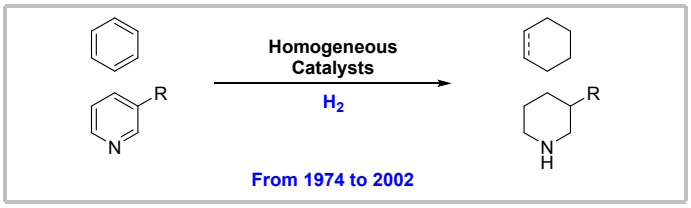
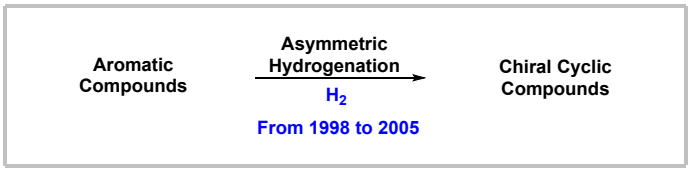
Reviews

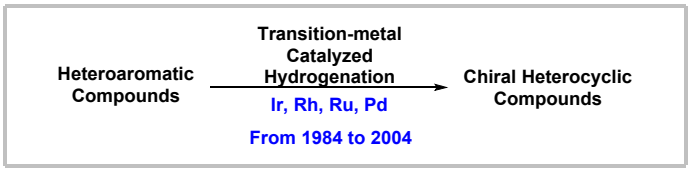
1. Paul J. Dyson.* Arene Hydrogenation by Homogeneous Catalysts: Fact or Fiction?*Dalton Trans.***2003**, 2964–2974.



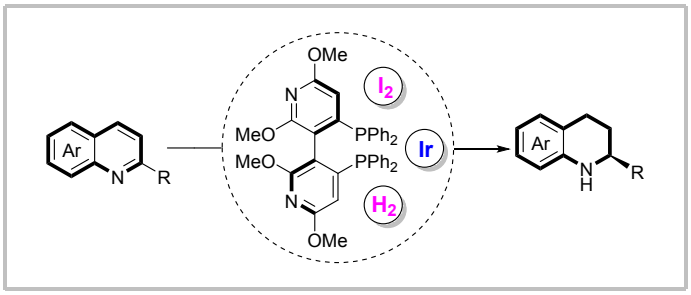
2. Frank Glorius.* Asymmetric Hydrogenation of Aromatic Compounds.*Org. Biomol. Chem.***2005**,*3*, 4171-4175.



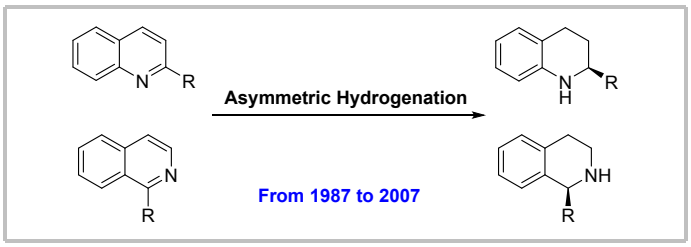
3. Sheng-Mei Lu, Xiu-Wen Han, Yong-Gui Zhou.* Recent Advances in Asymmetric Hydrogenation of Heteroaromatic Compounds.*Chin. J. Org. Chem.***2005**, *25*, 634-640.



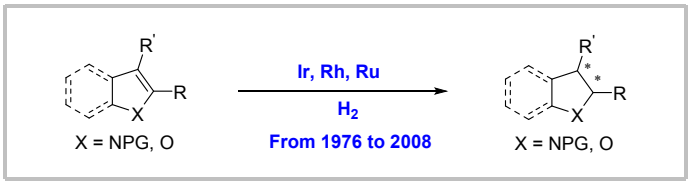
4. Jing Wu and Albert S. C. Chan.* P-Phos: A Family of Versatile and Effective Atropisomeric Dipyridylphosphine Ligands in Asymmetric Catalysis.*Acc. Chem. Res.***2006**,*39*, 711-720.



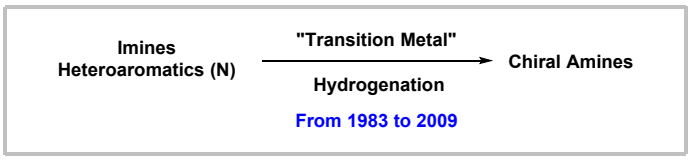
5. Yong-Gui Zhou.* Asymmetric Hydrogenation of Heteroaromatic Compounds.*Acc. Chem. Res.***2007**,*40*, 1357-1366.



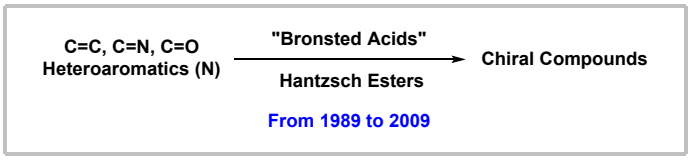
6. Ryoichi Kuwano.* Catalytic Asymmetric Hydrogenation of 5-membered Heteroaromatics. *Heterocycles***2008**,*76*, 909 -922.



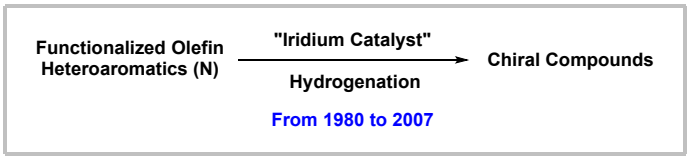
7. Nicolas Fleury-Bregeot, Veronica de la Fuente, Sergio Castillon,* and Carmen Claver.* Highlights of Transition Metal-Catalyzed Asymmetric Hydrogenation of Imines.*ChemCatChem***2010**,*2*, 1346–1371.



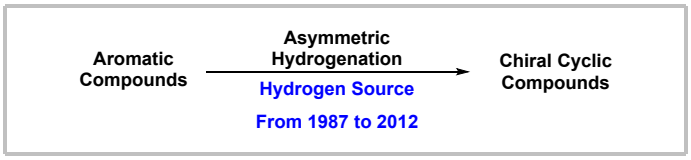
8. Magnus Rueping,* Erli Sugiono, Fenja R. Schoepke. Asymmetric Bronsted Acid Catalyzed Transfer Hydrogenations.*Synlett***2010**, 852-865.



9. Tamara L. Church, Pher G. Andersson.* Iridium Catalysts for the Asymmetric Hydrogenation of Olefins with Nontraditional Functional Substituents.*Coord. Chem. Rev.***2008**,*252*, 513-531.

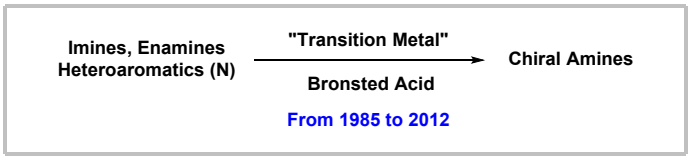


10. Duo-Sheng Wang, Qing-An Chen, Sheng-Mei Lu and Yong-Gui Zhou.* Asymmetric Hydrogenation of Heteroarenes and Arenes.*Chem. Rev.***2012**,*112*, 2557-2590.

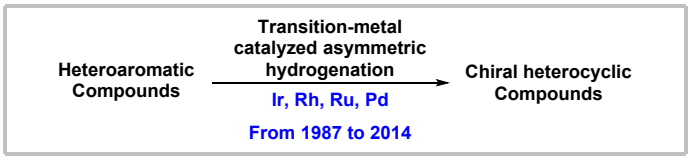


11. Zhengkun Yu,*Weiwei Jin, Quanbin Jiang. Bronsted Acid Activation Strategy in Transition-Metal Catalyzed Asymmetric Hydrogenation of*N*-Unprotected Imines, Enamines, and*N*-Heteroaromatic Compounds.*Angew. Chem.*

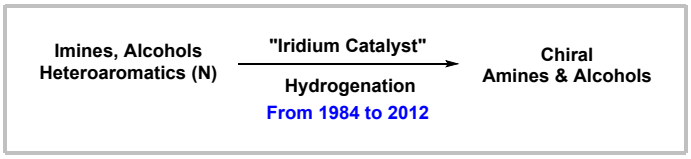
*Int. Ed.***2012**,*51*, 6060-6072.



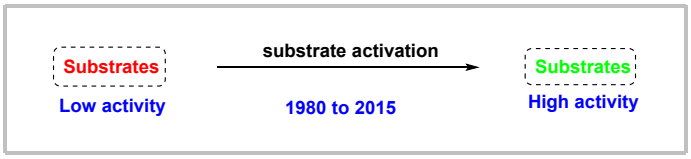
12. Yan-Mei He, Feng-Tao Song and Qing-Hua Fan.*Advances in Transition Metal-Catalyzed Asymmetric Hydrogenation of Heteroaromatic Compounds.*Top. Curr. Chem.***2014**,*343*, 145–190.



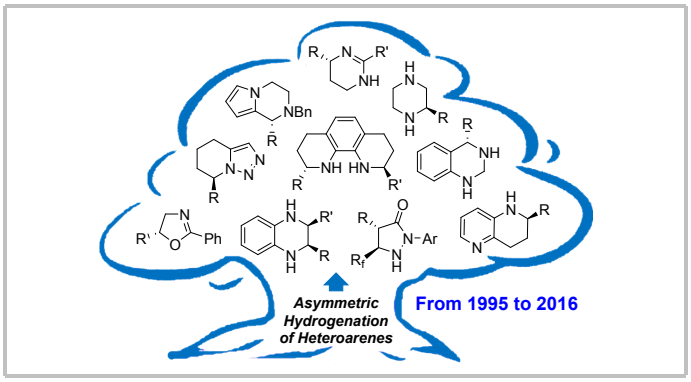
13. Agnieszka Bartoszewicz, Nanna Ahlsten, and Belén Martín-Matute.* Enantioselective Synthesis of Alcohols and Amines by Iridium-Catalyzed Hydrogenation, Transfer Hydrogenation, and Related Processes.*Chem. Eur. J.***2013**,*19*, 7274–7302.



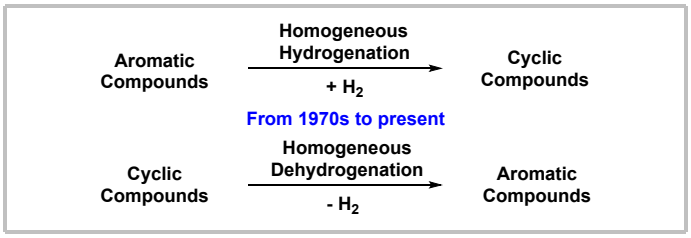
14. Bugga Balakrishna, José Luis Núñez-Rico and Anton Vidal-Ferran.* Substrate Activation in the Catalytic Asymmetric Hydrogenation of*N*-Heteroarenes.*Eur. J. Org. Chem.***2015**, 5293-5303.



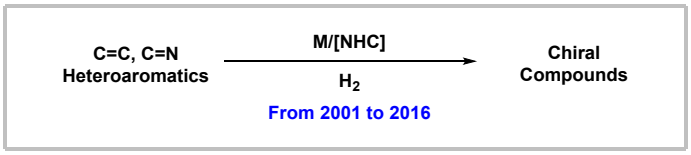
15. Zhang-Pei Chen, and Yong-Gui Zhou.* Asymmetric Hydrogenation of Heteroarenes with Multiple Heteroatoms.*Synthesis***2016**,*48*, 1769-1781.



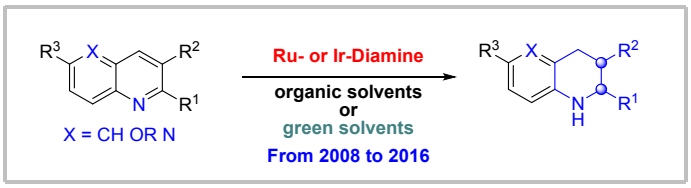
16. Zachary X. Giustra, Jacob S. A. Ishibashi, Shih-Yuan Liu.* Homogeneous Metal Catalysis for Conversion between Aromatic and Saturated Compounds.*Coord. Chem. Rev.***2016**,*314*, 134-181.



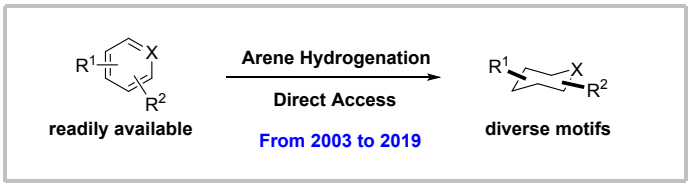
17. Dongbing Zhao, Lisa Candish, Daniel Paul and Frank Glorius.*_N_-Heterocyclic Carbenes in Asymmetric Hydrogenation. *ACS Catal.***2016**,*6*, 5978-5988.



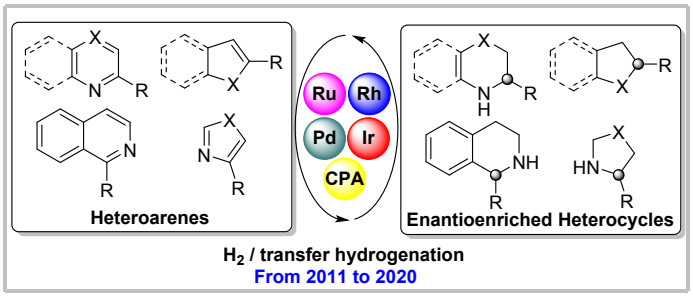
18. Yi-Er Luo, Yan-Mei He, Qing-Hua Fan.* Asymmetric Hydrogenationof Quinoline Derivatives Catalyzed by Cationic Transition MetalComplexes of Chiral Diamine Ligands: Scope, Mechanism andCatalyst Recycling. *Chem. Rec.***2016**, *16*, 2697-2711.



19. Mario P. Wiesenfeldt, Zackaria Nairoukh, Toryn Dalton, and Frank Glorius.* SelectiveArene Hydrogenation for Direct Access to Saturated Carbo- andHeterocycles. *Angew. Chem. Int. Ed*. **2019**, *58*, 10460-10476.



