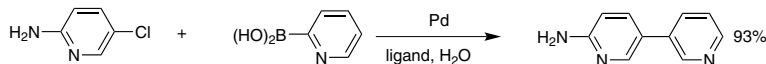
15-1142 **2'-(Dicyclohexylphosphino)-2,6-dimethoxy-3-sulfonato-1,1'-biphenyl hydrate sodium salt (water soluble SPhos), min. 98% (1049726-96-6)**
 $C_{26}H_{34}NaO_5PS \cdot XH_2O$; FW: 512.58; light yellow solid
 Note: Water soluble version of 15-1143 S-Phos.
 Buchwald Biaryl Ligand Master Kit component.
 Patents: US 6,395,916 and US 6,307,087.



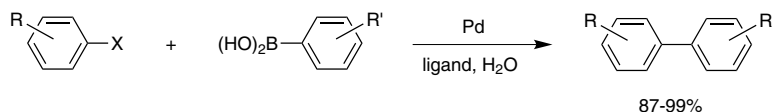
500mg
2g
10g

Technical Note:

- General ligand for the Pd-catalyzed Suzuki-Miyaura coupling reaction of aryl chlorides and for the coupling of challenging substrate combinations in water.



Tech. Note (1)
Ref. (1)

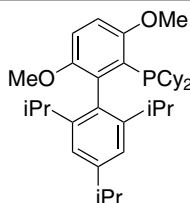


Tech. Note (1)
Ref. (1)

References:

- Angew. Chem. Int. Ed.*, **2005**, 44, 6173.

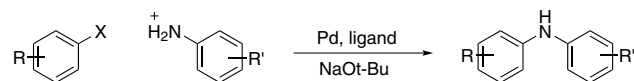
15-1152 **2-(Dicyclohexylphosphino)-3,6-dimethoxy-2',4',6'-tri-*i*-propyl-1,1'-biphenyl, min. 98% BrettPhos (1070663-78-3)**
 $C_{36}H_{53}O_2P$; FW: 536.77; white xtl.; m.p. 191-193°
 Note: Buchwald Biaryl Phosphine Ligand Master Kit component.. Buchwald Biaryl Phosphine Ligand Mini Kit 1 component.. Patents: US 6,395,916, US 6,307,087.



250mg
1g
5g
25g
100g

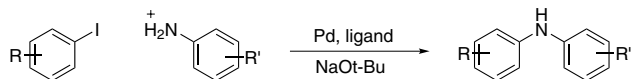
Technical Notes:

- Versatile Ligand for the Pd-catalyzed coupling of primary arylamines and alkylamines. (a) See also 46-0367, 46-0267. (b) See references 7,8.
- Ligand for palladium-catalyzed cross-coupling reactions using aryl mesylates with electron-deficient anilines.
- Ligand for palladium-catalyzed cross-coupling of primary arylamines at low catalyst loading.
- Ligand for palladium-catalyzed cross-coupling of aryl iodides and primary amines.
- Ligand for the Suzuki-Miyaura coupling of tosylates and mesylates.
- Ligand for the palladium-catalyzed trifluoromethylation of aryl chlorides.
- Ligand for the palladium-catalyzed formation of aryl-SCF₃ compounds from aryl bromides.
- Ligand for the nickel-catalyzed cross-coupling of styrenyl epoxides with boronic acids.
- Ligand for the palladium-catalyzed intramolecular CH difluoroalkylation.

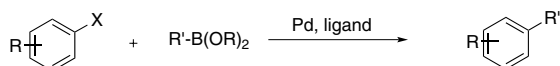


Tech. Note (2,3)
Ref. (1)

X = Cl, OMs



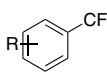
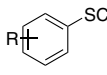
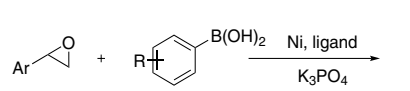
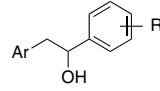
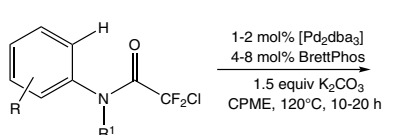
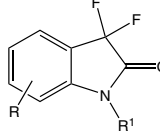
Tech. Note (4)
Ref. (2)



Tech. Note (5)
Ref. (3)

X = OMs, OTs
R' = Ar, HetAr, Vinyl

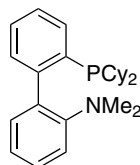
PHOSPHORUS (Compounds)

15-1152 (continued)	2-(Dicyclohexylphosphino)-3,6-dimethoxy-2',4',6'-tri-<i>i</i>-propyl-1,1'-biphenyl, min. 98% BrettPhos (1070663-78-3)		
			Tech. Note (6) Ref. (4)
			Tech. Note (7) Ref. (5)
			Tech. Note (8) Ref. (6)
			Tech. Note (9) Ref. (9)

References:

1. *J. Am. Chem. Soc.*, **2008**, *130*, 13552.
2. *J. Am. Chem. Soc.*, **2009**, *131*, 5766.
3. *Org. Lett.*, **2009**, *11*, 3954.
4. *Science*, **2010**, *328*, 1679
5. *Angew. Chem, Int. Edit.*, **2011**, *50*, 7312.
6. *Angew. Chem, Int. Edit.*, **2011**, *50*, 6056.
7. *Chem. Sci.*, **2011**, *2*, 27.
8. *Chem. Sci.*, **2011**, *2*, 57.
9. *Angew. Chem, Int. Edit.*, **2014**, *53*, 1.

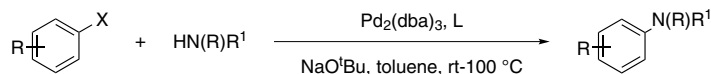
15-1145 **2-(Dicyclohexylphosphino)-2'-(*N,N*-dimethylamino)-1,1'-biphenyl, 98% DavePhos (213697-53-1)**
 C₂₆H₃₆NP; FW: 393.55; white xtl.; m.p. 115-119°
 Note: Buchwald Biaryl Phosphine Ligand Master Kit component. Buchwald Biaryl Phosphine Ligand Mini Kit 2 component. Patents: US 6,395,916, US 6,307,087.



500mg
2g
10g
50g

Technical Notes:

1. Ligand used in the Pd-catalyzed Suzuki coupling and arylation of unactivated aryl chlorides. The reactions generally occur at room temperature and give high yields of product.
2. Ligand used in Pd-catalyzed C-N bond formation. A general synthesis of N₆-aryl-2'-deoxyadenosine analogues.
3. Ligand used in Pd-catalyzed N-arylation of indoles.
4. Ligand used in Pd-catalyzed synthesis of aryl-tert-butyl ethers.
5. Effective ligand in the Pd-catalyzed arylation of ester enolates.
6. Ligand employed in arylation of ketone enolates using ortho-halo nitrobenzenes.
7. Ligand employed in the amination of aryl nonaflates using Pd catalysts.
8. Ligand used for cascade alkenyl amination/Heck reaction for the synthesis of indoles
9. Ligand used in Pd-catalyzed Kumada-Corriu cross coupling at low temperatures
10. Ligand used in Rh-catalyzed intramolecular hydroamination of unactivated terminal and internal alkenes with primary and secondary amines.
11. Ligand used in Au-catalyzed cycloisomerization of allenes.

