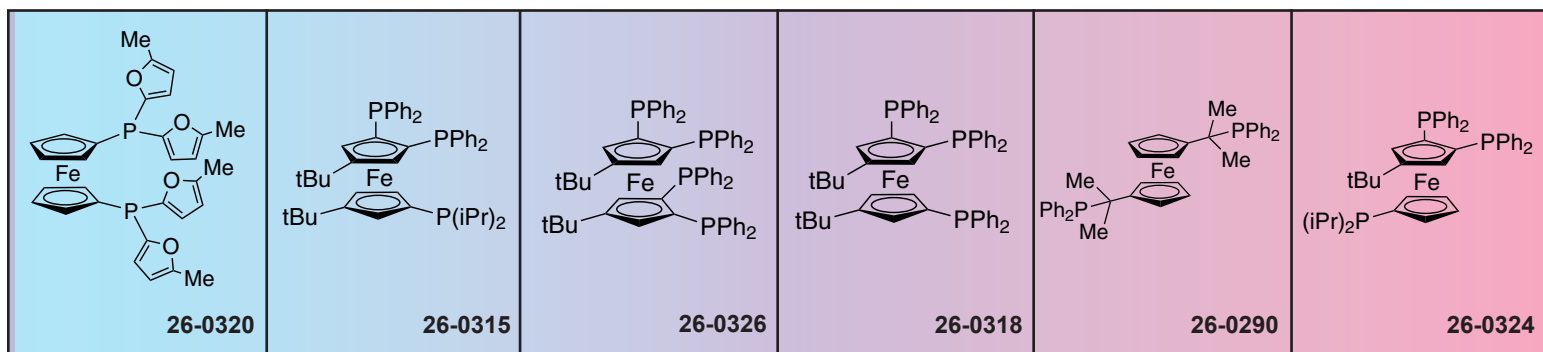


The **HiersoPHOS** family of ligands are ferrocenyl polyphosphine ligands which may be used in Palladium promoted catalytic transformations, such as the functionalization of hetero-aromatic compounds and various carbon-carbon and carbon-nitrogen bond formation reactions (Suzuki-Miyaura coupling, Heck coupling, Buchwald-Hartwig cross-coupling as well as Sonogashira reactions).



**26-0320** **1,1'-Bis[bis(5-methyl-2-furanyl) phosphino]ferrocene, 98% HiersoPHOS-3 (756824-22-3)**  
 $C_{30}H_{28}FeO_4P_2$ ; FW: 570.33; orange xtl.

100mg  
500mg

Technical Note:

- Used in various comparative studies for palladium-promoted catalytic transformations involving polydentate ferrocenylphosphines ligands:
  - Palladium coupling of aniline derivatives with bromo- and chloroarenes <sup>[1]</sup>
  - Palladium-catalyzed formation of secondary and tertiary amines from aryl dihalides <sup>[2]</sup>
  - Palladium-catalyzed arylation of phenols with chloro hetero arenes <sup>[3]</sup>
  - Palladium-catalyzed C-H Bond activation of heteroaromatics furan, thiophene, and thiazole and benzoxazole heterocycles <sup>[4]</sup>

References:

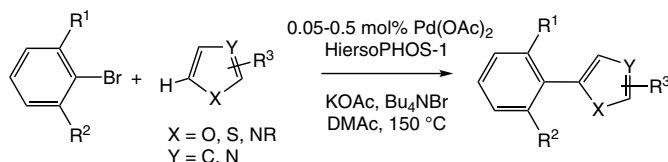
- ChemCatChem*, **2010**, 296.
- Adv. Synth. Catal.*, **2011**, 353, 3403.
- Catal. Commun.*, **2014**, 51, 10.
- Catal., Sci. Technol.*, **2014**, 4, 2072.

**26-0315** **1',4-Bis(t-butyl)-1,2-bis(diphenylphosphino)-3'-(di-i-propylphosphino)ferrocene, 98% HiersoPHOS-1**  
 (1313012-94-0)  
 $C_{48}H_{57}FeP_3$ ; FW: 782.73; orange xtl.