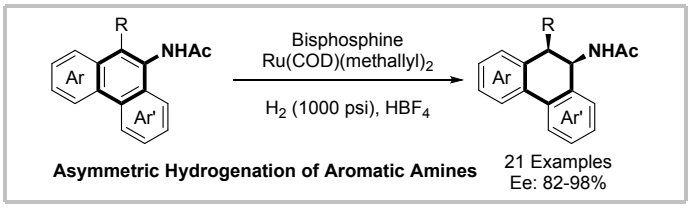
20. Alexia N. Kim and Brian M. Stoltz.* Recent Advances in Homogeneous Catalysts for the Asymmetric Hydrogenation of Heteroarenes. *ACS Catal*. **2020**, *10*, 13834-13851.



Carbocycle

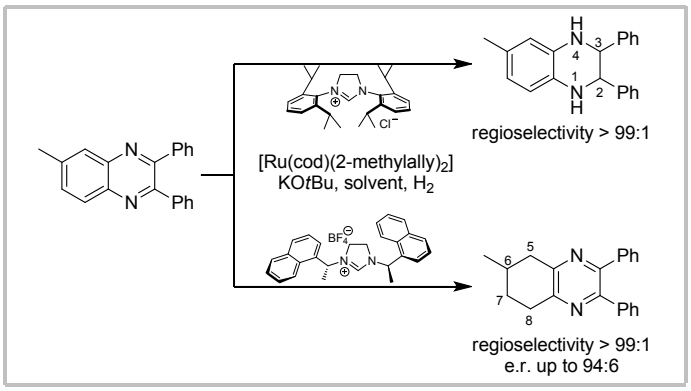
Our work

1. Zhong Yan, Huan-Ping Xie, Hong-Qiang Shen and Yong-Gui Zhou.* Ruthenium-Catalyzed Hydrogenation of Carbocyclic Aromatic Amines: Access to Chiral Exocyclic Amines. *Org. Lett.* **2018**,*20*, 1094-1097.

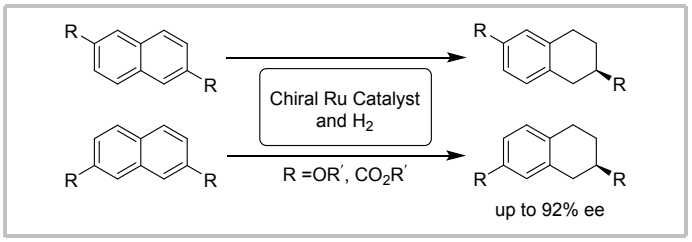


Others' work

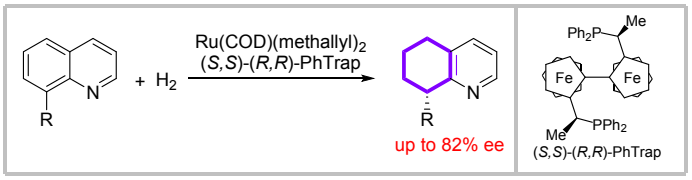
1. Slawomir Urban, Nuria Ortega and Frank Glorius.* Ligand-Controlled Highly Regioselective and Asymmetric Hydrogenation of Quinoxalines Catalyzed by Ruthenium*N*-Heterocyclic Carbene Complexes.*Angew. Chem. Int. Ed.***2011**,*50*, 3803-3805.



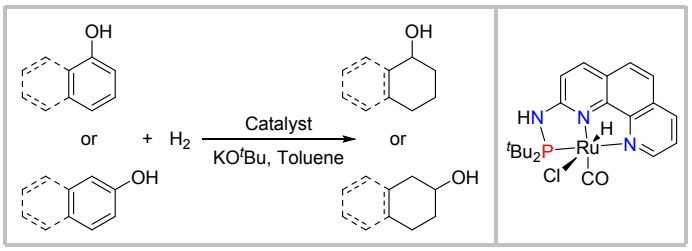
2. Ryoichi Kuwano, Ryuichi Morioka, Manabu Kashiwabara and Nao Kameyama. Catalytic Asymmetric Hydrogenation of Naphthalenes.*Angew. Chem. Int. Ed.***2012**,*51*, 4136-4139.



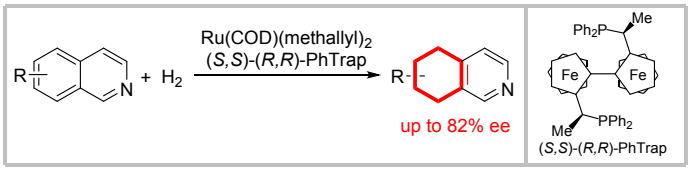
3. Ryoichi Kuwano,* Ryuhei Ikeda and Kazuki Hirasada. Catalytic Asymmetric Hydrogenation of Quinoline Carbocycles: Unusual Chemoselectivity in the Hydrogenation of Quinolines. *Chem. Commun.***2015**, *51*, 7558-7561.



4. Huaifeng Li, Yuan Wang, Zhiping Lai and Kuo-Wei Huang. Selective Catalytic Hydrogenation of Arenols by a Well-Defined Complex of Ruthenium and Phosphorus−NitrogenPN3−Pincer Ligand Containing a Phenanthroline Backbone.*ACS Catal.***2017**,*7*, 4446−4450.



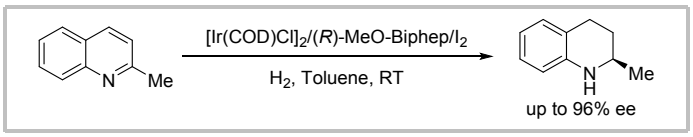
5. Yushu Jin, Yusuke Makida, Tatsuya Uchidaand Ryoichi Kuwano.* Ruthenium-Catalyzed Chemo- and Enantioselective Hydrogenationof Isoquinoline Carbocycles.*J. Org. Chem.* **2018**, *83,* 3829-3839.



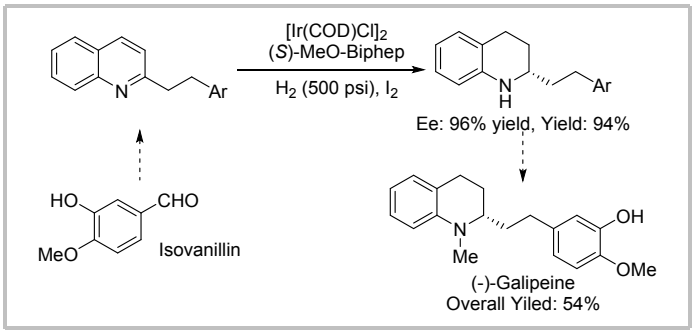
Quinolines

Our work

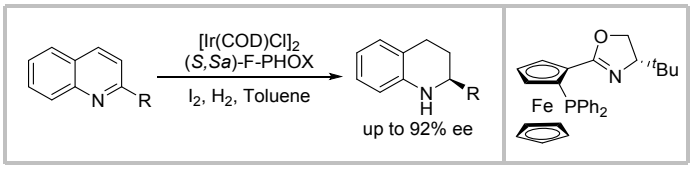
1. Wen-Bo Wang, Sheng-Mei Lu, Peng-Yu Yang, Xiu-Wen Han,**Yong-Gui Zhou**.*Highly Enantioselective Iridium-Catalyzed Hydrogenation of Heteroaromatic Compounds, Quinolines.*J. Am. Chem. Soc*.**2003**,*125*, 10536-10537.



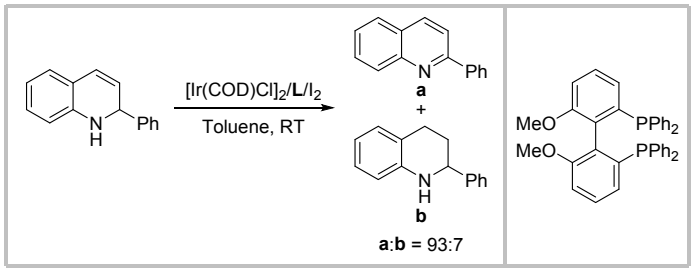
2. Peng-Yu Yang,**Yong-Gui Zhou**.*The Enantioselective Total Synthesis of Alkaloid (-)-Galipeine.*Tetrahedron: Asymmetry***2004**,*15*, 1145-1149.



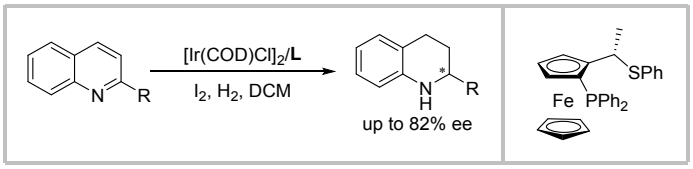
3. Sheng-Mei Lu, Xiu-Wen Han,**Yong-Gui Zhou**.*Asymmetric Hydrogenation of Quinolines Catalyzed by Iridium with Chiral Ferrocenyloxazoline Derived N,P Ligands.*Adv. Synth. Catal.***2004**,*346*, 909-912.



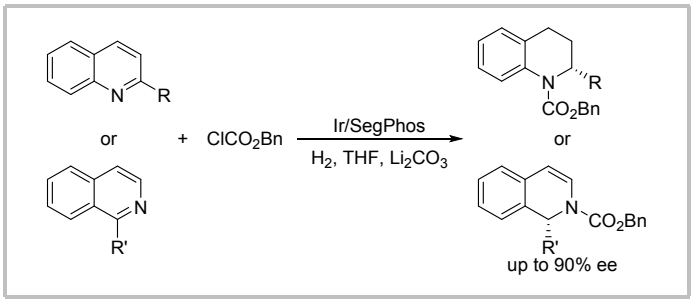
4. Sheng-Mei Lu, You-Qing Wang, Xiu-Wen Han,**Yong-Gui Zhou**.*Homogeneous Iridium-catalyzed Dehydro-aromatization of 2-Substituted-1,2-dihydro-Quinolines.*Chin. J. Catal.***2005**,*26*, 287-290.



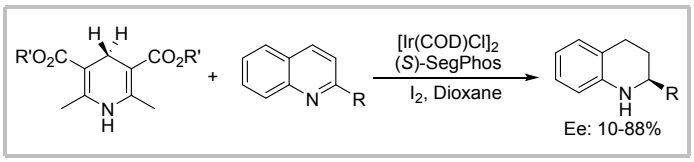
5. Yu-Jun Zhao, You-Qing Wang,**Yong-Gui Zhou**.*Application of Ferrocene-Derived Chiral S,P-Donor Ligands for Iridium-catalyzed Asymmetric Hydrogenation of Quinolines.*Chin. J. Catal.***2005**,*26*, 737-739.



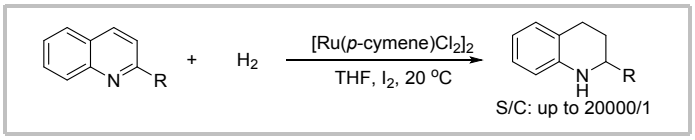
6. Sheng-Mei Lu, You-Qing Wang, Xiu-Wen Han,**Yong-Gui Zhou**.*Asymmetric Hydrogenation of Quinoline and Isoquinolines Acitivated by Chloroformates.*Angew. Chem. Int. Ed.***2006**,*45*, 2260-2263.



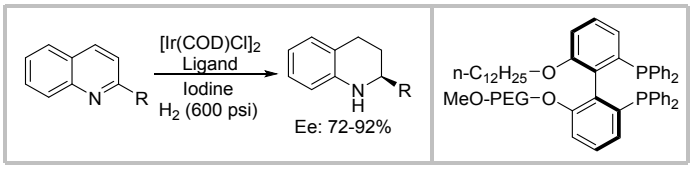
7. Da-Wei Wang, Wei Zeng,**Yong-Gui Zhou**.*Iridium-catalyzed Asymmetric Transfer Hydrogenation of Quinolines with Hantzsch Esters.*Tetrahedron: Asymmetry***2007**,*18*, 1103-1107.



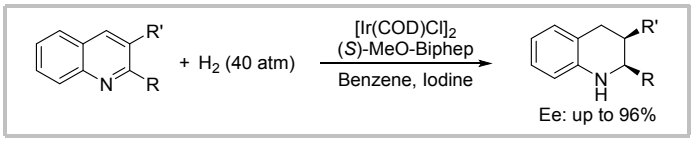
8. Sheng-Mei Lu, Xiu-Wen Han,**Yong-Gui Zhou**.*An Efficient Catalytic System for the Hydrogenation of Quinolines.*J. Organomet. Chem.***2007**,*692*, 3065-3069.



9. Xiao-Bing Wang and**Yong-Gui Zhou**.*Synthesis of Tunable Bisphosphine Ligands and Their Application in Asymmetric Hydrogenation of Quinolines.*J. Org. Chem.***2008**,*73*, 5640-5642.

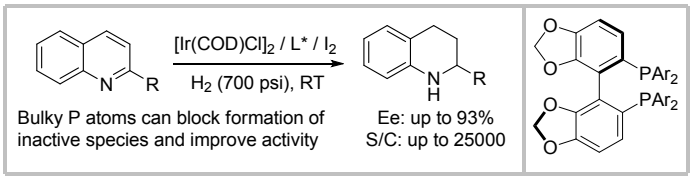


10. Da-Wei Wang, Xiao-Bing Wang, Duo-Sheng Wang, Sheng-Mei Lu, Chang-Bin Yu,**Yong-Gui Zhou**.*Highly Enantioselective Iridium-Catalyzed Hydrogenation of 2-Benzylquinolines, 2-Functionalized and 2,3-Disubstituted Quinolines.*J. Org. Chem.***2009**,*74*, 2780-2787.