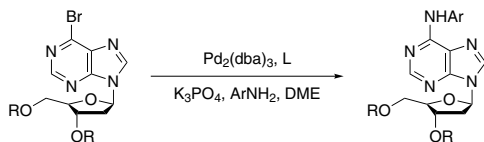


Tech. Note (1)
Ref. (1)

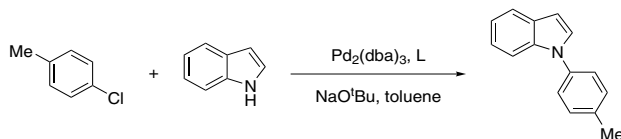
PHOSPHORUS (Compounds)

15-1145
(continued)

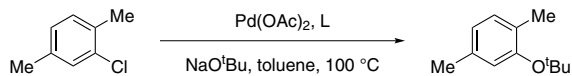
2-(Dicyclohexylphosphino)-2'-(N,N-dimethylamino))-1,1'-biphenyl, 98% DavePhos
(213697-53-1)



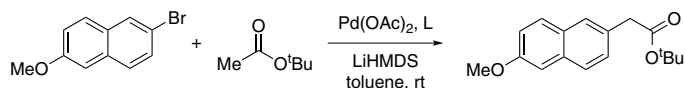
Tech. Note (2)
Ref. (2)



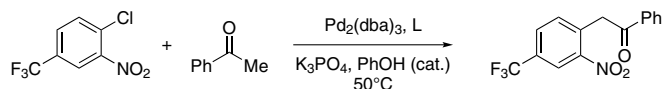
Tech. Note (3)
Ref. (3)



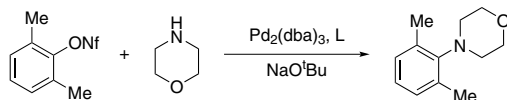
Tech. Note (4)
Ref. (4)



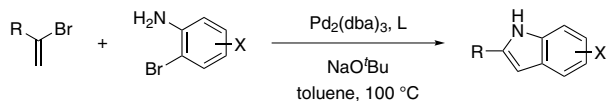
Tech. Note (5)
Ref. (5)



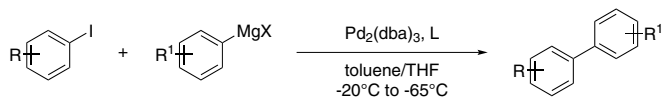
Tech. Note (6)
Ref. (6)



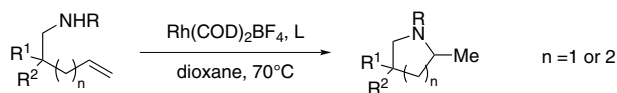
Tech. Note (7)
Ref. (7)



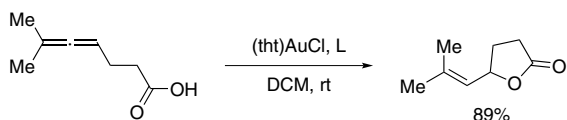
Tech. Note (8)
Ref. (8)



Tech. Note (9)
Ref. (9)



Tech. Note (10)
Ref. (10)



Tech. Note (11)
Ref. (11)

PHOSPHORUS (Compounds)

15-1145 **2-(Dicyclohexylphosphino)-2'-(N,N-dimethylamino)-1,1'-biphenyl, 98% DavePhos**
 (continued) (213697-53-1)

References:

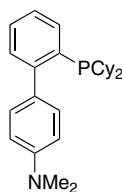
1. *J. Am. Chem. Soc.*, **1998**, 120, 9722
2. *J. Am. Chem. Soc.*, **1999**, 121, 6090.
3. *Org. Lett.*, **2000**, 2, 1403.
4. *J. Org. Chem.*, **2001**, 66, 2498.
5. *J. Am. Chem. Soc.*, **2001**, 123, 7996.
6. *J. Am. Chem. Soc.*, **2002**, 124, 15168.
7. *J. Org. Chem.*, **2003**, 68, 9563.
8. *Chem. Eur. J.*, **2005**, 11, 2276
9. *J. Am. Chem. Soc.*, **2007**, 129, 3844.
10. *J. Am. Chem. Soc.*, **2008**, 130, 1570.
11. *Adv. Synth. Catal.*, **2009**, 351, 576.
12. *Chem. Sci.*, **2011**, 2, 27.

15-1154**NEW**

2-Dicyclohexylphosphino-4'-(N,N-dimethylamino)-1,1'-bi-phenyl, 98% (1185899-00-6)

C₂₆H₃₆NP; FW: 393.55; white xtl.

Note: Patents: US 6,395,916, US 6,307,087.



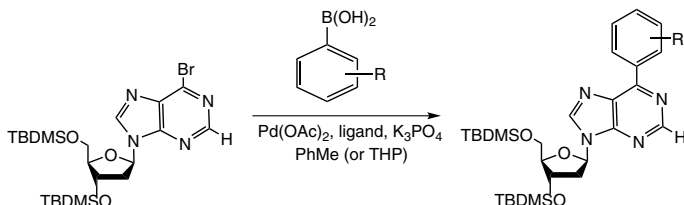
250mg

1g

5g

Technical Note:

1. Ligand used in the palladium-catalyzed C-C bond formation in a substituted deoxyguanosine.



Tech. Note (1)
Ref. (1)

References:

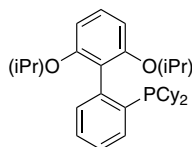
1. *J. Am. Chem. Soc.*, **2009**, 131, 12240.

15-1146

2-Dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-bi-phenyl, min. 98% RuPhos (787618-22-8)

C₃₀H₄₃O₂P; FW: 466.64; white powd.; m.p. 123-124°

Note: Buchwald Biaryl Phosphine Ligand Master Kit component. Buchwald Biaryl Phosphine Ligand Mini Kit 1 component. Patents: US 6,395,916, US 6,307,087.



1g

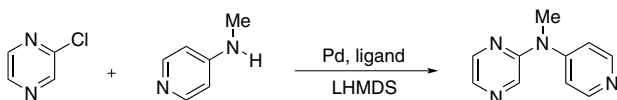
5g

25g

100g

Technical Notes:

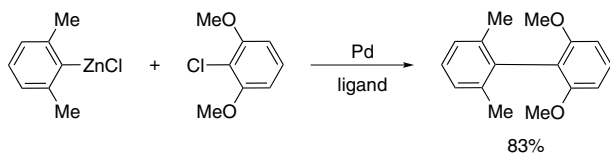
1. Versatile Ligand for the Pd-catalyzed coupling of secondary arylamines and alkylamines.
 (a) See also 46-0266, 46-0366. (b) See reference 7, 8.
2. Ligand used for the Pd-catalyzed Negishi cross-coupling reaction of (hetero)arylchlorides.
3. Synthesis of ladder-type π -conjugated heteroacenes via palladium-catalyzed double N-arylation and intramolecular O-arylation.
4. A palladium-catalyzed regioselective synthesis of N-aryl benzimidazoles.
5. Versatile ligand used for the Pd-catalyzed C-N coupling reaction of secondary aryl- and alkyl-amines at low temperature with the Pd precatalyst.
6. Ligand used for the Pd-catalyzed Suzuki-Miyaura coupling of aryl chloride and NHC-boranes.
7. Ligand for the palladium-catalyzed trifluoromethylation of hindered aryl chlorides.
8. Ligand used for the palladium-catalyzed coupling of alkyl boronates.