100mg  
500mg

Technical Notes:

- Direct Arylation of Heteroaromatics with Congested, Functionalised Aryl Bromides at Low Palladium Loading (0.05-0.5 mol%):furans, thiophenes, thiazoles, pyrroles functionalized with alkyl, nitrile, aldehyde, keto, and ester groups coupling with *ortho*- and *di-ortho*-substituted aryl bromides (phenyl, naphthyl, anthracenyl) bearing alkyl, aryl, alcohol, nitrile, carbonitrile, and ethoxy groups.
- Etherification of Functionalized Phenols with Chloroheteroarenes at Low Palladium Loading (0.2-0.5 mol%): *para*-, *meta*- and *ortho*-mono and di-substituted phenols (bearing methyl, isopropyl, methoxy, fluoro, amino, and ester groups) coupling with chloro-pyridines, -quinolines, -hydroxypyridines, -pyrimidines, -thiazoles bearing electron-withdrawing or -donating cyano and methoxy groups.



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

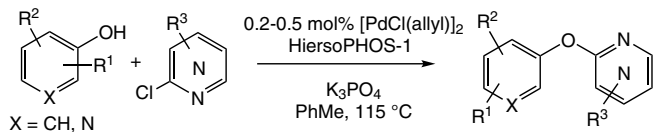
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**Tech. Note (2)**  
**Ref. (2)**

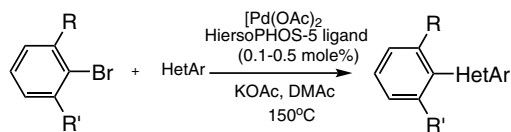
References:

1. *Chem. Eur. J.*, **2011**, *17*, 6453.
2. *Adv. Synth. Catal.*, **2011**, *353*, 3403.

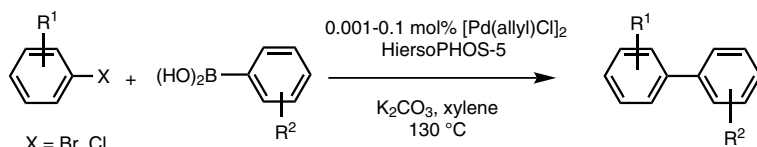
**26-0326**    **4,4'-Bis(t-butyl)-1,1',2,2'-tetrakis(diphenylphosphino)ferrocene, 98% HiersoPHOS-5 (403815-19-0)**    100mg  
C<sub>66</sub>H<sub>62</sub>FeP<sub>4</sub>; FW: 1034.94; orange xtl.    500mg

Technical Notes:

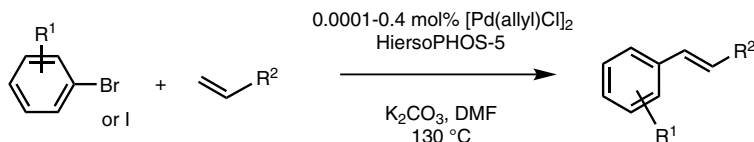
1. Ligand/palladium complex used in the direct arylation of heteroaromatic compounds with congested, functionalized aryl bromides.
2. Suzuki-Miyaura Coupling of Aryl Bromides and Chlorides bearing alkyl, methoxy, keto, nitrile, etc. substitution to phenyl- and methoxybenzene boronic acids at Low Palladium Loading.
3. Heck Coupling of Functionalized Aryl Bromides to n-butyl acrylate, styrene and n-butyl vinyl ether at Low Palladium Loading.
4. Additional catalyzed reaction include Allylic Amination of Monoterpene Derivatives including geranylacetate, nerylacetate, linalylacetate and perillylacetate at Low Palladium Loading (0.001-1.0 mol%, Ref.2), and Sonogashira Cross-Coupling of Aryl Bromides by using stabilizing new copper-tetraphosphane adducts (Ref. 3).



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



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



**Tech. Note (3)**

References:

1. *Chemistry – A European Journal*, **2011**, *17*, 23, 6453.
2. *Organometallics*, **2003**, *22*, 4490.
3. *Appl. Organometal. Chem.*, **2006**, *20*, 845.
4. *Organometallics*, **2008**, *27*, 1506.