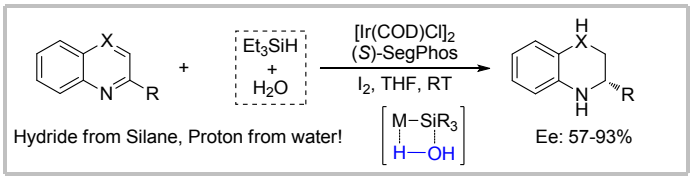


11. Duo-Sheng Wang, Juan Zhou, Da-Wei Wang, Yin-Long Guo,***Yong-Gui Zhou**.*Inhibiting Deactivation of

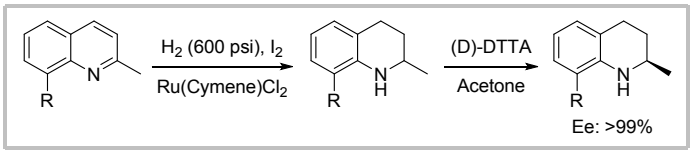
Iridium Catalysts with Bulky Substituents on Coordination Atoms.*Tetrahedron Lett.***2010**,*51*, 525-528.



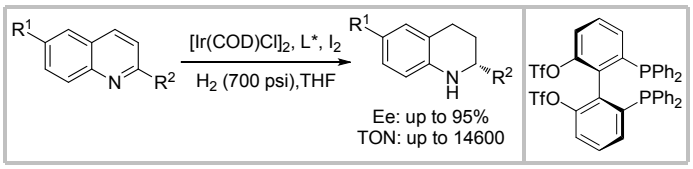
12. Da-Wei Wang, Duo-Sheng Wang, Qing-An Chen,**Yong-Gui Zhou**.*Asymmetric Hydrogenation with Water/Silane as the Hydrogen Source. *Chem. Eur. J.***2010**, *16*, 1133-1136.



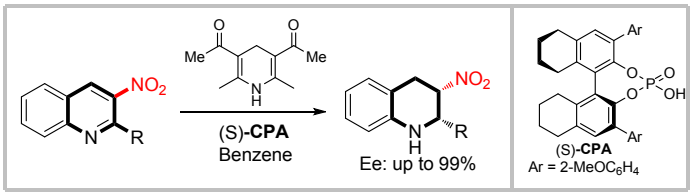
13. Jie Tang, Guo-Fang Jiang,* and **Yong-Gui Zhou.*** Convenient Synthesis of Optically Pure 8-Methoxy-2-methyl-1,2,3,4-tetrahydroquinoline and 2-Methyl-1,2,3,4-tetrahydroquinoline. *Heterocycles*. **2010**, *82*, 887-893.



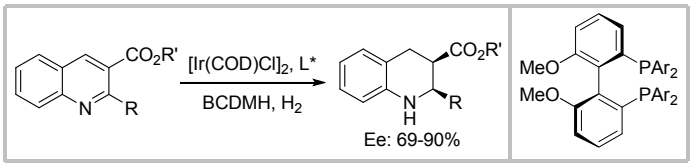
14. De-Yang Zhang, Duo-Sheng Wang, Min-Can Wang,* Chang-Bin Yu, Kai Gao and **Yong-Gui Zhou.*** Synthesis of Electronically Deficient Atropisomeric Bisphosphine Ligands and Their Application in Asymmetric Hydrogenation of Quinolines. *Synthesis.***2011**, 2796-2802.



15. Xian-Feng Cai, Mu-Wang Chen, Zhi-Shi Ye, Ran-Ning Guo, Lei Shi, Yan-Qin Li and **Yong-Gui Zhou.*** Asymmetric Transfer Hydrogenation of Aromatic Nitro Compounds, 3-Nitroquinolines: A Facile Access to Cyclic Nitro Compounds with Two Contiguous Stereocenters. *Chem. Asian J.* **2013**, *8*, 1381-1385.

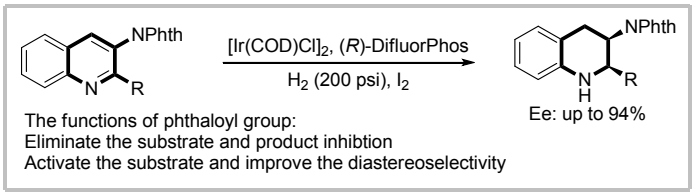


16. Zhang-Pei Chen, Zhi-Shi Ye, Mu-Wang Chen and **Yong-Gui Zhou.*** Enantioselective Synthesis of Endo-Cyclic Beta-Amino Acids with Two Contiguous Stereocenters via Hydrogenation of 3-Carbalkoxy-2-Substituted Quinolines. *Synthesis***2013**, 3239-3244.

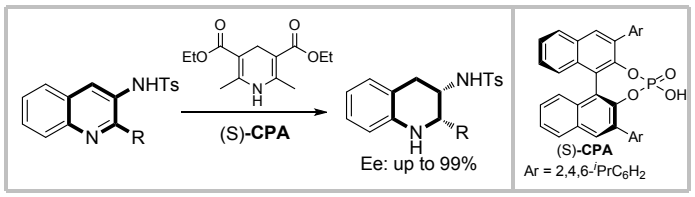


17. Xian-Feng Cai, Ran-Ning Guo, Mu-Wang Chen, Lei Shi and **Yong-Gui Zhou.*** Synthesis of Chiral

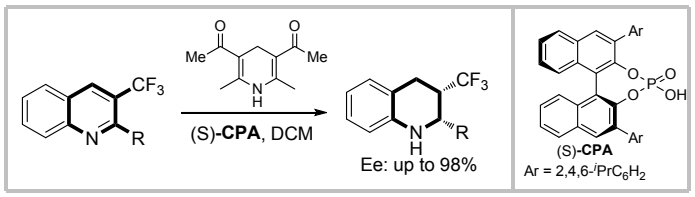
Exocyclic Amines via Asymmetric Hydrogenation of Aromatic Quinolin-3-amines. *Chem. Eur. J.***2014**, *20*, 7245-7248.



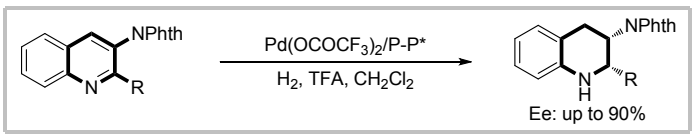
18. Xian-Feng Cai, Ran-Ning Guo, Guang-Shou Feng, Bo Wu and **Yong-GuiZhou.*** Chiral Phosphoric Acid-Catalyzed Asymmetric Transfer Hydrogenation of Quinolin-3-amines. *Org. Lett.***2014**, *16*, 2680-2683.



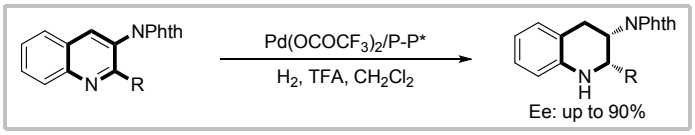
19. Ran-Ning Guo, Zhang-Pei Chen, Xian-Feng Cai and **Yong-Gui Zhou.*** Asymmetric Transfer Hydrogenation of 3-(Trifluoromethyl)quinolines. *Synthesis***2014**, *46*, 2751-2756.



20. Xian-Feng Cai, Wen-Xue Huang, Zhang-Pei Chen and **Yong-Gui Zhou.*** Palladium-Catalyzed Asymmetric Hydrogenation of 3-Phthalimido Substituted Quinolines. *Chem. Commun.***2014**, *50*, 9588-9590.

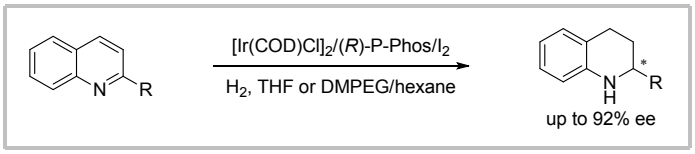


21. Mu-Wang Chen, Xian-Feng Cai, Zhang-Pei Chen, Lei Shi and **Yong-Gui Zhou.*** Facile Construction of Three Contiguous Stereogenic Centers via Dynamic Kinetic Resolution in Asymmetric Transfer Hydrogenation of Quinolines. *Chem. Commun*. **2014**, *50*, 12526-12529.



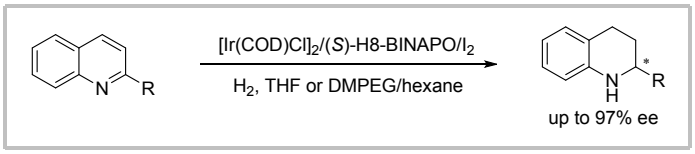
Others' work

1. Lijin Xu, Kim Hung Lam, Jianxin Ji, Jing Wu, Qing-Hua Fan,* Wai-Hung Lo and Albert S. C. Chan.* Air-stable Ir-(P-Phos) complex for Highly Enantioselective Hydrogenation of Quinolines and Their Immobilization in Poly(ethylene glycol) dimethyl Ether (DMPEG). *Chem. Commun.***2005**, 1390-1392.

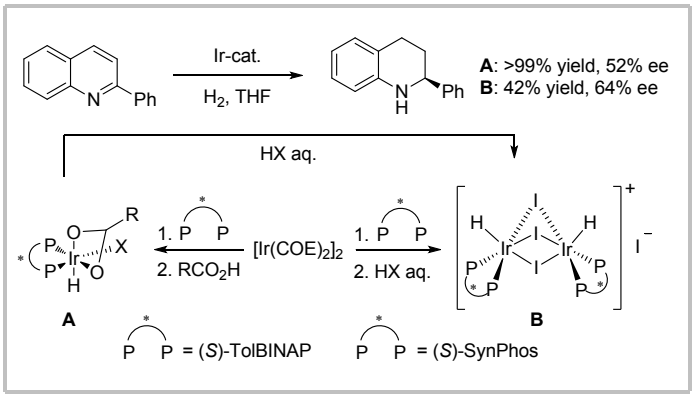


2. Kim Hung Lam, Lijin Xu,* Lichun Feng, Qing-Hua Fan,* Fuk Loi Lam, Wai-hung Lo, Albert S. C. Chan.* Highly Enantioselective Iridium-Catalyzed Hydrogenation of Quinoline Derivatives Using Chiral Phosphinite H8-

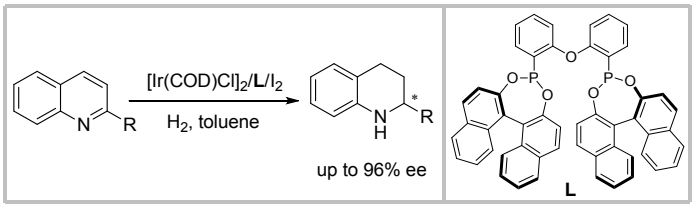
BINAPO. *Adv. Synth. Catal.* **2005**, *347*, 1755-1758.



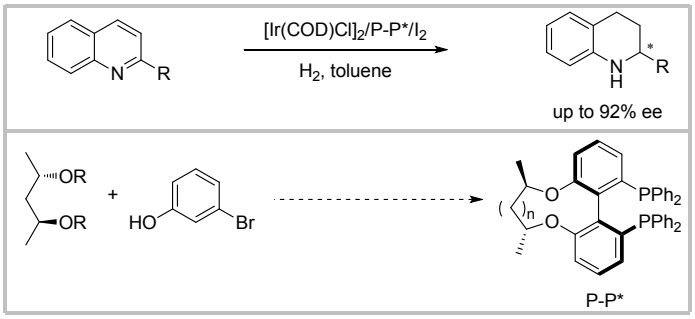
3. Tsuneaki Yamagata, Hiroshi Tadaoka, Mitsuhiro Nagata, Tsukasa Hirao, Yasutaka Kataoka, Virginie Ratovelomanana-Vidal, Jean Pierre Genet* and Kazushi Mashima.* Oxidative Addition of RCO_2H and HX to Chiral Diphosphine Complexes of Iridium(I): Convenient Synthesis of Mononuclear Halo-Carboxylate Iridium(III) Complexes and Cationic Dinuclear Triply Halogen-Bridged Iridium(III) Complexes and Their Catalytic Performance in Asymmetric Hydrogenation of Cyclic Imines and 2-Phenylquinoline. *Organometallics***2006**, *25*, 2505-2513.



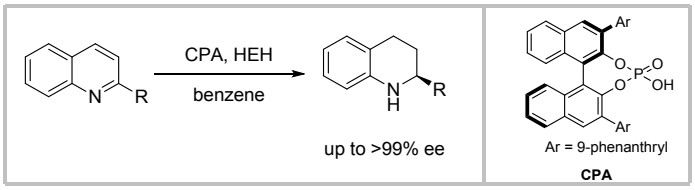
4. Manfred T. Reetz* and Xiaoguang Li. Asymmetric Hydrogenation of Quinolines Catalyzed by Iridium Complexes of BINOL-derived Diphosphonites. *Chem. Commun*. **2006**, 2159-2160.



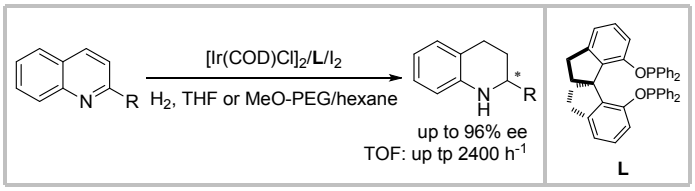
5. Liqin Qiu, Fuk Yee Kwong, Jing Wu, Wai Har Lam, Shusun Chan, Wing-Yiu Yu, Yue-Ming Li, Rongwei Guo, Zhongyuan Zhou and Albert S. C. Chan.* A New Class of Versatile Chiral-Bridged Atropisomeric Diphosphine Ligands: Remarkably Efficient Ligand Syntheses and Their Applications in Highly Enantioselective Hydrogenation Reactions. *J. Am. Chem. Soc.***2006**, *128*, 5955-5965.