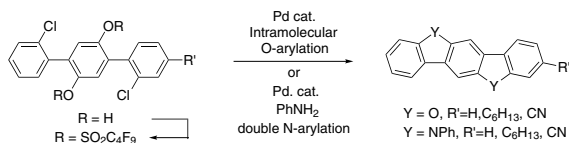
Tech. Note (1)
Ref. (6,7)

PHOSPHORUS (Compounds)

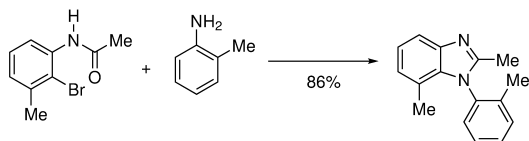
15-1146 (continued) 2-Dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-biphenyl, min. 98% RuPhos (787618-22-8)



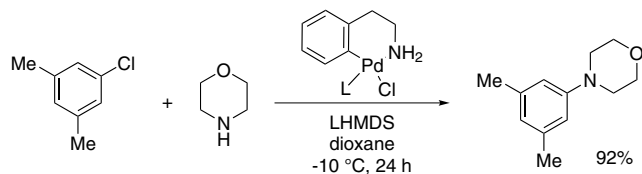
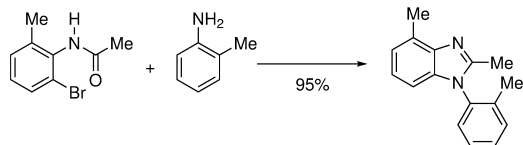
Tech. Note (2)
Ref. (1)



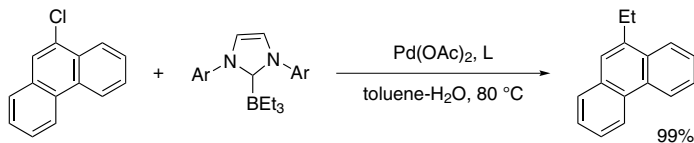
Tech. Note (3)
Ref. (2)



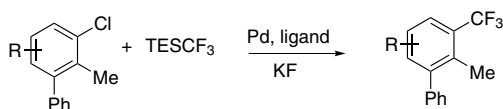
Tech. Note (4)
Ref. (3)



Tech. Note (5)
Ref. (4)



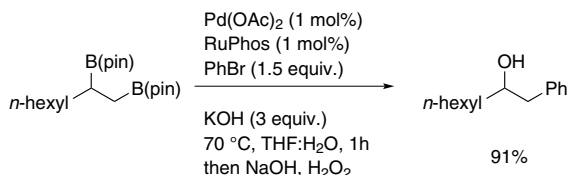
Tech. Note (6)
Ref. (5)



Tech. Note (7)
Ref. (6)

PHOSPHORUS (Compounds)

15-1146 2-Dicyclohexylphosphino-2',6'-di-i-propoxy-1,1'-biphenyl, min. 98% RuPhos (787618-22-8)
(continued)

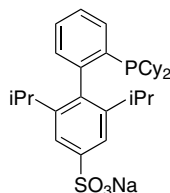


Tech. Note (8)
Ref. (9)

References:

1. *J. Am. Chem. Soc.*, **2004**, 126, 13028.
2. *Angew. Chem. Int. Ed.*, **2007**, 46, 7509.
3. *J. Org. Chem.*, **2007**, 72, 5119.
4. *J. Am. Chem. Soc.*, **2008**, 130, 6686.
5. *Org. Lett.*, **2009**, 11, 4914.
6. *Science*, **2010**, 328, 1679.
7. *Chem. Sci.*, **2011**, 2, 27.
8. *Chem. Sci.*, **2011**, 2, 57.
9. *Nature*, **2014**, 505, 386.

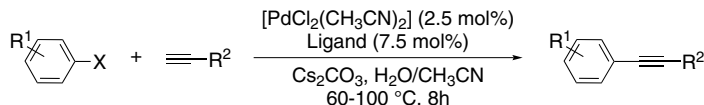
15-1135 2'-Dicyclohexylphosphino-2,6-di-i-propyl-4-sulfonato-1,1'-biphenyl hydrate sodium salt (XPhos-SO₃Na) (870245-84-4)
C₃₀H₄₂NaO₃PS·XH₂O; FW: 536.68; beige solid
Note: Water soluble phosphine. Buchwald Biaryl Phosphine Ligand Master Kit component.
Patents: US 6,395,916, US 6,307,087.



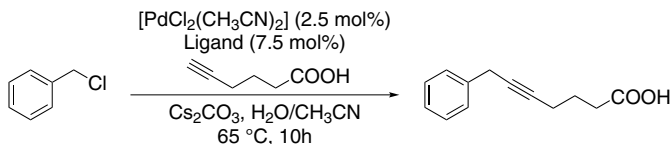
100mg
500mg
2g

Technical Notes:

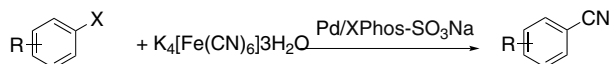
1. Water soluble catalyst for Sonogashira coupling reactions
2. Water soluble catalyst for coupling of benzyl chloride and terminal alkynes.
3. Water soluble ligand for cyanation of aryl chlorides and aryl sulfonates with potassium ferrocyanide.



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)



Tech. Note (3)
Ref. (3)

References:

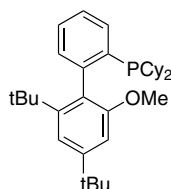
1. *Angew. Chem. Int. Ed.*, **2005**, 44, 6173.
2. *Synlett.*, **2006**, 18, 2941.
3. *Catal. Lett.*, **2010**, 139, 56.

PHOSPHORUS (Compounds)

15-1105

NEW

2-Dicyclohexylphosphino-2'-methoxy-4',6'-di-*t*-butyl-1,1'-biphenyl, min. 98% VPhos (1848244-75-6)
 $C_{33}H_{49}OP$; FW: 492.72; white to off-white solid
 Note: Patents: US 6,395,916, US 6,307,087



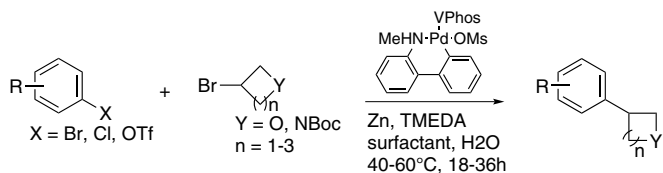
250mg

1g

5g

Technical Note:

- Ligand for the palladium catalyzed aqueous Lipshutz-Negishi cross-coupling of alkyl halides with aryl electrophiles.



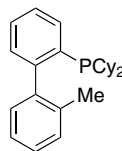
Tech. Note (1)
Ref. (1)

References:

- Angew. Chem. Int. Ed.*, **2016**, 55, 1849

15-1148

2-Dicyclohexylphosphino-2'-methyl-1,1'-biphenyl, min. 98% MePhos (251320-86-2)
 $C_{25}H_{33}P$; FW: 364.51; white xtl.; m.p. 107-110°
 Note: Buchwald Biaryl Phosphine Ligand Master Kit component. Buchwald Biaryl Phosphine Ligand Mini Kit 2 component. Patents: US 6,395,916, US 6,307,087.



500mg

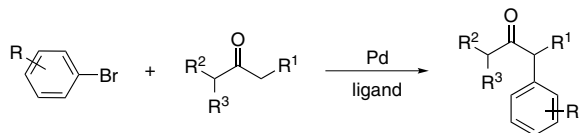
2g

10g

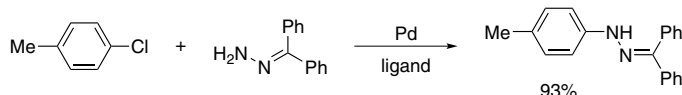
50g

Technical Notes:

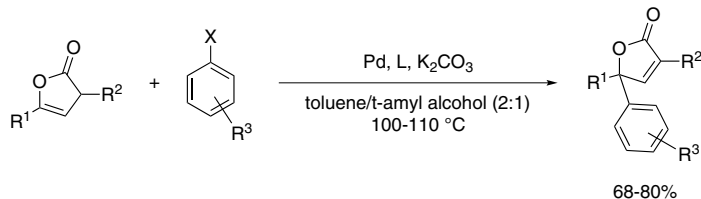
- Ligand used for the Pd-catalyzed formation of α -arylketones
- Ligand used for the Pd-catalyzed amination reaction (see 15-1045).
 a. See (Ref. 5)
- Ligand used for the Pd-catalyzed hydrazone arylation
- Ligand used for the Pd-catalyzed synthesis of 5,5-disubstituted butenolides.
- Ligand used for the Pd-catalyzed direct arylation of polyfluorinated arenes at room temperature.



