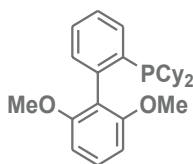
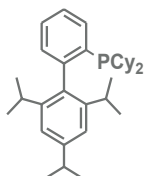




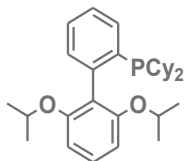
Buchwald Phosphine Ligands



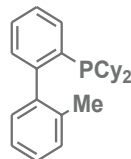
SPhos



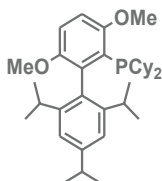
XPhos



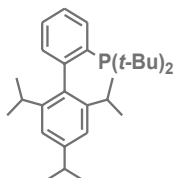
RuPhos



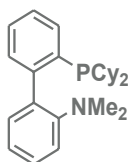
MePhos



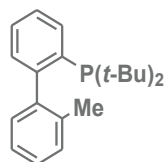
BrettPhos



t-Bu-XPhos

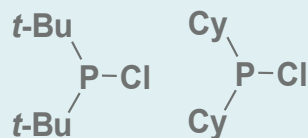


DavePhos



t-Bu-MePhos

Licensed by MIT



**Buchwald
Ligands**

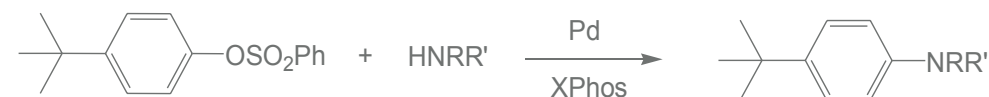
100 kg Production has been industrialized

NCI's advantages

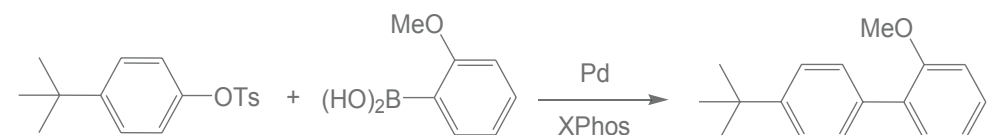
- | | |
|---|--|
| • Cost Effective | Integrated Production from PH_3 |
| • High Purity | More than 98.0% |
| • Industrial Scale Supply | Flexible and Capable |
| • Contract Manufacturing Service | Ask us to find your solution |

Application examples

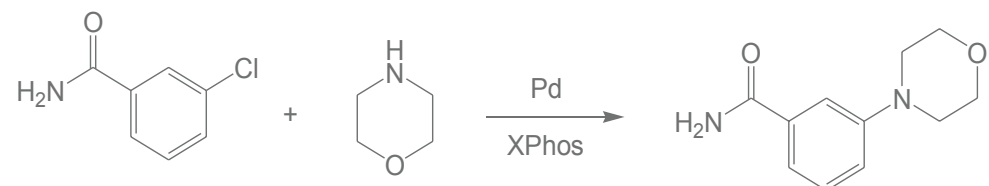
Amination and amidation of arylsulfonates



Pd catalyzed Suzuki-Miyaura coupling reaction

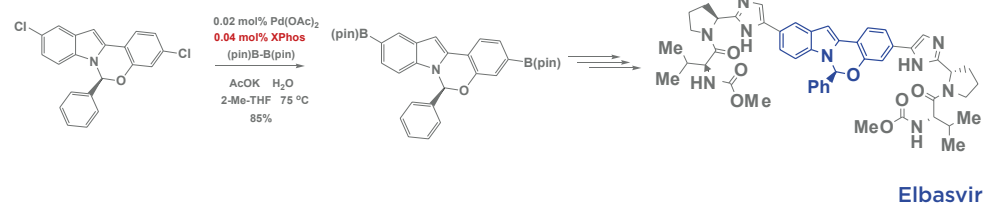


Chemoselective amination of aryl-chlorides

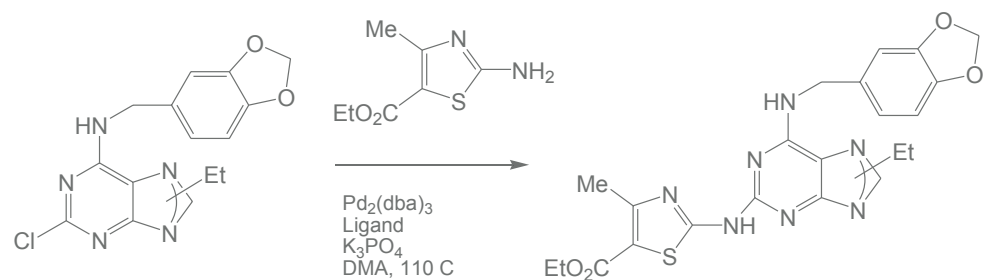


Applications in Pharmaceutical Synthesis

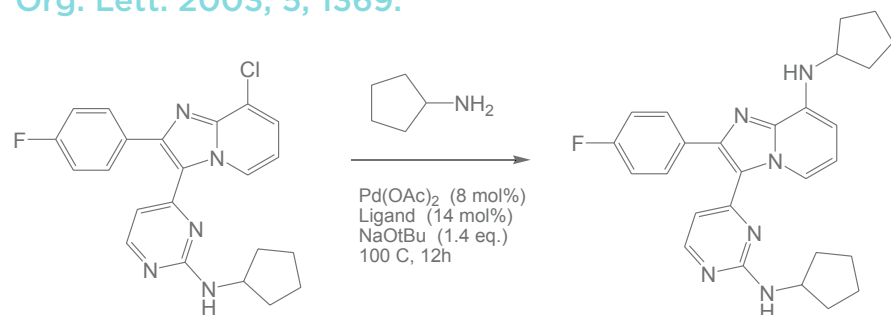
J. Am. Chem. Soc., 2015, 137, 13728.