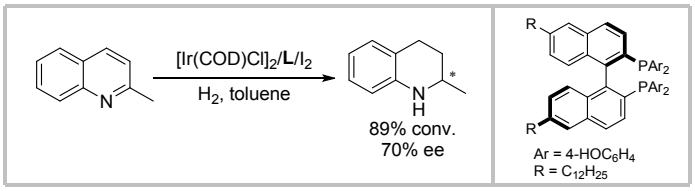
6. Magnus Rueping,* Andrey P. Antonchick, and Thomas Theissmann. A Highly Enantioselective Bronsted Acid Catalyzed Cascade Reaction: Organocatalytic Transfer Hydrogenation of Quinolines and Their Application in the Synthesis of Alkaloids. *Angew. Chem. Int. Ed.***2006**, *45*, 3683-3686.



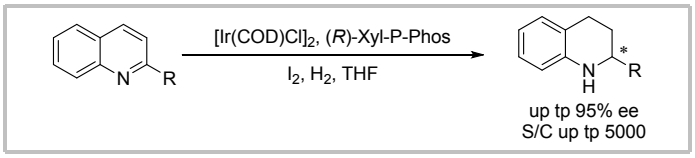
7. Wei-Jun Tang, Shou-Fei Zhu, Li-Jin Xu,* Qi-Lin Zhou, Qing-Hua Fan,* Hai-Feng Zhou, Kimhung Lam and Albert S. C. Chan.* Asymmetric Hydrogenation of Quinolines with High Substrate/Catalyst Ratio. *Chem. Commun*. **2007**, 613-615.



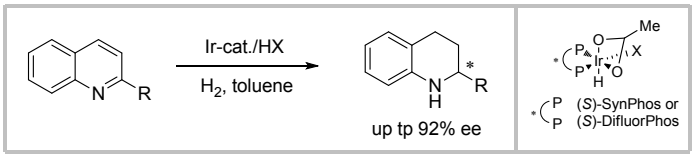
8. Mohamad Jahjah, Mohamad Alame, Stephane Pellet-Rostaing* and Marc Lemaire*. Catalytic Asymmetric Hydrogenation of α-Ketoesters and Quinoline Uusing Electronically Enriched BINAP. *Tetrahedron: Asymmetry***2007**, *18*, 2305-2312.



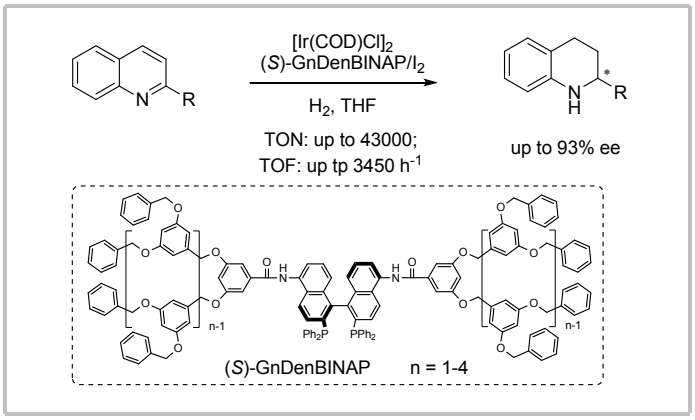
9. Sau Hing Chan, Kim Hung Lam,* Yue-Ming Li, Lijin Xu, Weijun Tang, Fuk Loi Lam, Wai Hung Lo, Wing Yiu Yu, Qinghua Fan* and Albert S. C. Chan.* Asymmetric Hydrogenation of Quinolines with Recyclable and Air-stable Iridium Catalyst Systems. *Tetrahedron: Asymmetry***2007**, *18*, 2625-2631.



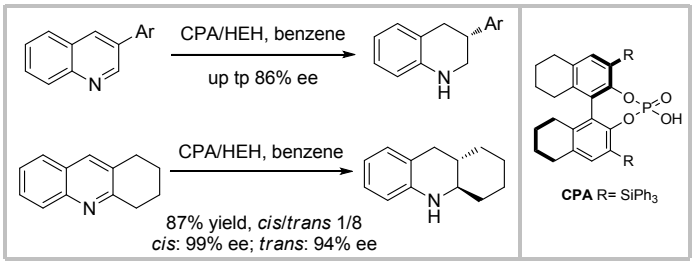
10. Coralie Deport, Marie Buchotte, Keren Abecassis, Hiroshi Tadaoka, Tahar Ayad, Takashi Ohshima, Jean-Pierre Genet,* Kazushi Mashima,* Virginie Ratovelomanana-Vidal.* Novel Ir–SYNPHOS and Ir-DIFLUORPHOS Catalysts for Asymmetric Hydrogenation of Quinolines. *Synlett***2007**, 2743-2747.



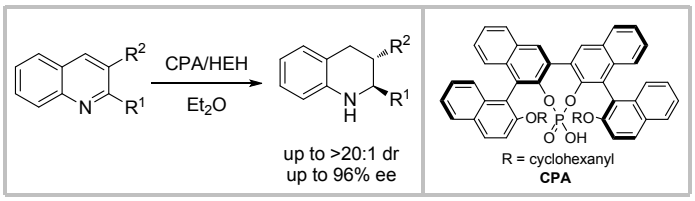
11. Zhi-Jian Wang, Guo-Jun Deng, Yong Li, Yan-Mei He, Wei-Jun Tang and Qing-Hua Fan.* Enantioselective Hydrogenation of Quinolines Catalyzed by Ir(BINAP)-Cored Dendrimers: Dramatic Enhancement of Catalytic Activity. *Org. Lett*. **2007**, *9*, 1243-1246.



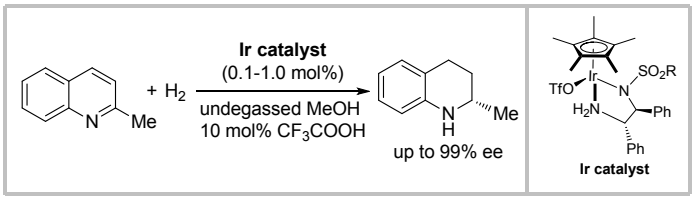
12. Magnus Rueping,* Thomas Theissmann, Sadiya Raja, and Jan W. Bats. Asymmetric Counterion Pair Catalysis: An Enantioselective Bronsted Acid-Catalyzed Protonation. *Adv. Synth. Catal.***2008**, *350*, 1001-1006.



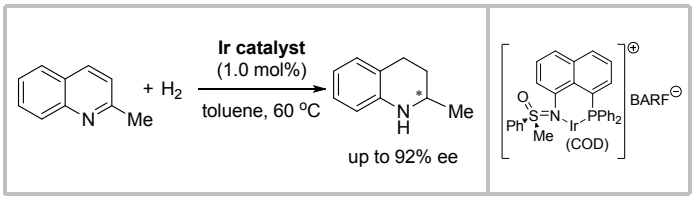
13. Qun-Sheng Guo, Da-Ming Du* and Jiaxi Xu. The Development of Double Axially Chiral Phosphoric Acids and Their Catalytic Transfer Hydrogenation of Quinolines. Angew. Chem. Int. Ed. 2008, 47, 759-762.



14. Zhi-Wei Li, Tian-Li Wang, Yan-Mei He, Zhi-Jian Wang, Qing-Hua Fan,* Jie Pan, and Li-Jin Xu.* Air-Stable and Phosphine-Free Iridium Catalysts for Highly Enantioselective Hydrogenation of Quinoline Derivatives. *Org. Lett*. **2008**, *10*, 5265-5268.

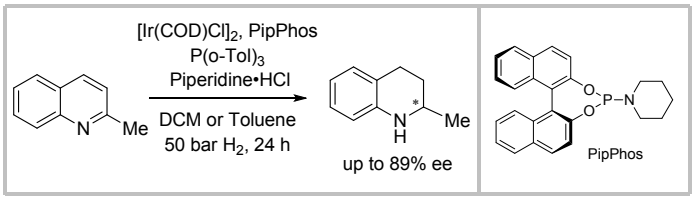


15. Sheng-Mei Lu and Carsten Bolm.* Synthesis of Sulfoximine-Derived P,N Ligands and their Applications in Asymmetric Quinoline Hydrogenations. *Adv. Synth. Catal*. **2008**, *350*, 1101-1105.

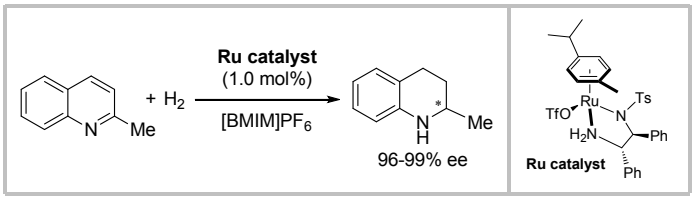


16. Natasa Mrsic, Laurent Lefort, Jeroen A. F. Boogers, Adriaan J. Minnaard,* Ben L. Feringa,* and Johannes G. de Vries.* Asymmetric Hydrogenation of Quinolines Catalyzed by Iridium Complexes of Monodentate BINOL-

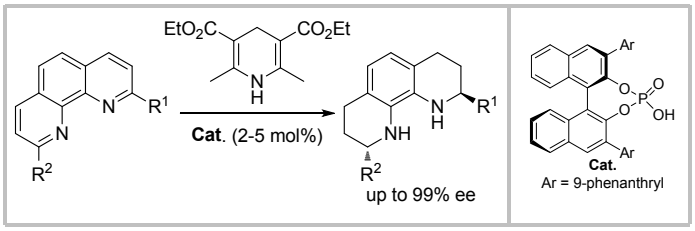
Derived Phosphoramidites. *Adv. Synth. Catal*. **2008**, *350*, 1081-1089.



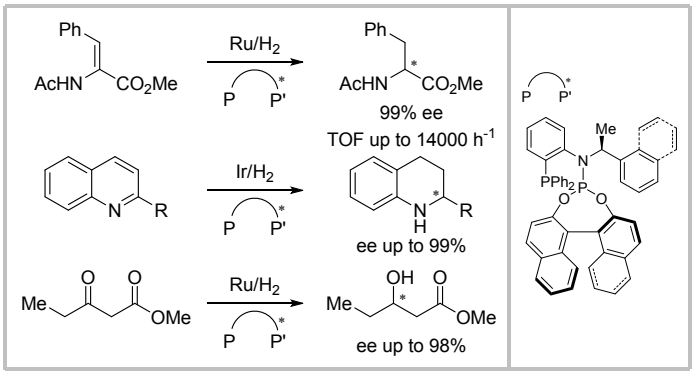
17. Haifeng Zhou, Zhiwei Li, Zhijian Wang, Tianli Wang, Lijin Xu, Yanmei He, Qing-Hua Fan,* Jie Pan, Lianquan Gu, and Albert S. C. Chan.* Hydrogenation of Quinolines Using a Recyclable Phosphine-Free Chiral Cationic Ruthenium Catalyst: Enhancement of Catalyst Stability and Selectivity in an Ionic Liquid. *Angew. Chem. Int. Ed*. **2008**, *47*, 8464-8467.



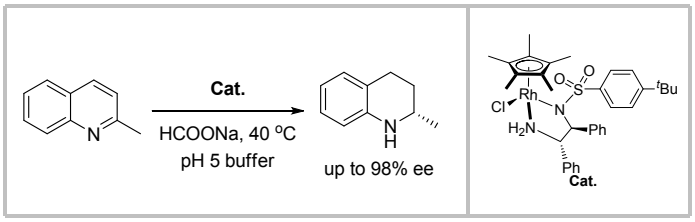
18. Metallinos Costa,* Barrett Fred B, Xu, Shufen. Bronsted Acid Catalyzed Asymmetric Reduction of 2- and 2,9-Substituted 1,10-Phenanthrolines. *Synlett***2008**, 720-724.



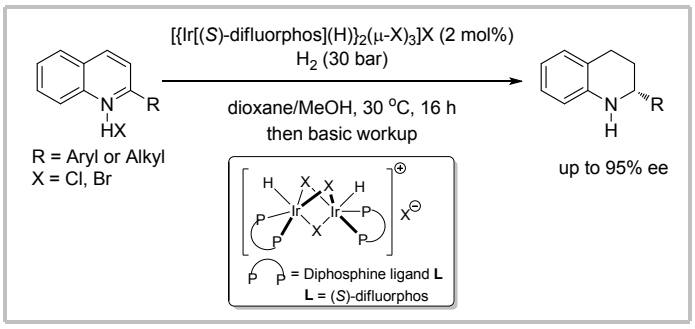
19. Matthias Eggenstein, Anika Thomas, Jens Theuerkauf, Giancarlo Francio,* and Walter Leitnera.* Highly Efficient and Versatile Phosphine-Phosphoramidite Ligands for Asymmetric Hydrogenation. *Adv. Synth. Catal.***2009**, *351*, 725-732.



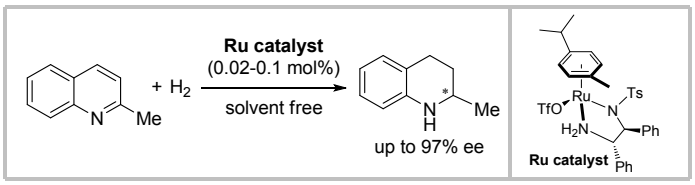
20. Chao Wang, Chaoqun Li, Xiaofeng Wu, Alan Pettman, and Jianliang Xiao.* pH-Regulated Asymmetric Transfer Hydrogenation of Quinolines in Water. *Angew. Chem. Int. Ed*. **2009**, *48*, 6524-6528.



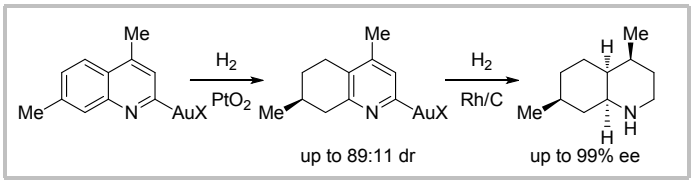
21. Hiroshi Tadaoka, Damien Cartigny, Takuto Nagano, Tushar Gosavi, Tahar Ayad, Jean-Pierre GenTt, Takashi Ohshima,* Virginie Ratovelomanana-Vidal,* and Kazushi Mashima. Unprecedented Halide Dependence on Catalytic Asymmetric Hydrogenation of 2-Aryl- and 2-Alkyl-Substituted Quinolinium Salts by Using Ir Complexes with Difluorphos and Halide Ligands. *Chem. Eur. J.***2009**, *15*, 9990-9994.