Tech. Note (1)
Ref. (1)



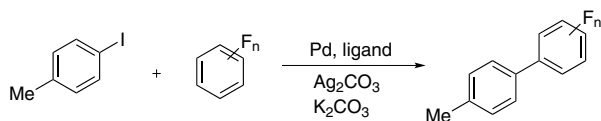
Tech. Note (3)
Ref. (2)



Tech. Note (4)
Ref. (3)

PHOSPHORUS (Compounds)

15-1148 **2-Dicyclohexylphosphino-2'-methyl-1,1'-biphenyl, min. 98% MePhos (251320-86-2)**
 (continued)

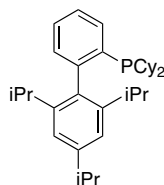


Tech. Note (5)
Ref. (4)

References:

1. *J. Am. Chem. Soc.*, **2000**, 122, 1360.
2. *Adv. Synth. Catal.*, **2007**, 347, 773.
3. *Org. Lett.*, **2009**, 11, 2663.
4. *Org. Lett.*, **2010**, 12, 2116.
5. *Chem. Sci.*, **2011**, 2, 27.

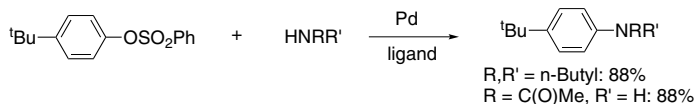
15-1149 **2-(Dicyclohexylphosphino)-2',4',6'-tri-*i*-propyl-1,1'-biphenyl, min. 98% XPhos (564483-18-7)**
 $C_{33}H_{49}P$; FW: 476.72; white powdr.; m.p. 185°
 Note: Buchwald Biaryl Phosphine Ligand Master Kit component. Buchwald Biaryl Phosphine Ligand Mini Kit 1 component. Patents: US 6,395,916, US 6,307,087.



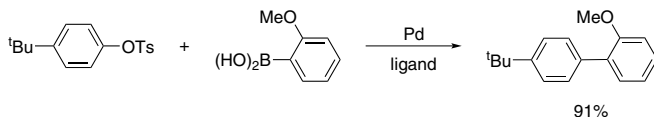
500mg
 2g
 10g
 100g
 500g

Technical Notes:

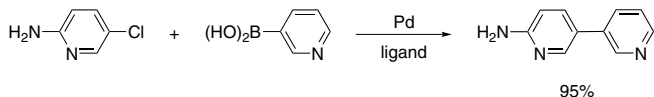
1. See also 46-0268.
2. Exceptional ligands for Pd-catalyzed amination and amidation of aryl sulfonates.
3. Ligand used for the Pd-catalyzed Suzuki-Miyaura coupling reaction and carbonyl enolate coupling.
4. Ligand used for the chemoselective amination of aryl chlorides.
5. Ligand used for the Pd-catalyzed borylation of aryl chlorides. (For the formation of trifluoroborates, see also Ref. 11)
6. Ligand used for the Pd-catalyzed amination of vinyl halides and triflates.
7. Ligand used for the Pd-catalyzed three-component synthesis of indoles.
8. Ligand used for the Pt-catalyzed regioselective hydrosilylation of functionalized terminal arylalkynes.
9. Ligand used for the Pd-catalyzed synthesis of carbazoles.
10. Ligand used for the Pd-catalyzed Suzuki-Miyaura coupling of aryl chloride and NHC-boranes.
11. Ligand used for the direct arylation of picoline N-oxide.
12. Ligand used for the Negishi coupling of 2-heterocyclic organozinc reagents.
13. Catalyst for a phosphine-catalyzed Heine reaction.
14. Ligand used for the palladium-catalyzed oxidative coupling of indoles and heteroarenes.
15. Ligand used for the silver-catalyzed hydrogenation of aldehydes.
16. Ligand used for the palladium-catalyzed cyanation of heterocyclic halides.



Tech. Note (2)
Ref. (1)



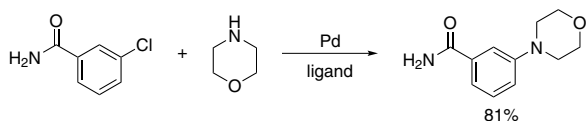
Tech. Note (3)
Ref. (2)



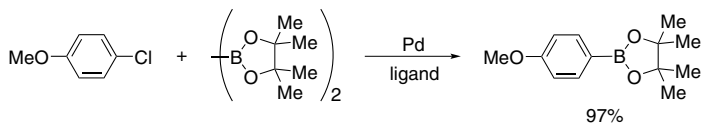
Tech. Note (3)
Ref. (3,4)

PHOSPHORUS (Compounds)

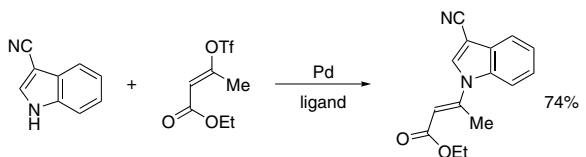
15-1149 2-(Dicyclohexylphosphino)-2',4',6'-tri-*i*-propyl-1,1'-biphenyl, min. 98% XPhos (564483-18-7)
(continued)



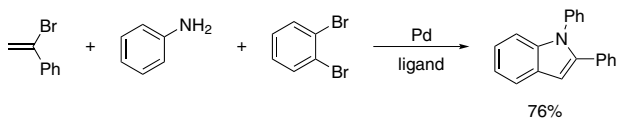
Tech. Note (4)
Ref. (3)



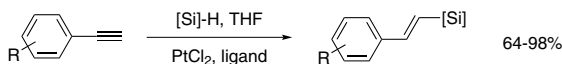
Tech. Note (5)
Ref. (5)



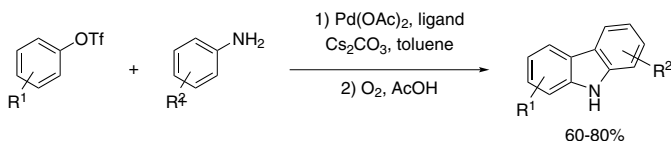
Tech. Note (6)
Ref. (6)



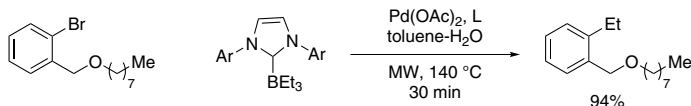
Tech. Note (7)
Ref. (7)



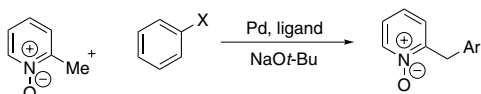
Tech. Note (8)
Ref. (8)



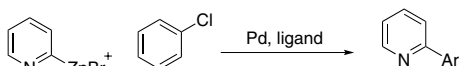
Tech. Note (9)
Ref. (10)



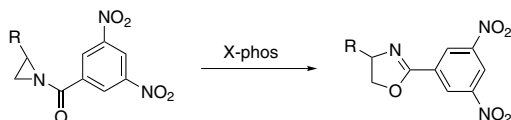
Tech. Note (10)
Ref. (10)



Tech. Note (11)
Ref. (12)



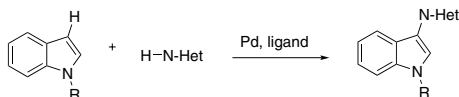
Tech. Note (12)
Ref. (13)



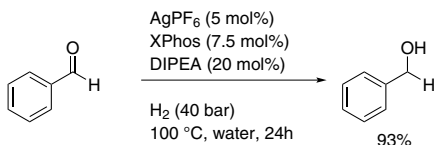
Tech. Note (13)
Ref. (14)

PHOSPHORUS (Compounds)