**26-0318**    **1',4-Bis(t-butyl)-1,2,3'-tris(diphenylphosphino) ferrocene, 98% HiersoPHOS-2 (1159850-42-6)**    100mg  
C<sub>54</sub>H<sub>53</sub>FeP<sub>3</sub>; FW: 850.77; orange xtl.    500mg

Technical Notes:

1. Direct Arylation of Heteroaromatics with Functionalized Aryl Chlorides at Low Palladium Loading (0.1-0.5 mol%): furans, thiophenes, thiazoles, pyrroles functionalized with alkyl, ester, nitrile, and aldehyde groups coupling with para-, meta- and ortho-substituted chloroarenes bearing alkyl, formyl, nitriles, nitro, keto and ester groups.
2. Additional catalyzed reactions include Sonogashira Cross-Coupling of Aryl Bromides and Chlorides at Low Palladium and Copper Iodide Loading (0.05 to 0.4 mol%) by using stabilizing new copper-tri-phosphane adducts (Ref. 2).

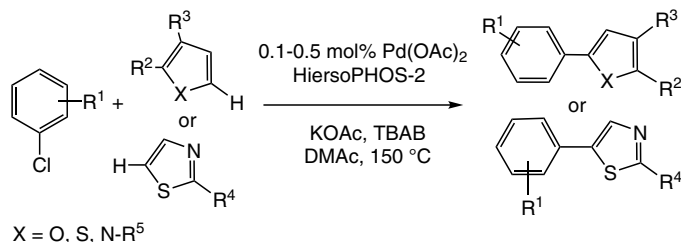
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**Tech. Note (1)**  
**Ref. (1)**

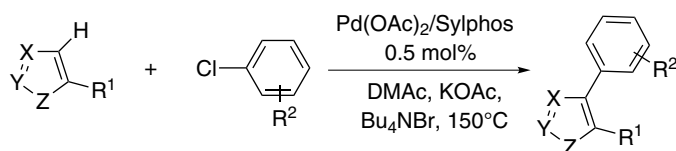
References:

1. *Angew. Chem. Int. Ed.*, **2010**, *49*, 6650.
2. *Organometallics*, **2010**, *29*, 2815.

**26-0290**    **1,1'-Bis(1-diphenylphosphino-1-methylethyl)ferrocene ethanol adduct, 97% HiersoPHOS-6 (Sylphos)**    100mg  
(109313-83-9)    500mg  
C<sub>40</sub>H<sub>40</sub>FeP<sub>2</sub>·CH<sub>3</sub>CH<sub>2</sub>OH; FW: 638.54 (684.61); orange solid

Technical Note:

1. Ligand used in the palladium-catalyzed direct arylation of heteroaremetics with activated aryl chlorides.



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

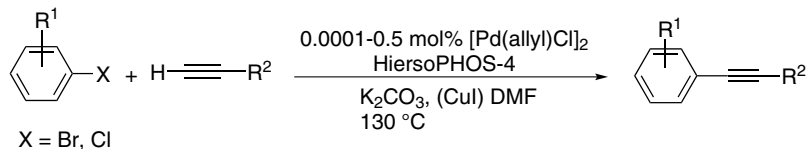
References:

1. *ACS Catalysis*, **2012**, *21*, 1033.

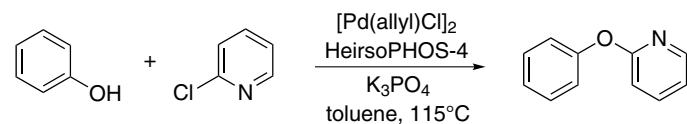
**26-0324**    **4-(t-Butyl)-1,2-bis(diphenylphosphino)-1'-di-i-propylphosphino)ferrocene, 98% HiersoPHOS-4 (776315-37-8)**    100mg  
C<sub>44</sub>H<sub>49</sub>FeP<sub>3</sub>; FW: 726.63; orange xtl.    500mg

Technical Notes:

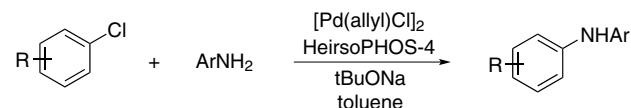
1. Ligand for the Sonogashira couplings of aryl halides at ultra-low catalyst loading
2. Ligand for the palladium catalysed C-O coupling of phenols with heteroaryl chlorides
3. Ligand for the Buchwald-Hartwig cross-coupling of aryl halides with arylamines



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



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



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

References:

1. *Org. Lett.*, **2004**, *6*, 3473.
2. *Organometallics*, **2010**, *29*, 2815.
3. *Adv. Synth. Catal.*, **2011**, *353*, 3403.
4. *Catal. Sci. Technol.*, **2014**, *4*, 2072.
5. *Catal. Commun.*, **2014**, *51*, 10.

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