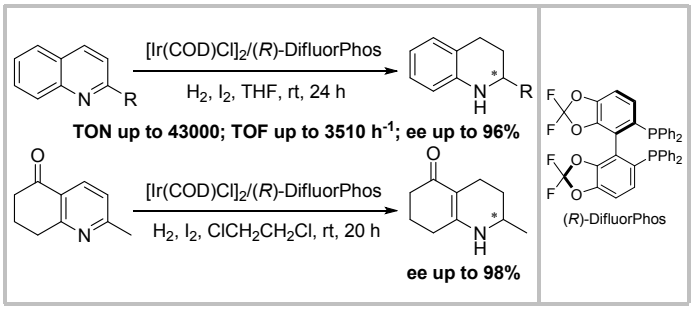
22. Zhi-Jian Wang, Hai-Feng Zhou, Tian-Li Wang, Yan-Mei He and Qing-Hua Fan.* Highly Enantioselective Hydrogenation of Quinolines under Solvent-free or Highly Concentrated Conditions. *Green Chem.***2009**, *11*, 767-769.



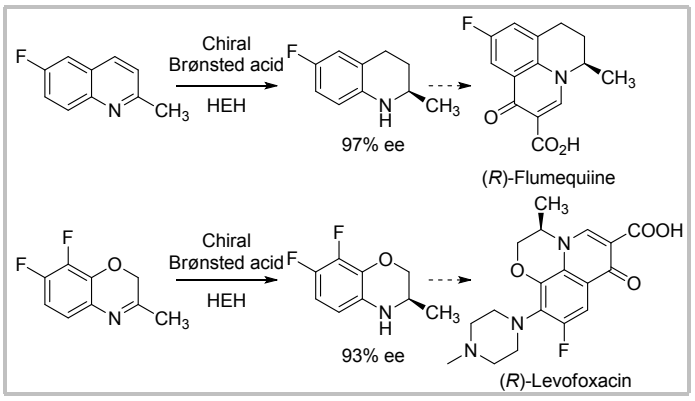
23. Maja Heitbaum, Roland Frohlich and Frank Gloriua,* Diastereoselective Hydrogenation of Substituted Quinolines to Enantiomerically Pure Decahydroquinolines. *Adv. Synth. Catal*. **2010**, *352*, 357-362.



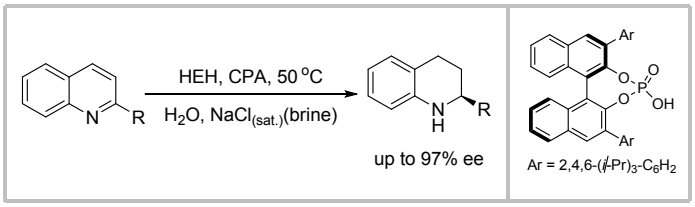
24. Weijun Tang, Yawei Sun, Lijin Xu,* Tianli Wang, Qinghua Fan, Kim-Hung Lam and Albert S. C. Chan. Highly Efficient and Enantioselective Hydrogenation of Quinolines and Pyridines with Ir-Difluorphos Catalyst. *Org. Biomol. Chem*. **2010**, *8*, 3464-3471.



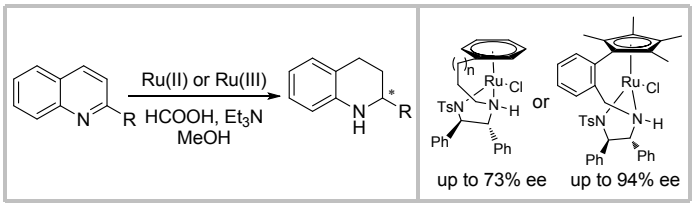
25. Magnus Rueping,* Mirjam Stoeckel, Erli Sugiono, Thomas Theissmann. Asymmetric Metal-free Synthesis of Fluoroquinolones by Organocatalytic Hydrogenation. *Tetrahedron***2010**, *66*, 6565-6568.



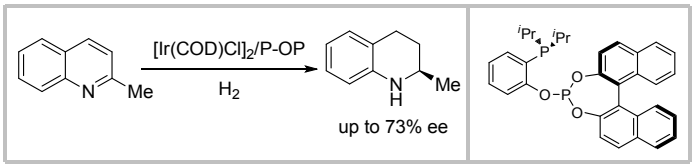
26. Magnus Rueping* and Thomas Theissmann. Asymmetric Bronsted Acid Catalysis in Aqueous Solution. *Chem. Sci*. **2010**, *1*, 473-476.



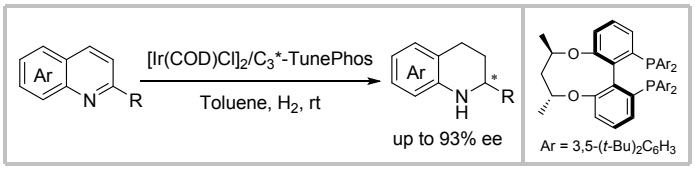
27. Vimal Parekh, James A. Ramsden, Martin Wills.* Asymmetric Transfer Hydrogenation of Quinolines Using Tethered Ru(II) Catalysts. *Tetrahedron: Asymmetry***2010**, *21*, 1549-1556.



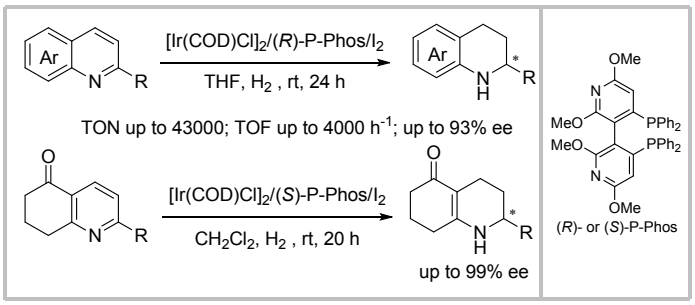
28. Miguel Rubio and Antonio Pizzano.* Application of Phosphine-Phosphite Ligands in the Iridium Catalyzed Enantioselective Hydrogenation of 2-Methylquinoline. *Molecules***2010**, *15*, 7732-7741.



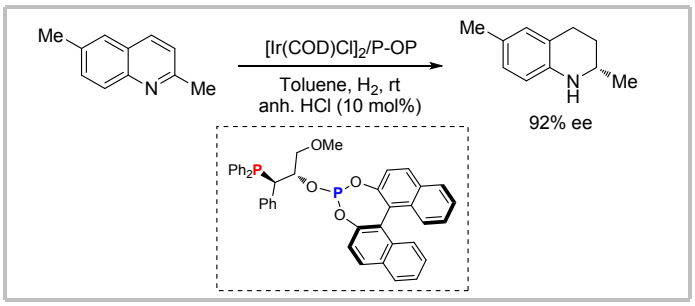
29. Fa-Rong Gou, Wei Li, Xumu Zhang,* and Yong-Min Liang.* Iridium-Catalyzed Asymmetric Hydrogenation of Quinoline Derivatives with C3*-TunePhos. *Adv. Synth. Catal*. **2010**, *352*, 2441-2444.



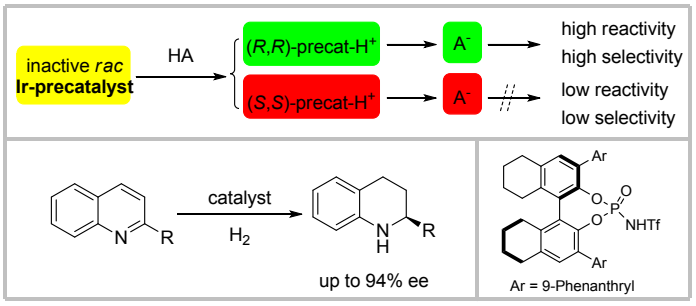
30. Wei-Jun Tang, Jing Tan, Li-Jin Xu,* Kim-Hung Lam, Qing-Hua Fan, and Albert S. C. Chan Highly Enantioselective Hydrogenation of Quinoline and Pyridine Derivatives with Iridium-(P-Phos) Catalyst *Adv. Synth. Catal.***2010**, *352*, 1055-1062.



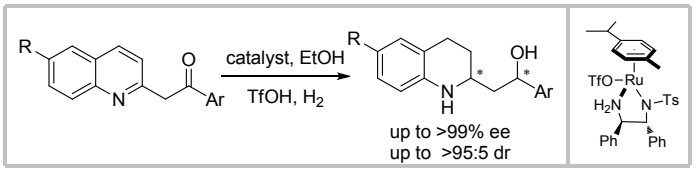
31. Jose L.Nunez-Rico, Hector Fernandez-Perez, J. Benet-Buchholz, and Anton Vidal-Ferran*, Asymmetric Hydrogenation of Heteroaromatic Compounds Mediated by Iridium-(P-OP) Complexes. *Organometallics***2010**, *29*, 6627-6631.



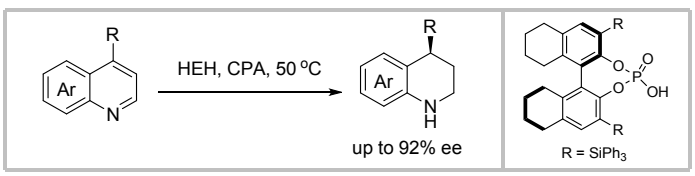
32. Magnus Rueping* and Rene M. Koenigs. Bronsted Acid Differentiated Metal Catalysis by Kinetic Discrimination. *Chem. Commun.***2011**, *47*, 304-306.



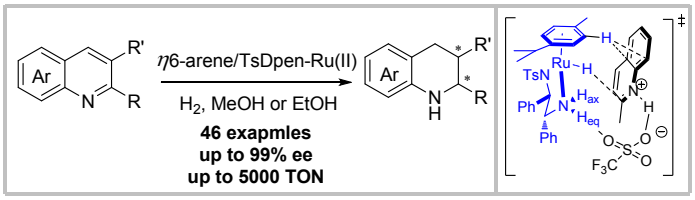
33. Tianli Wang, Guanghui Ouyang, Yan-Mei He, Qing-Hua Fan*. Asymmetric Tandem Reduction of 2-(Aroylmethyl)quinolines with Phosphine-Free Ru-TsDPEN Catalyst. *Synlett***2011**, 939-942.



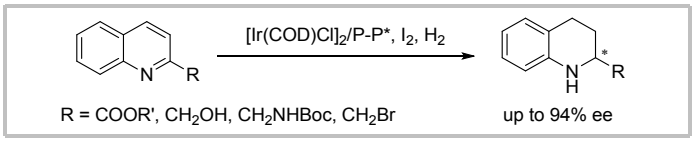
34. Magnus Rueping,* Thomas Theissmann, Mirjam Stoeckel, Andrey P. Antonchick. Direct Enantioselective Access to 4-substituted Tetrahydroquinolines by Catalytic Asymmetric Transfer Hydrogenation of Quinolines. *Org. Biomol. Chem.***2011**, *9*, 6844-6850.



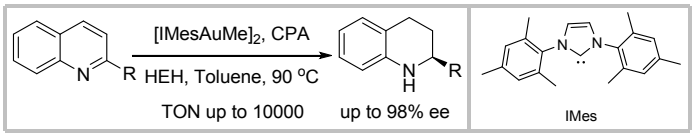
35. Tianli Wang, Lian-Gang Zhuo, Zhiwei Li, Fei Chen, Ziyuan Ding, Yanmei He, Qing-Hua Fan,* Junfeng Xiang, Zhi-Xiang Yu* and Albert S. C. Chan. Highly Enantioselective Hydrogenation of Quinolines Using Phosphine-free Chiral Cationic Ruthenium Catalysts: Scope, Mechanism, and Origin of Enantioselectivity. *J. Am. Chem. Soc.***2011**, *133*, 9878-9891.



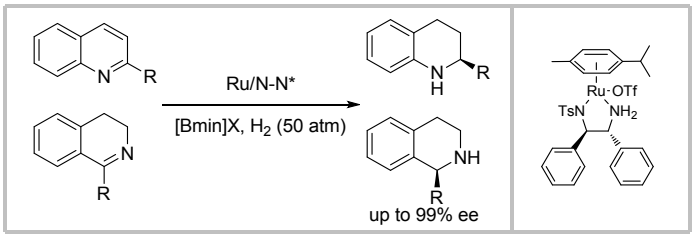
36. Anna M. Maj, Isabelle Suisse, Catherine Méliet, Christophe Hardouin and Francine Agbossou-Niedercorn.* Highly Enantioselective Hydrogenation of New 2-functionalized Quinoline Derivatives. *Tetrahedron Lett.***2012**, *53*, 4747-4750.



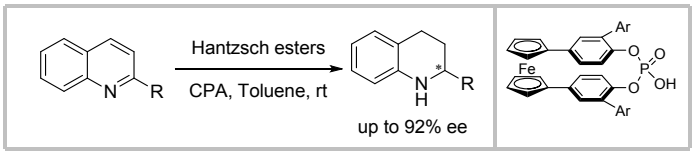
37. Xi-Feng Tu, Liu-Zhu Gong.* Highly Enantioselective Transfer Hydrogenation of Quinolines Catalyzed by Gold Phosphates: Achiral Ligand Tuning and Chiral-Anion Control of Stereoselectivity. *Angew. Chem. Int. Ed.***2012**, *51*, 11346-11349.



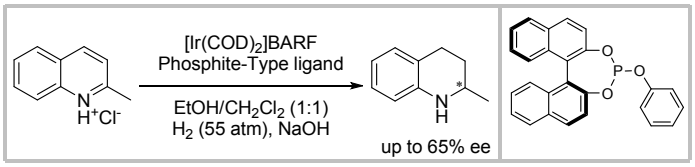
38. Zi-Yuan Ding, Tianli Wang, Yan-Mei He, Fei Chen, Hai-Feng Zhou, Qing-Hua Fan,* Qingxiang Guo,* and Albert S. C. Chan.* Highly Enantioselective Synthesis of Chiral Tetrahydroquinolines and Tetrahydro-isoquinolines by Ruthenium-Catalyzed Asymmetric Hydrogenation in Ionic Liquid. *Adv. Synth. Catal.***2013**, *355*, 3727-3735.