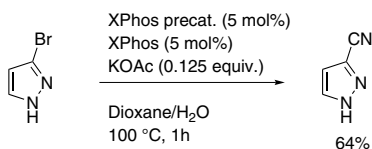
15-1149 2-(Dicyclohexylphosphino)-2',4',6'-tri-*i*-propyl-1,1'-biphenyl, min. 98% XPhos (564483-18-7)
(continued)



Tech. Note (14)
Ref. (15)



Tech. Note (15)
Ref. (16)



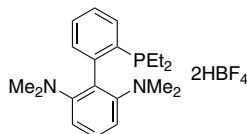
Tech. Note (16)
Ref. (17)

References:

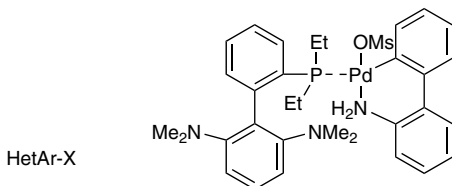
1. *J. Am. Chem. Soc.*, **2003**, 125, 6653.
2. *J. Am. Chem. Soc.*, **2003**, 125, 11818.
3. *Angew. Chem. Int. Ed.*, **2006**, 45, 6523.
4. *J. Am. Chem. Soc.*, **2007**, 129, 3358.
5. *Angew. Chem. Int. Ed.*, **2007**, 46, 5359.
6. *J. Org. Chem.*, **2005**, 70, 8638.
7. *Angew. Chem. Int. Ed.*, **2007**, 46, 1529.
8. *Tetrahedron Lett.*, **2008**, 49, 2429.
9. *Acc. Chem. Res.* **2008**, 41, 1461.
10. *J. Org. Chem.*, **2009**, 74, 4720.
11. *Org. Lett.*, **2009**, 11, 4914.
12. *J. Am. Chem. Soc.*, **2010**, 132, 17701.
13. *J. Org. Chem.*, **2010**, 75, 8330.
14. *Org. Lett.*, **2011**, 13, 5444.
15. *Angew. Chem., Int. Ed.*, **2011**, 50, 5365.
16. *Chem. Sci.*, **2011**, 2, 27.
17. *Angew. Chem., Int. Ed.*, **2013**, 52, 11871.
18. *Angew. Chem., Int. Ed.*, **2013**, 52, 10035.

15-1151 2-Diethylphosphino-2',6'-bis(dimethylamino)-1,1'-biphenyl di(hydrogen tetrafluoroborate) salt, min. 98% EtCPhos

C₂₀H₂₉N₂P·2(HBF₄); FW: 504.01; white powdr.
Note: Patents: US 6,395,916, US 6,307,087.



100mg
500mg



sec-alkylZnBr·LiCl

1 mol% catalyst

THF/toluene
0 °C to rt, 1-12 h

HetAr-sec-alkyl

excellent selectivity
for non-rearranged products

References:

1. *Org. Lett.*, 2014, 16, 4638 (Note this reference is for is for 46-0348, EtCPhos Palladacycle Gen. 3.)

PHOSPHORUS (Compounds)

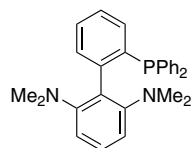
15-1125

NEW

2-Diphenylphosphino-2',6'-bis(dimethyl-amino)-1,1'-biphenyl, min. 98% PhCPhos
(1447963-71-4)

$C_{26}H_{29}N_2P$; FW: 424.52; tan solid

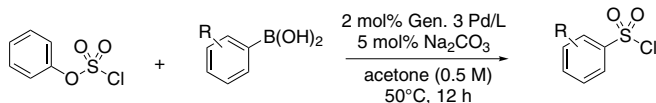
Note: Patents: US 6,395,916, US 6,307,087



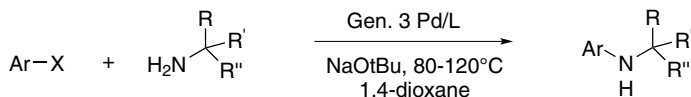
100mg
500mg

Technical Notes:

1. Ligand for the Palladium catalyzed chlorosulfonylation of aryl boronic acids
2. Ligand for the Palladium-catalyzed Buchwald-Hartwig cross-coupling of hindered primary amines & aryl halides



Tech. Note (1)
Ref. (1)



Tech. Note (2)
Ref. (2)

References:

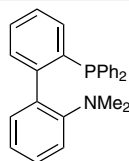
1. *J. Am. Chem. Soc.*, **2013**, 135, 10638
2. *J. Am. Chem. Soc.*, **2015**, 137, 3085

15-1745

2-Diphenylphosphino-2'-(N,N-dimethylamino)-1,1'-biphenyl, 98% PhDavePhos (240417-00-9)

$C_{26}H_{24}NP$; FW: 381.46; white powdr.

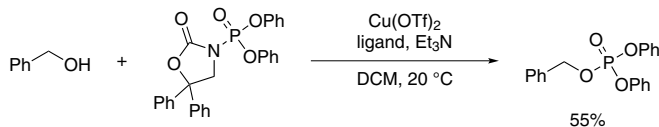
Note: Buchwald Biaryl Phosphine Ligand Master Kit component.. Buchwald Biaryl Phosphine Ligand Mini Kit 2 component.. Patents: US 6,395,916, US 6,307,087.



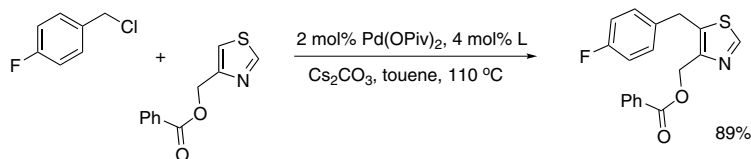
500mg
2g
10g

Technical Notes:

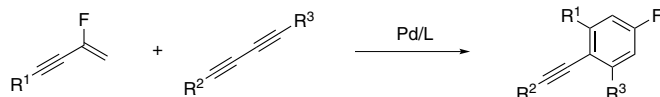
1. Useful ligand for sterically hindered substrates in the Pd-catalyzed amination reactions of aryl bromides.
2. Ligand used for the Cu-catalyzed phosphorylation of alcohols
3. Ligand for Pd-catalyzed C-H benzylation
4. Ligand for palladium-catalyzed [4 + 2] benzannulation reaction.



Tech. Note (2)
Ref. (1)



Tech. Note (3)
Ref. (2)



Tech. Note (4)
Ref. (3)

References:

1. *Org. Lett.*, **2005**, 7, 3271.
2. *Org. Lett.*, **2009**, 11, 4160.
3. *Org. Lett.*, **2013**, 15, 2562.
4. *Chem. Sci.*, **2011**, 2, 27.

Buchwald Biaryl Phosphine Ligand Master Kit (includes 30 items)

96-5500

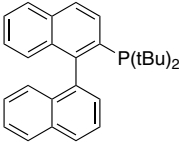
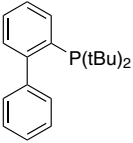
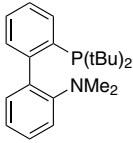
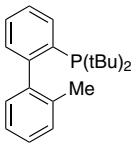
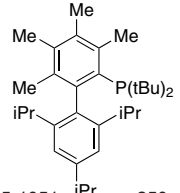
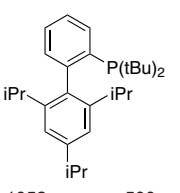
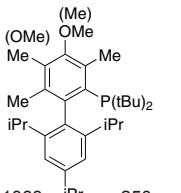
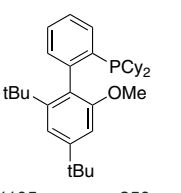
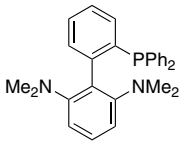
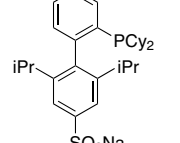
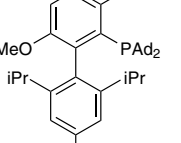
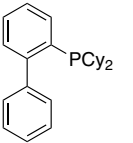
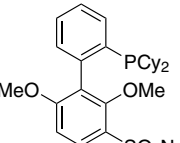
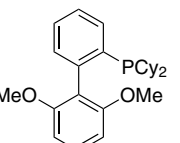
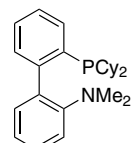
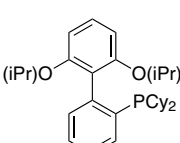
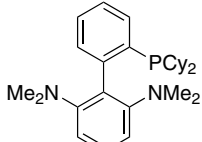
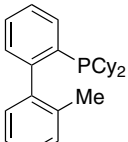
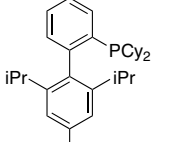
Buchwald Biaryl Phosphine Ligand Master Kit for Aromatic Carbon-Heteroatom Bond Formation, Suzuki Coupling and Negishi Cross-coupling

For aromatic carbon-heteroatom bond formation and Suzuki Coupling.