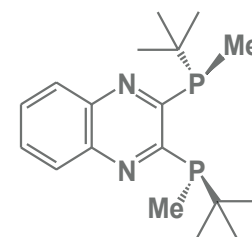
Bioorg. Med. Chem. Lett. 2004, 14, 2955.



Org. Lett. 2003, 5, 1369.

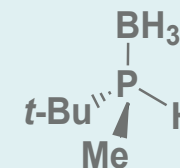


P-Chiral Phosphine Ligand QuinoxP*



(*R,R*)-QuinoxP*
R,R-2,3-Bis(tert-butylmethylphosphino) quinoxaline
CAS No.: 866081-62-1
Appearance: Orange crystalline solid
m.p.: 102-103 °C
[α]_D²²: -54.3 (c 1.00, CHCl₃)

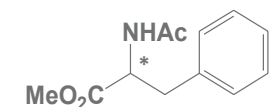
(*R,R*)-QuinoxP*



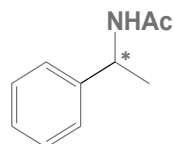
Chiral
Ligands

100 kg Production has been industrialized

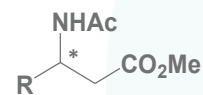
- Air-stable crystalline solid.
- Excellent enantioselectivities of up to 99.9% ee in asymmetric hydrogenation and C-C or C-N bond formations.
- (*S,S*)-QuinoxP* is also available.
- QuinoxP* is patented by NCI.



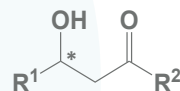
α-Amino Acids



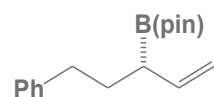
Chiral Amines



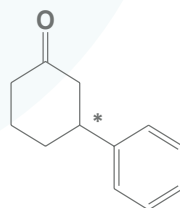
β-Amino Acids



Chiral Alcohols



Allylboronates

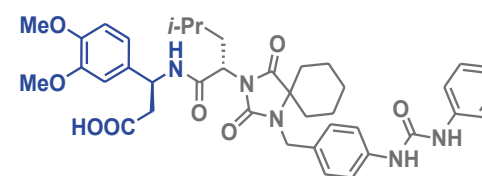
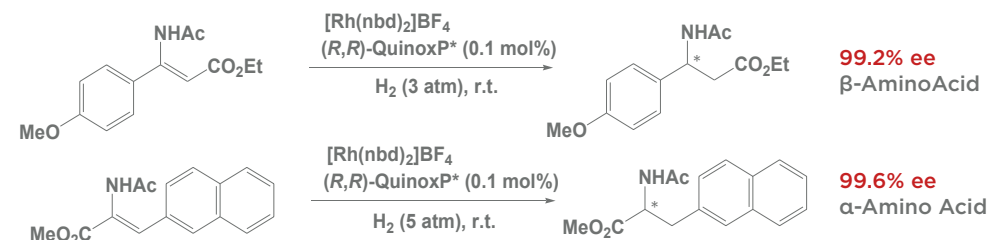


Chiral C-C Coupling

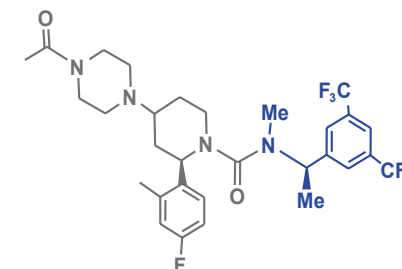
QuinoxP*

Application examples

Enantioselective Hydrogenation



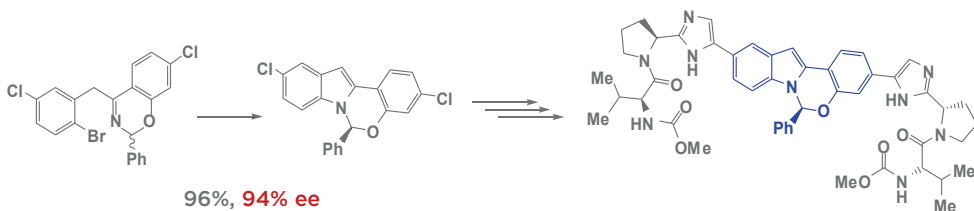
S/C 1,000 **97.7% ee**
VLA-4 antagonist S9059



S/C 10,000 **99.9% ee**
Casopitant

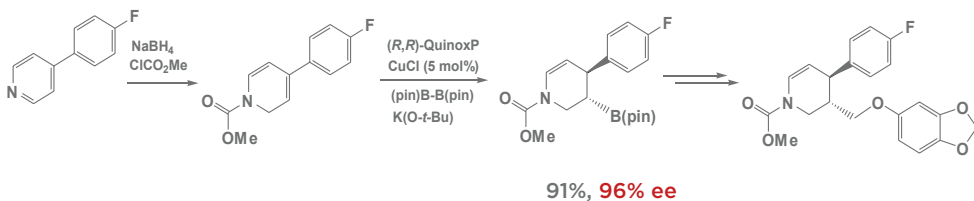
Application examples

Enantioselective C-C or C-N bond forming reaction



Elbasvir

J. Am. Chem. Soc., 2015, 137, 13728.



J. Am. Chem. Soc., 2016, 138, 4338.