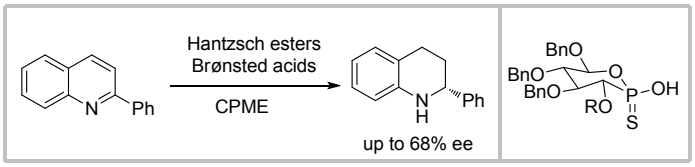
39. Jérémy Stemper, Kévin Isaac, Julien Pastor, Gilles Frison, Pascal Retailleau, Arnaud Voituriez, Jean-Francois Betzer,* and Angela Marinetti.* Development of Chiral Phosphoric Acids based on Ferrocene-Bridged Paracyclophane Frameworks. *Adv. Synth. Catal*. **2013**, *355*, 3613-3624.



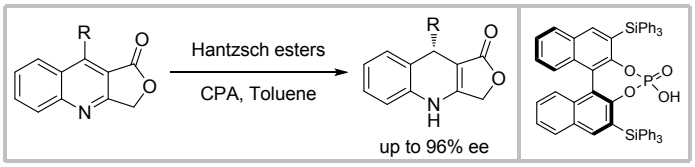
40. Sergey E. Lyubimov, Dmitry V. Ozolin, Pavel Yu Ivanov, Artem Melman, Valeriya S. Velezheva, Vadim A. Davankov. The Use of Phosphite-Type Ligands in the Ir-Catalyzed Asymmetric Hydrogenation of Heterocyclic Compounds. *Chirality***2014**, *26*, 56-60.



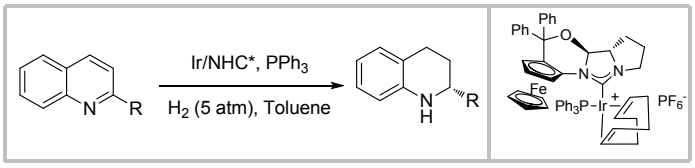
41. Ferry, A., Stemper, J., Marinetti, A., Voituriez, A. and Guinchard, X. Thiophostone-Derived Bronsted Acids in the Organocatalyzed Transfer Hydrogenation of Quinolines: Influence of the P-Stereogenicity. *Eur. J. Org. Chem.***2014**, 188-193.



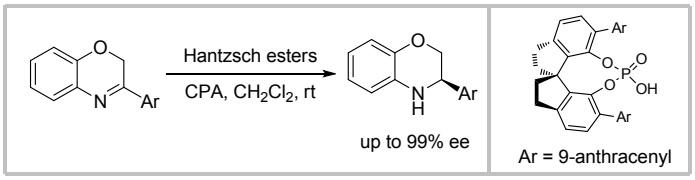
42. Alexandre Aillerie, Vincent Lemau de Talancé, Aurélien Moncomble, Till Bousquet* and Lydie Pélinski.* Enantioselective Organocatalytic Partial Transfer Hydrogenation of Lactone-Fused Quinolines. *Org. Lett.* **2014**, *16*, 2982-2985.



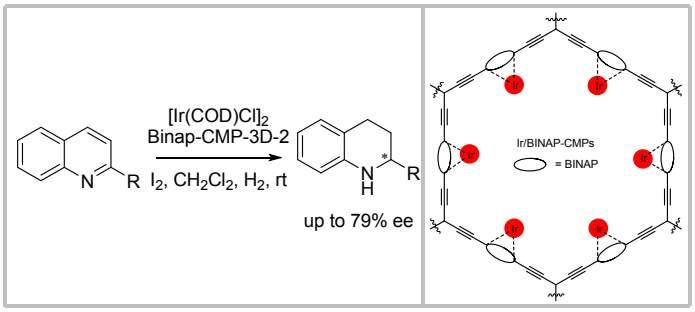
43. Joshni John, Cody Wilson-Konderka and Costa Metallinosa.* Low Pressure Asymmetric Hydrogenation of Quinolines Using an Annulated Planar Chiral N-Ferrocenyl NHC-Iridium Complex. *Adv. Synth. Catal*. **2015**, *357*, 2071-2081.



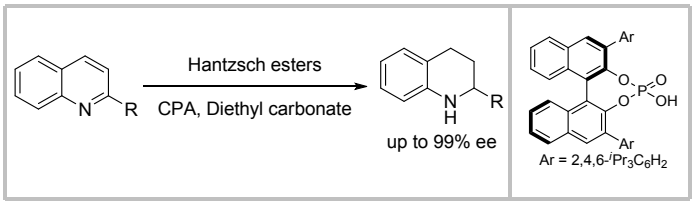
44. Yiliang Zhang, Rong Zhao, Robert Li-Yuan Bao and Lei Shi.* Highly Enantioselective SPINOL-Derived Phosphoric Acid Catalyzed Transfer Hydrogenation of Diverse C=N-Containing Heterocycles. *Eur. J. Org. Chem.***2015**, 3344-3351.



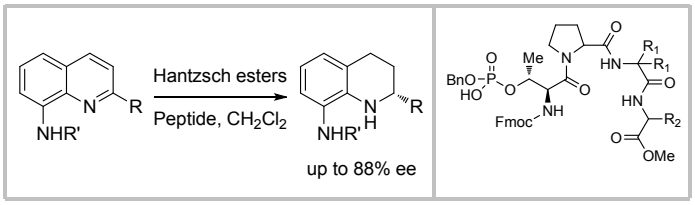
45. Xu Wang, Jun Li, Shengmei Lu, Yan Liu,* Can Li.* Efficient Enantioselective Hydrogenation of Quinolines Catalyzed by Conjugated Microporous Polymers with Embedded Chiral BINAP Ligand. *Chin. J. Catal.***2015**, *36*, 1170-1174.



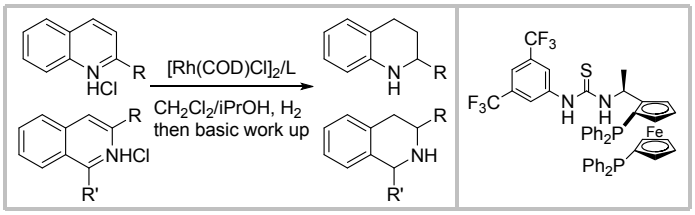
46. Ganesh V. More and Bhalchandra M. Bhanage.* Chiral Phosphoric Acid Catalyzed Asymmetric Transfer Hydrogenation of Quinolines in a Sustainable Solvent. Tetrahedron: Asymmetry 2015, 2, 1174-1179.



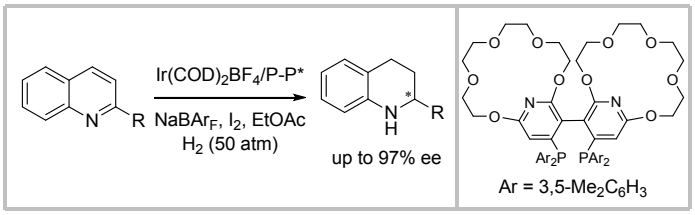
47. Christopher R. Shugrue and Scott J. Miller.* Phosphothreonine as a Catalytic Residue in Peptide-Mediated Asymmetric Transfer Hydrogenations of 8-Aminoquinolines. *Angew. Chem. Int. Ed.***2015**, *54*, 11173 -11176.



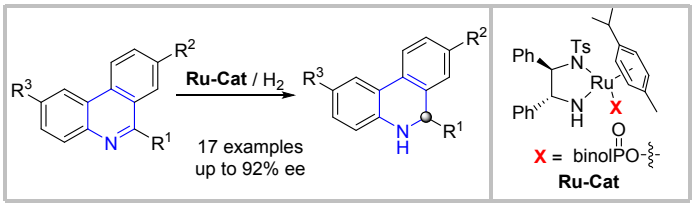
48. Jialin Wen, Renchang Tan, Shaodong Liu, Qingyang Zhao* and Xumu Zhang.* Strong Bronsted Acid Promoted Asymmetric Hydrogenation of Isoquinolines and Quinolines Catalyzed by a Rh-thiourea Chiral Phosphine Complex via Anion Binding. *Chem. Sci.***2016**, *7*, 3047-3051.



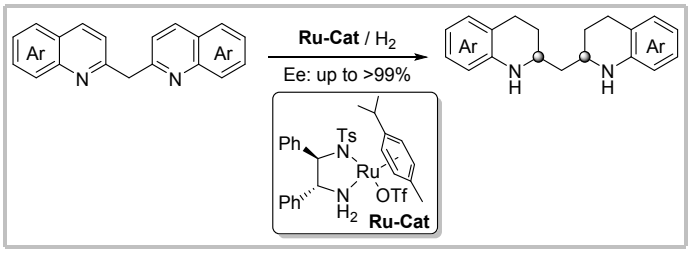
49. Xi-Chang Zhang, Yi-Hu Hu, Chuan-Fu Chen, Qiang Fang, Li-Yao Yang, Ying-Bo Lu, Lin-Jie Xie, Jing Wu,* Shijun Li* and Wenjun Fang. A Supramolecularly Tunable Chiral Diphosphine Ligand: Application to Rh and Ir-catalyzed Enantioselective Hydrogenation. *Chem. Sci*. **2016**, *7*, 4594-4599.



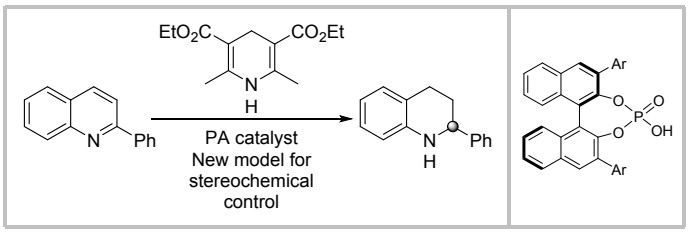
50. Zhusheng Yang, Fei Chen,* Shuxin Zhang, Yanmei He, Nianfa Yang* and Qing-Hua Fan.*ARuthenium-Catalyzed Enantioselective Hydrogenation ofPhenanthridine Derivatives. *Org. Lett.* **2017**, *19,* 1458-1461.



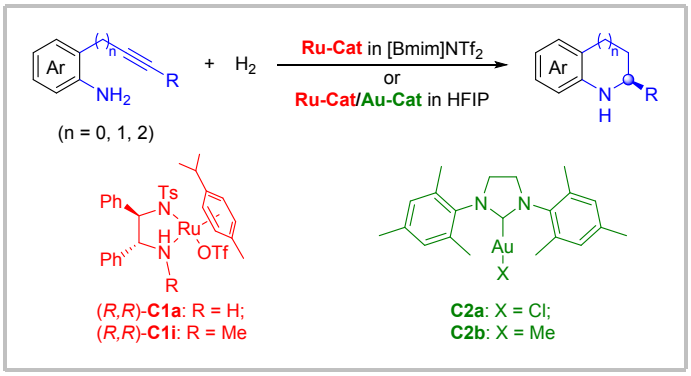
51. Bin Li, Cong Xu, Yan-Mei He,* Guo-Jun Dengand Qing-Hua Fan.*Asymmetric Hydrogenation of Bis(quinolin-2-yl)methanes: A DirectAccess to Chiral 1,3-Diamines. *Chin. J. Chem.***2018**, *36*, 1169-1173.



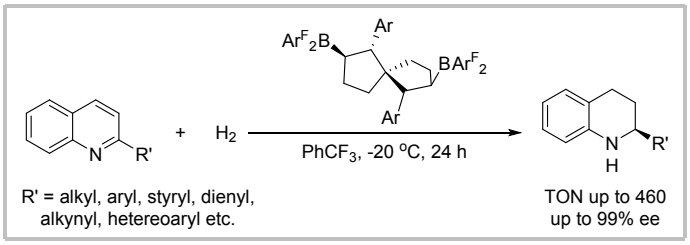
52. Julien Pastor, Elixabete Rezabal, Arnaud Voituriez, Jean-François Betzer,* Angela Marinettiand Gilles Frison.* Revised Theoretical Model on Enantiocontrol in Phosphoric AcidCatalyzed H‑Transfer Hydrogenation of Quinoline. *J. Org. Chem*. **2018**, *83*, 2779-2787.



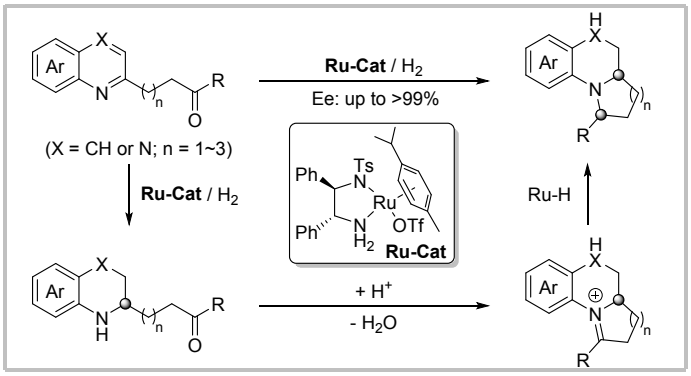
53. Cong Xu, Yu Feng, Faju Li, Jiahong Han, Yan-Mei Heand Qing-Hua Fan.* A Synthetic Route to Chiral Benzo-Fused N−Heterocycles viaSequential Intramolecular Hydroamination and AsymmetricHydrogenation of Anilino-Alkynes. *Organometallics***2019**, *38*, 3979-3990.