Patents: US 6,395,916, US 6,307,087

Components also available for individual sale.

Contains the following:

 15-1043 250mg TrixiePhos	 15-1045 500mg JohnPhos	 15-1048 500mg tBuDavePhos	 15-1049 500mg t-BuMePhos
 15-1051 250mg Me4-t-BuXPhos	 15-1052 500mg t-BuXphos	 15-1063 250mg	 15-1105 250mg VPhos
 15-1125 100mg PhCPhos	 15-1135 100mg (XPhos-SO₃Na)	 15-1138 100mg AdBrettPhos	 15-1140 1g CyJohnPhos
 15-1142 500mg (water soluble SPhos)	 15-1143 500mg SPhos	 15-1145 500mg DavePhos	 15-1146 1g RuPhos
 15-1147 250mg CPhos	 15-1148 500mg MePhos	 15-1149 500mg XPhos	

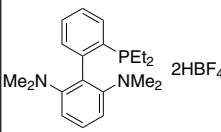
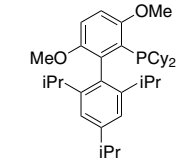
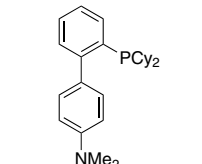
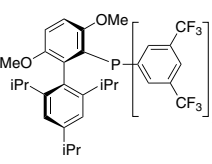
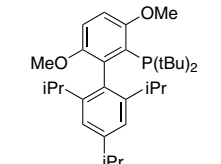
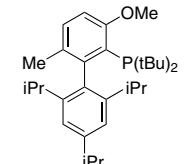
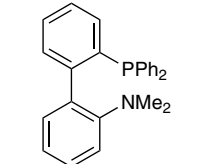
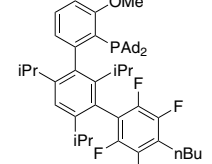
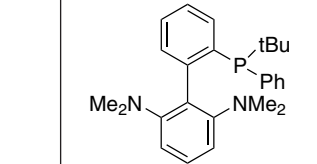
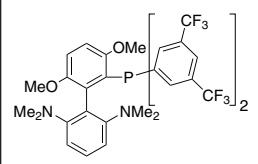
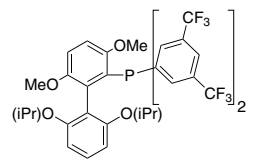
Buchwald Biaryl Phosphine Ligand Master Kit (includes 30 items)

96-5500

Buchwald Biaryl Phosphine Ligand Master Kit for Aromatic Carbon-Heteroatom

(continued)

Bond Formation, Suzuki Coupling and Negishi Cross-coupling

 15-1151 EtCPhos 100mg	 15-1152 BrettPhos 250mg	 15-1154 250mg	 15-1157 JackiePhos 100mg
 15-1164 t-BuBrettPhos 100mg	 15-1168 RockPhos 100mg	 15-1745 PhDavePhos 500mg	 15-2065 AIPhos 100mg
 15-3010 (t-Bu)PhCPhos 250mg	 15-3015 100mg	 15-3020 250mg	

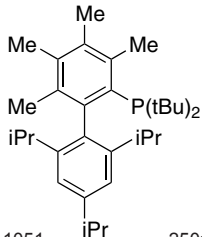
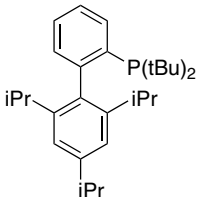
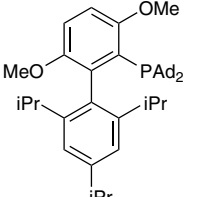
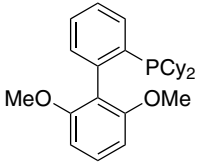
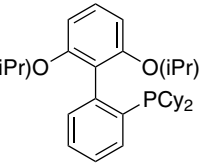
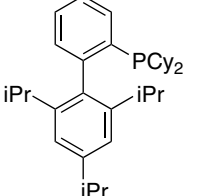
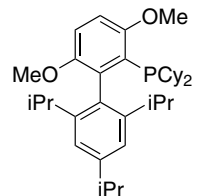
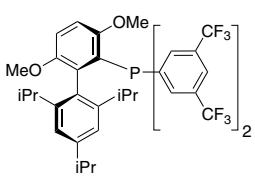
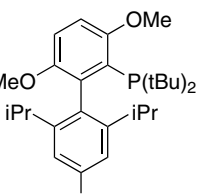
Buchwald Biaryl Phosphine Ligand Mini Kit 1 (includes 9 items)

96-5485

Buchwald Biaryl Phosphine Ligand Mini Kit 1 for Aromatic Carbon-Heteroatom Bond Formation, Suzuki Coupling and Negishi Cross-coupling
For aromatic carbon-heteroatom bond formation and Suzuki Coupling.

Patents: US 6,395,916, US 6,307,087

Components also available for individual sale. Contains the following:

 15-1051 Me₄-t-BuXPhos 250mg	 15-1052 t-BuXPhos 500mg	 15-1138 AdBrettPhos 100mg
 15-1143 SPhos 500mg	 15-1146 RuPhos 1g	 15-1149 XPhos 500mg
 15-1152 BrettPhos 250mg	 15-1157 JackiePhos 100mg	 15-1164 t-BuBrettPhos 100mg

Buchwald Biaryl Phosphine Ligand Mini Kit 2 (includes 8 items)

96-5490

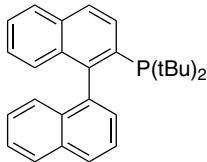
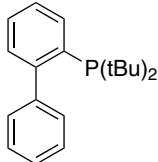
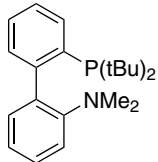
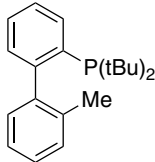
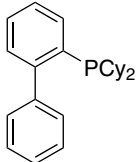
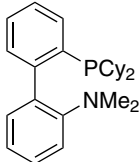
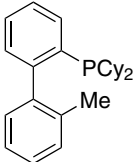
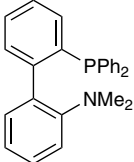
Buchwald Biaryl Phosphine Ligand Mini Kit 2 for Aromatic Carbon-Heteroatom Bond Formation, Suzuki Coupling and Negishi Cross-coupling

For aromatic carbon-heteroatom bond formation and Suzuki Coupling.

Patents: US 6,395,916, US 6,307,087

Components also available for individual sale.

Contains the following:

 15-1043 TrixiePhos 250mg	 15-1045 JohnPhos 500mg	 15-1048 tBuDavePhos 500mg
 15-1049 t-BuMePhos 500mg	 15-1140 CyJohnPhos 1g	 15-1145 DavePhos 500mg
 15-1148 MePhos 500mg	 15-1745 PhDavePhos 500mg	

Buchwald Biaryl Phosphine Ligand Mini Kit 3 (includes 13 items)

96-5495

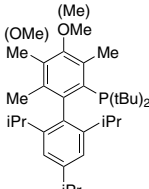
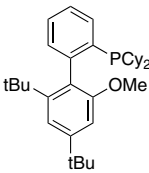
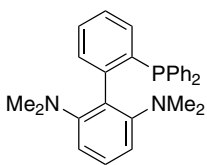
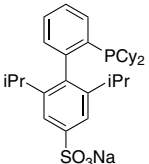
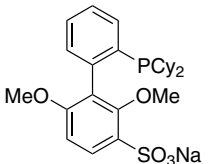
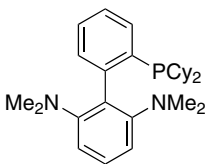
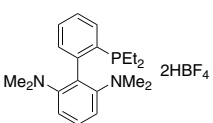
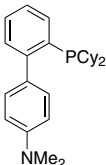
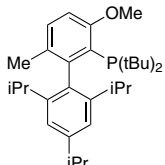
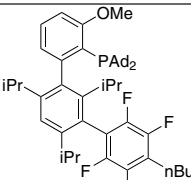
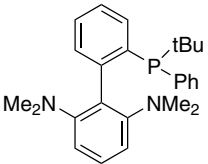
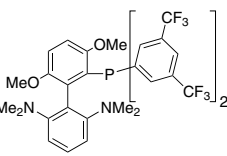
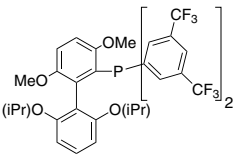
NEW

Buchwald Biaryl Phosphine Ligand Mini Kit 3 for Aromatic Carbon-Heteroatom Bond Formation, Suzuki Coupling and Negishi Cross-coupling

For aromatic carbon-heteroatom bond formation and Suzuki Coupling.

Patents: US 6,395,916, US 6,307,087.

Components also available for individual sale. Contains the following:

 15-1063 250mg	 15-1105 VPhos 250mg	 15-1125 PhCPhos 100mg
 15-1135 (XPhos-SO₃Na) 100mg	 15-1142 (water soluble SPhos) 500mg	 15-1147 CPhos 250mg
 15-1151 EtCPhos 100mg	 15-1154 250mg	 15-1168 RockPhos 100mg
 15-2065 AlPhos 100mg	 15-3010 (t-Bu)PhCPhos 250mg	 15-3015 100mg
 15-3020 250mg		

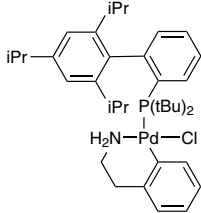
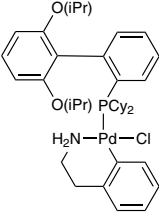
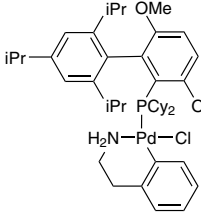
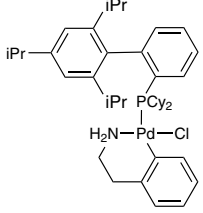
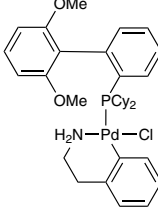
Buchwald Palladacycle Precatalyst Kit 1 (Generation 1) (includes 5 items)

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 t-BuXPhos 100mg	 46-0266 RuPhos 100mg	 46-0267 BrettPhos 100mg
 46-0268 XPhos 250mg	 46-0269 SPhos 250mg	

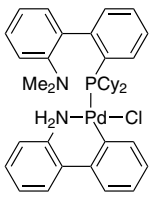
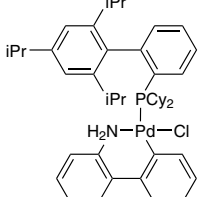
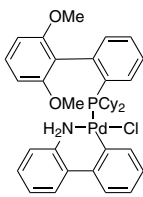
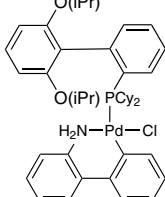
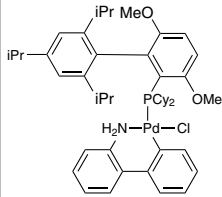
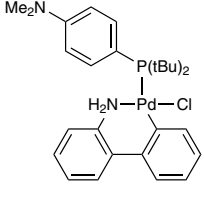
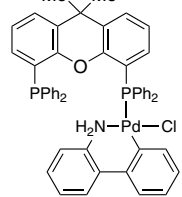
Buchwald Palladacycle Precatalyst Kit 3 (Generation 2) (includes 7 items)

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:

 46-0232 DavePhos 250mg	 46-0281 XPhos 250mg	 46-0283 SPhos 250mg	 46-0286 RuPhos 250mg
 46-0292 BrettPhos 100mg	 46-0342 Amphos 250mg	 46-0955 Xantphos 500mg	

Buchwald Palladacycle Precatalyst Kit 2a (Generation 3) (includes 17 items)

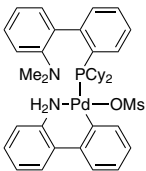
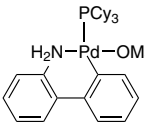
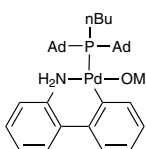
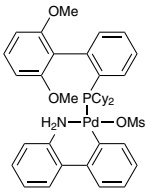
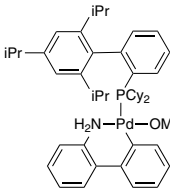
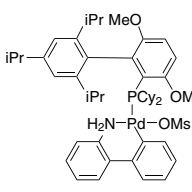
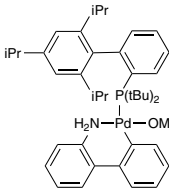
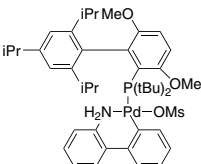
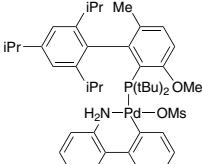
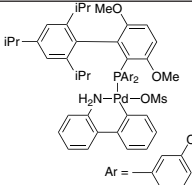
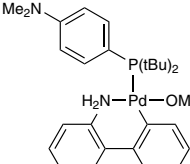
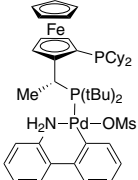
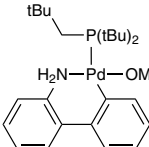
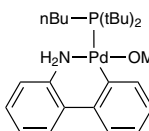
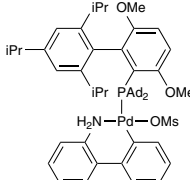
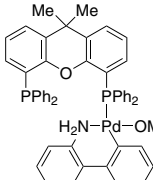
96-5505

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:

 46-0237 250mg DavePhos	 46-0239 250mg PCy3	 46-0278 250mg cataCXium® A	 46-0314 250mg RuPhos
 46-0318 250mg SPhos	 46-0320 250mg XPhos	 46-0322 100mg BrettPhos	 46-0323 250mg t-BuXPhos
 46-0325 100mg t-BuBrettPhos	 46-0335 100mg RockPhos	 46-0340 100mg JackiePhos	 46-0345 250mg Amphos
 46-0353 100mg Josiphos	 46-0358 250mg DTBNpP	 46-0365 250mg P(t-Bu)2(n-Bu)	 46-0480 50mg AdBrettPhos
 46-0957 500mg Xantphos			

Buchwald Palladacycle Precatalyst Kit 2b (Generation 3) (includes 12 items)