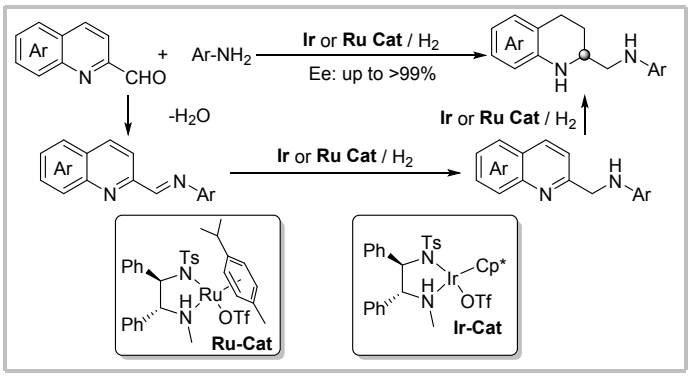
54. Xiang Li, Jun-Jie Tian, Ning Liu, Xian-Shuang Tu, Ning-Ning Zeng and Xiao-Chen Wang.*Spiro-Bicyclic Bisborane Catalysts for Metal-Free Chemoselective andEnantioselective Hydrogenation of Quinolines. *Angew. Chem. Int. Ed*. **2019**, *58*, 4664-4668.



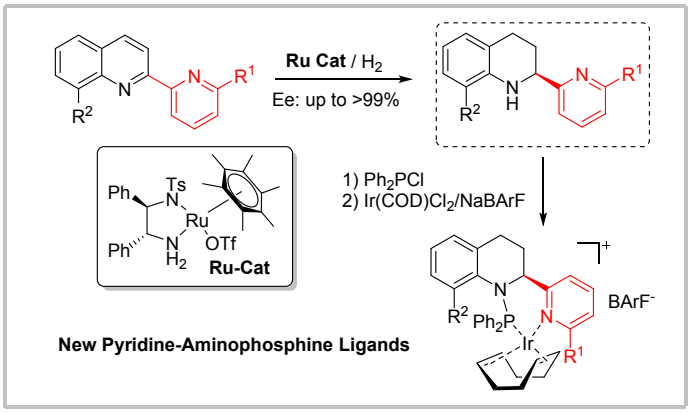
55. Ya Chen, Yan-Mei He, Shanshan Zhang, Tingting Miao and Qing-Hua Fan.* Rapid Construction of Structurally Diverse Quinolizidines, Indolizidines, and Their Analogues via Ruthenium-CatalyzedAsymmetric Cascade Hydrogenation/Reductive Amination. *Angew. Chem. Int. Ed.***2019**, *58*, 3809-3813.



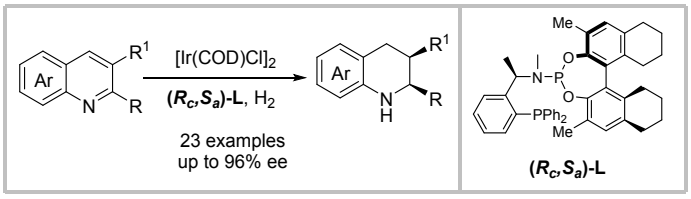
56. Ya Chen, Yixiao Pan, Yan-Mei He* and Qing-Hua Fan.* Rapid Consecutive Intermolecular Reductive Amination/AsymmetricHydrogenation: Facile Access to Sterically Tunable Chiral VicinalDiamines and N-Heterocyclic Carbenes. *Angew. Chem. Int. Ed.***2019**, *58*, 16831-16834.



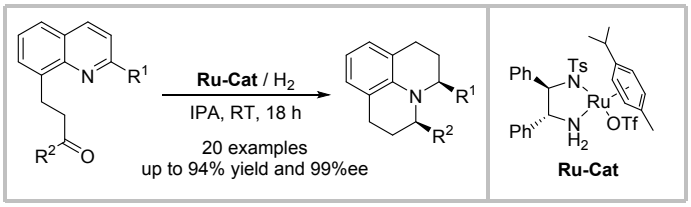
57. Youran Liu, Fei Chen, Yan-Mei He, Chenghao Li and Qing-Hua Fan* Enantioselective Synthesis of Tunable Chiral Pyridine–Aminophosphine Ligands and Their Applications in Asymmetric Hydrogenation. *Org. Biomol. Chem.,* **2019**, *17*, 5099-5105.



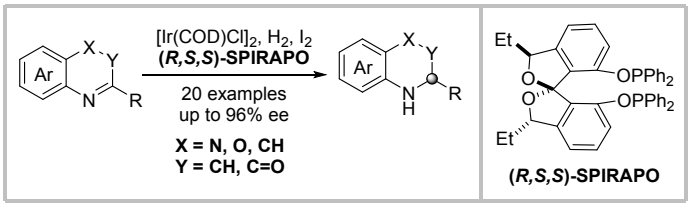
58. Xin-Hu Huand Xiang-Ping Hu.*Highly Diastereo- and Enantioselective Ir-Catalyzed Hydrogenationof 2,3-Disubstituted Quinolines with Structurally Fine-TunedPhosphine-Phosphoramidite Ligands.*Org. Lett*. **2019**, *21*, 10003-10006.



59. Li-Ren Wang, Dan Chang, Yu Feng,* Yan-Mei He, Guo-Jun Deng* and Qing-Hua Fan.* Highly Enantioselective Ruthenium-Catalyzed Cascade DoubleReduction Strategy: Construction of Structurally Diverse Julolidinesand Their Analogues. *Org. Lett*. **2020**, *22*, 2251-2255.



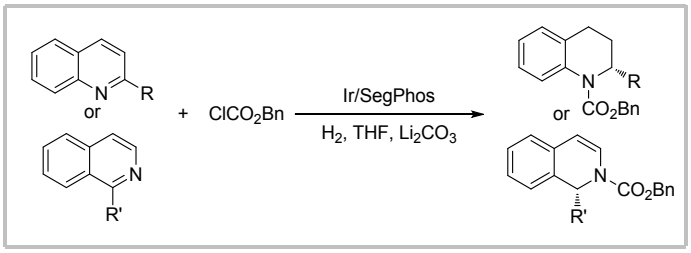
60. Siyuan Sun and Pavel Nagorny.* Exploration of Chiral Diastereomeric Spiroketal(SPIROL)-Based Phosphinite Ligands in Asymmetric Hydrogenation of Heterocycles. *Chem. Commun.***2020**, *56*, 8432-8435.



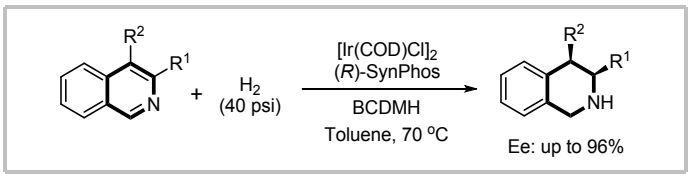
Isoquinolines

Our work

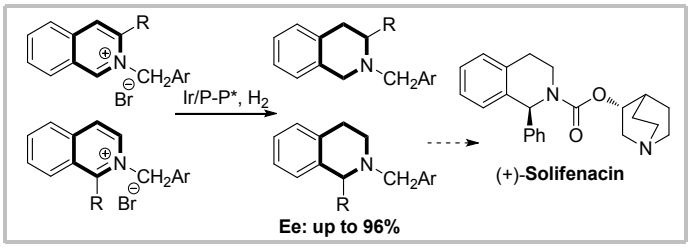
1. Sheng-Mei Lu, You-Qing Wang, Xiu-Wen Han, Yong-Gui Zhou.* Asymmetric Hydrogenation of Quinoline and Isoquinolines Acitivated by Chloroformates. *Angew. Chem. Int. Ed.***2006**, *45*, 2260-2263.



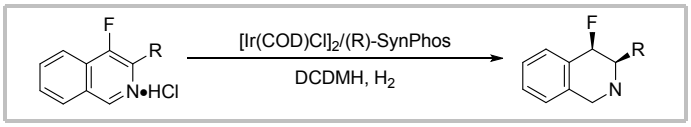
2. Lei Shi, Zhi-Shi Ye, Liang-Liang Cao, Ran-Ning Guo, Yue Hu and Yong-Gui Zhou.* Enantioselective Iridium-Catalyzed Hydrogenation of 3,4-Disubstituted Isoquinolines. *Angew. Chem. Int. Ed*. **2012**, *51*, 8286-8289.



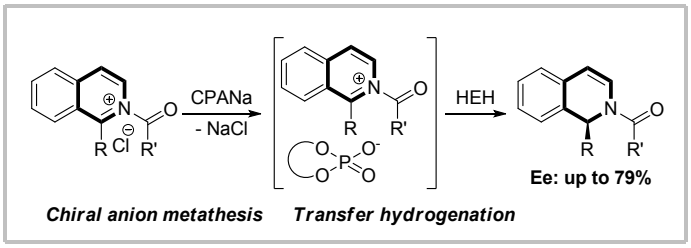
3. Zhi-Shi Ye, Ran-Ning Guo, Xian-Feng Cai, Mu-Wang Chen, Lei Shi and Yong-Gui Zhou.* Enantio-selective Iridium-Catalyzed Hydrogenation of 1- and 3-Substituted Isoquinolinium Salts. *Angew. Chem. Int. Ed.***2013**, *52*, 3685-3689.



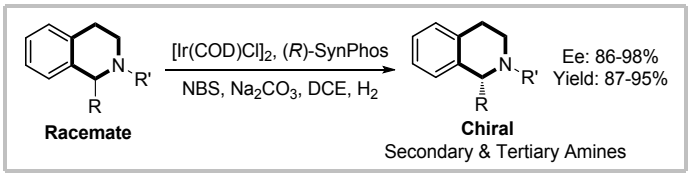
4. Ran-Ning Guo, Xian-Feng Cai, Lei Shi, Zhi-Shi Ye, Mu-Wang Chen and Yong-Gui Zhou.* An Efficient Route to Chiral N-Heterocycles Bearing C-F Stereogenic Center via Asymmetric Hydrogenation of Fluorinated Isoquinolines. *Chem. Commun*. **2013**, *49*, 8537-8539.



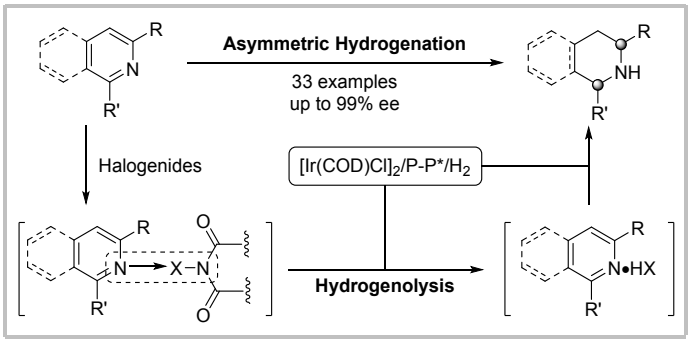
5. Lei Shi,* Yue Ji, Wen-Xue Huang and Yong-Gui Zhou.* Application of Chiral Anion Metathesis Strategy in Asymmetric Transfer Hydrogenation of Isoquinolines. *Acta Chim. Sinica***2014**, *72*, 820-824.



6. Yue Ji, Lei Shi,* Mu-Wang Chen, Guang-Shou Feng and Yong-Gui Zhou.* Concise Redox De-racemization of Secondary and Tertiary Amines with a Tetrahydroisoquinoline Core via a Nonenzymatic Process. *J. Am. Chem. Soc*. **2015**, *137*, 10496-10499.

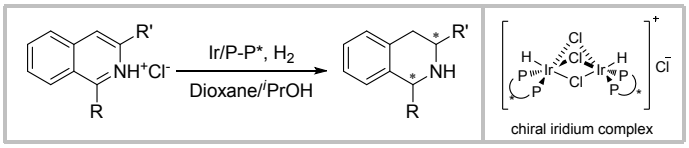


7. Mu-Wang Chen, Yue Ji, Jie Wang, Qing-An Chen, Lei Shi andYong-Gui Zhou.* Asymmetric Hydrogenation of Isoquinolines and Pyridines Using Hydrogen Halide Generated*in situ*as Activator. *Org. Lett.***2017**,*19*, 4988-4991.

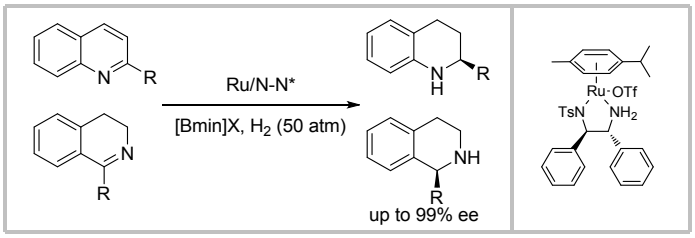


Others' work

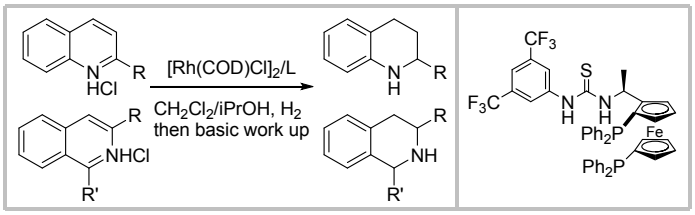
1. Atsuhiro Iimuro, Kenta Yamaji, Sathaiah Kandula, Takuto Nagano, Yusuke Kita, and Kazushi Mashima.* Asymmetric Hydrogenation of Isoquinolinium Salts Catalyzed by Chiral Iridium Complexes: Direct Synthesis for Optically Active 1,2,3,4-Tetrahydroisoquinolines. *Angew. Chem. Int. Ed*. **2013**, *52*, 2046-2050.



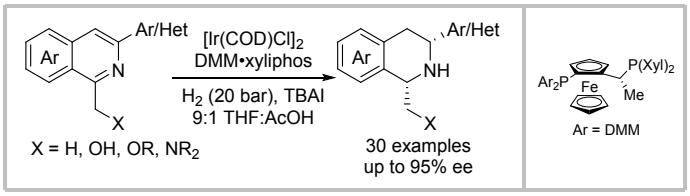
2. Zi-Yuan Ding, Tianli Wang, Yan-Mei He, Fei Chen, Hai-Feng Zhou, Qing-Hua Fan,* Qingxiang Guo,* and Albert S. C. Chan.* Highly Enantioselective Synthesis of Chiral Tetrahydroquinolines and Tetrahydro-isoquinolines by Ruthenium-Catalyzed Asymmetric Hydrogenation in Ionic Liquid. *Adv. Synth. Catal*. **2013**, *355*, 3727-3735.