96-5506

NEW

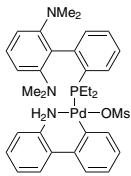
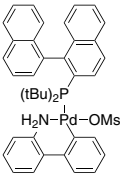
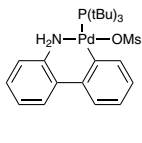
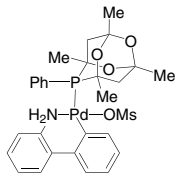
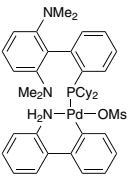
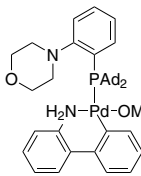
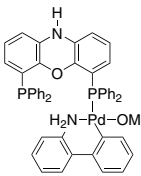
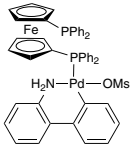
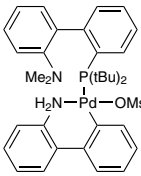
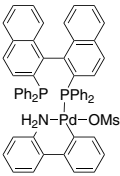
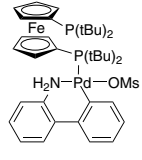
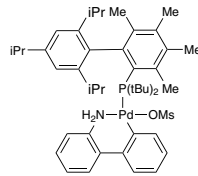
Buchwald Palladacycle Precatalyst Kit 2b

(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:

 46-0348 EtCPhos 50mg	 46-0357 TrixiePhos 100mg	 46-0387 P(t-Bu)₃ 50mg	 46-0392 MeCgPPH 500mg
 46-0487 CPhos 100mg	 46-0935 Mor-DalPhos 50mg	 46-0959 NiXantphos 100mg	 46-2128 DPPF 250mg
 46-2135 t-BuDavePhos 250mg	 46-2153 BINAP 250mg	 46-2158 DTBPF 250mg	 46-2163 Me4 t-ButylXPhos 100mg

Buchwald Palladacycle Precatalyst Kit 4 (Generation 4) (includes 9 items)

96-5512

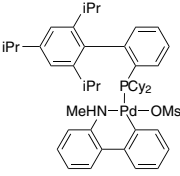
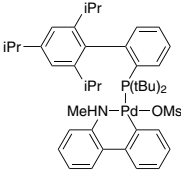
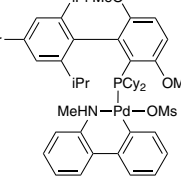
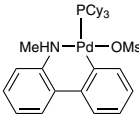
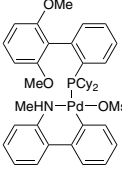
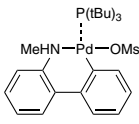
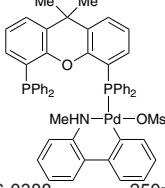
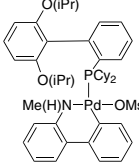
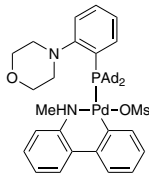
Buchwald Palladacycle Precatalyst Kit 4

(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:

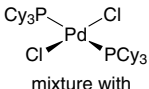
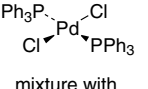
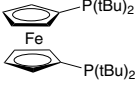
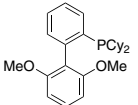
 46-0327 XPhos 250mg	 46-0330 t-BuXPhos 250mg	 46-0333 BrettPhos 250mg	 46-0379 PCy₃ 250mg
 46-0380 SPhos 250mg	 46-0385 P(t-Bu)₃ 250mg	 46-0388 Xantphos 250mg	 46-0395 RuPhos 250mg
 46-0940 MorDalphos 250mg			

CATALYST & ORGANOCATALYST KITS - Kit of CatKits

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 1 vial
46-2033	Palladium(II) acetate/2-dicyclohexylphosphino-2,6-dimethoxy-1,1'-bi-phenyl (SPhos)/potassium phosphate admixture [CatKit single-use vials - 1.96 wt% Pd(OAc) ₂]	5 x 1 vial
46-2038	trans-Dichlorobis(triphenylphosphine)palladium(II)/potassium phosphate admixture [CatKit single-use vials - 6.32 wt% Pd complex] (13965-03-2)	5 x 1 vial
46-2040	trans-Dichlorobis(tricyclohexylphosphine)palladium(II)/potassium phosphate admixture [CatKit single-use vials - 6.62 wt% Pd complex] (29934-17-6)	5 x 1 vial

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.				

LIGAND KITS - Phosphine Ligand Kit

96-1650

Phosphine Ligand Kit for Palladium-Catalyzed Carbon-Carbon and Carbon-Heteroatom Bond Formation

For Palladium-catalyzed carbon-carbon and carbon-heteroatom bond formation. Components also available for individual sale. Contains the following:

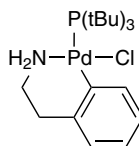
15-0380 DPEphos 5g	15-0433 rac-BINAP 1g	15-1023 1g	15-1045 JohnPhos 500mg
15-6000 1g	15-6372 500mg	15-7720 10g	15-8050 5g
26-0270 DPPF 1g			

PALLADIUM (Compounds)

46-0028

NEW

Chloro(tri-*t*-butylphosphine)(2'-amino-1,1'-biphenyl-2-yl)palladium(II), min. 98% (1375325-71-5)
 $C_{24}H_{37}ClNPd$; FW: 512.40; yellow powdr.;
 m.p. 158-160°



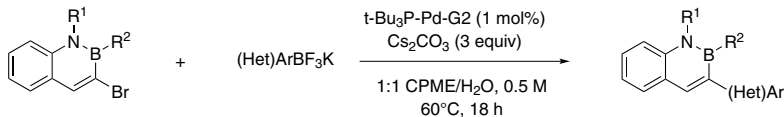
250mg

1g

5g

Technical Note:

- Catalyst for the Suzuki Coupling of brominated 2,1-borazonaphthalenes and potassium organotrifluoroborates



Tech. Note (1)
Ref. (1)

>20 Brominated Azaborines

R^1 = H, alkyl

R^2 = alkyl, aryl, heteroaryl

References:

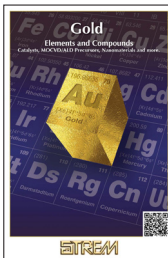
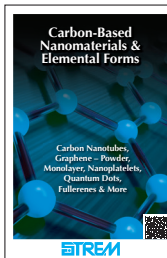
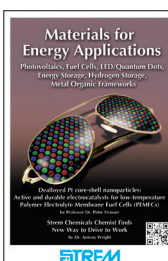
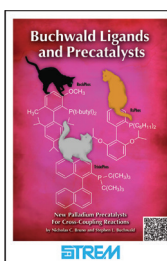
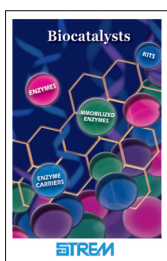
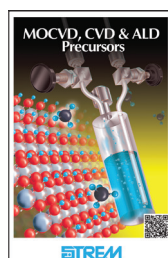
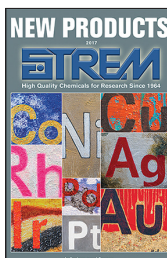
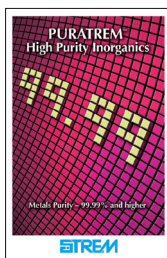
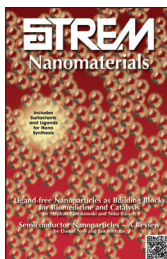
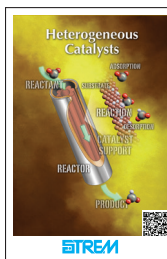
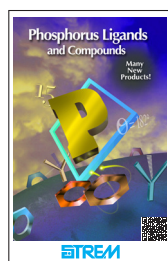
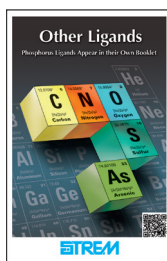
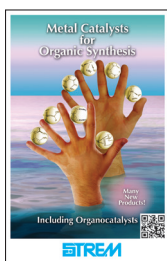
- J. Org. Chem.* **2014**, 79, 6663

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