3. Jialin Wen, Renchang Tan, Shaodong Liu, Qingyang Zhao* and Xumu Zhang.* Strong Bronsted Acid Promoted Asymmetric Hydrogenation of Isoquinolines and Quinolines Catalyzed by a Rh–thiourea Chiral Phosphine Complex via Anion Binding. *Chem. Sci*. **2016**, *7*, 3047-3051.



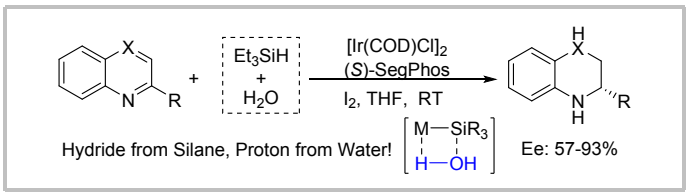
4. Alexia N. Kim, Aurapat Ngamnithiporn, Eric R. Welin, Martin T. Daiger, Christian U. Grünanger,Michael D. Bartberger, Scott C. Virgil and Brian M. Stoltz.*Iridium-Catalyzed Enantioselective and DiastereoselectiveHydrogenation of 1,3-Disubstituted Isoquinolines. *ACS Catal.***2020**, *10*, 3241-3248.



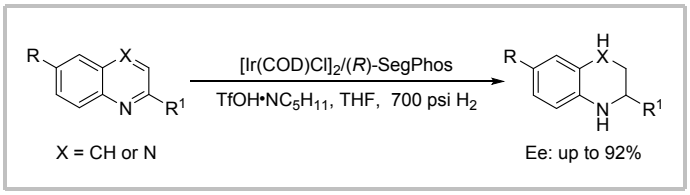
Quinoxalines

Our work

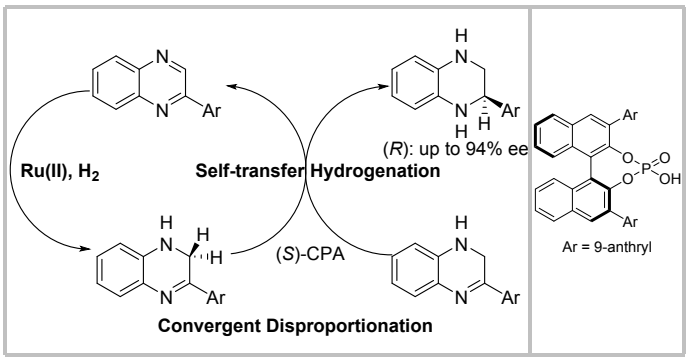
1. Da-Wei Wang, Duo-Sheng Wang, Qing-An Chen, and **Yong-Gui Zhou*** Asymmetric Hydrogenation with Water/Silane as the Hydrogen Source. *Chem. Eur. J.* **2010**, *16*, 1133-1136.



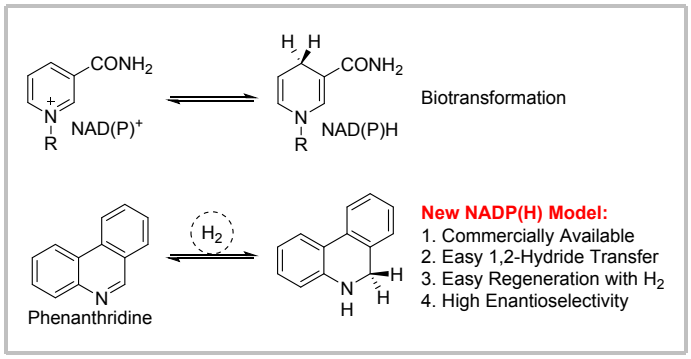
2. Duo-Sheng Wang, **Yong-Gui Zhou**,* Asymmetric hydrogenation of quinolines activated by Bronsted acids. *Tetrahedron Lett*. **2010**, *51,* 3014-3017.



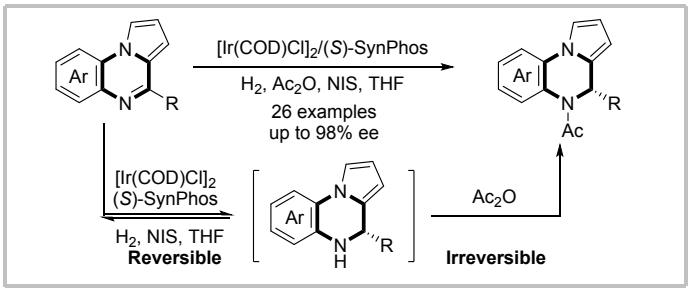
3. Qing-An Chen, Duo-Sheng Wang, **Yong-Gui Zhou**,* Ying Duan, Hong-Jun Fan,* Yan Yang, and Zhang Zhang. Convergent Asymmetric Disproportionation Reactions: Metal/Bronsted Acid Relay Catalysis for Enantioselective Reduction of Quinoxalines. *J. Am. Chem. Soc.* **2011**, *133*, 6126-6129.



4. Qing-An Chen, Kai Gao, Ying Duan, Zhi-Shi Ye, Lei Shi, Yan Yang and **Yong-Gui Zhou.*** Dihydrophenanthridine: A New and Easily Regenerable NAD(P)H Model for Biomimetic Asymmetric Hydrogenation. *J. Am. Chem. Soc.* **2012**, *134*, 2442-2448.

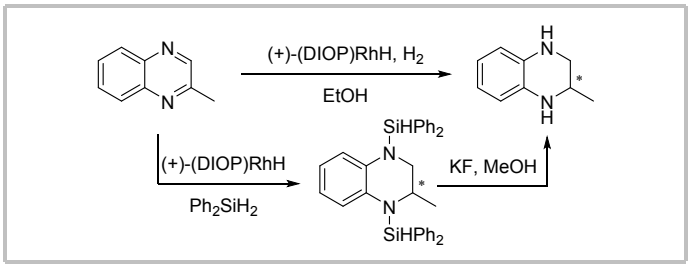


5. Shu-Bo Hu, Xiao-Yong Zhai, Hong-Qiang Shen and Yong-Gui Zhou.* Iridium-catalyzed Asymmetric Hydrogenation of Polycyclic Pyrrolo/Indolo[1,2-a]quinoxalines and Phenanthridines. *Adv. Synth. Catal.* **2018**, *360,* 1334-1339.

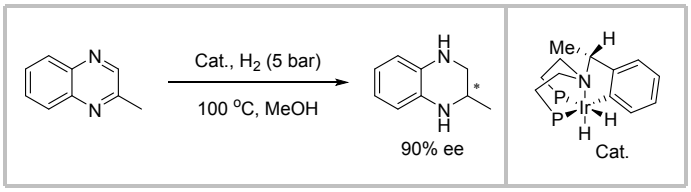


Others' work

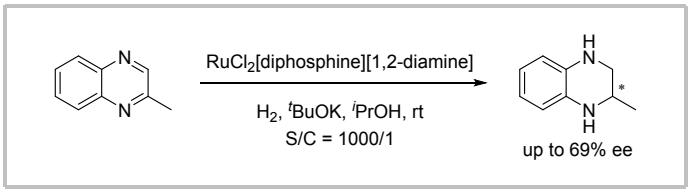
1. Shizuaki Murata*, Takashi Sugimoto, and Sadao Matsuura, Hydrogenation and Hydrosilylation of Quinoxaline by Homogeneous Rhodium Catalysts. *Heterocycles,* **1987**, *26*, 763-766.



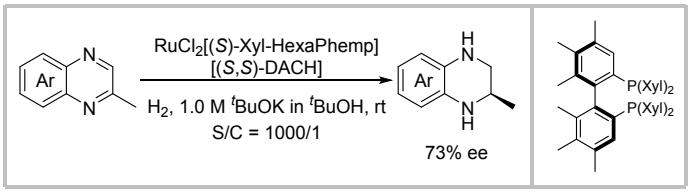
2. Claudio Bianchini,* Pierluigi Barbaro, Giancarlo Scapacci, Erica Farnetti, and Mauro Graziani. Enantio-selective Hydrogenation of 2-Methylquinoxaline to (-)-(2*S*)-2-Methyl-1,2,3,4-tetrahydroquinoxaline by Iridium Catalysis. *Organometallics* **1998**, *17*, 3308 – 3310.



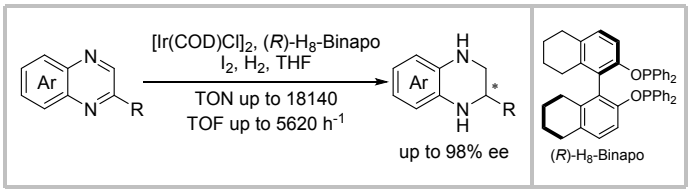
3. Christopher J. Cobley, Julian P. Henschke. Enantioselective Hydrogenation of Imines Using a Diverse Library of Ruthenium Dichloride(diphosphine)(diamine) Precatalysts. *Adv. Synth. Catal.* **2003**, *345*, 195-201.



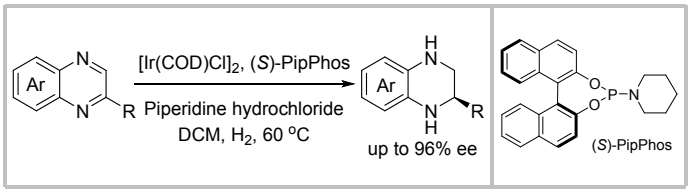
4. Julian P. Henschke,* Mark J. Burk, Christophe G. Malan, Daniela Herzberg, Justine A. Peterson, Andrew J. Wildsmith, Christopher J. Cobley, Guy Casy*. Synthesis and Applications of HexaPHEMP, a Novel Biaryl Diphosphine Ligand. *Adv. Synth. Catal.* **2003**, *345*, 300-307.



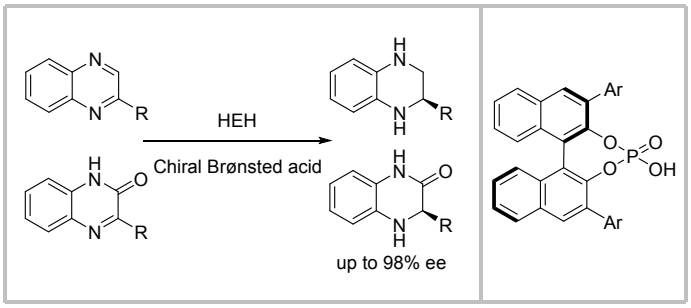
5. Weijun Tang, Lijin Xu,* Qing-Hua Fan,* Jun Wang, Baomin Fan, Zhongyuan Zhou, Kim-hung Lam, and Albert S. C. Chan*. Asymmetric Hydrogenation of Quinoxalines with Diphosphinite Ligands: A Practical Synthesis of Enantioenriched, Substituted Tetrahydroquinoxalines. *Angew. Chem. Int. Ed.* **2009**, *48*, 9135-9138.



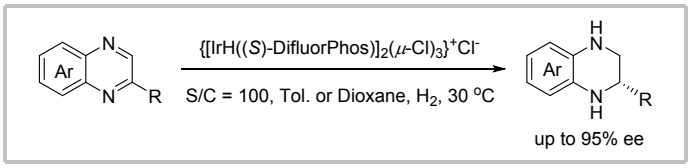
6. Nataša Mršić, Thomas Jerphagnon, Adriaan J. Minnaard,* Ben L. Feringa,* and Johannes G. de Vriesa,*. Asymmetric Hydrogenation of Quinoxalines Catalyzed by Iridium/PipPhos. *Adv. Synth. Catal.* **2009**, *351*, 2549-2552.



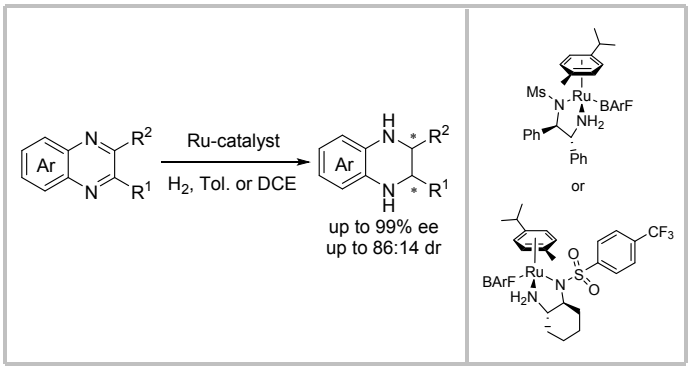
7. Magnus Rueping,* Francisco Tato, and Fenja. R. Schoepke. The First General, Efficient and Highly Enantioselective Reduction of Quinoxalines and Quinoxalinones. *Chem. Eur. J.* **2010**, *16*, 2688-2691.



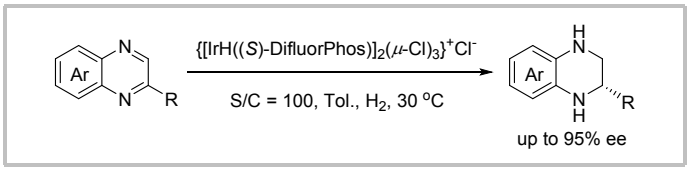
8. Damien Cartigny, Takuto Nagano, Tahar Ayad, Jean-Pierre Genet, Takashi Ohshim,* Kazushi Mashima* and Virginie Ratovelomanana-Vidal.* Iridium-Difluorphos-Catalyzed Asymmetric Hydrogenation of 2-Alkyl- and 2-Aryl-Substituted Quinoxalines: A General and Efficient Route into Tetrahydroquinoxalines. *Adv. Synth. Catal.* **2010**, *352*, 1886-1891.



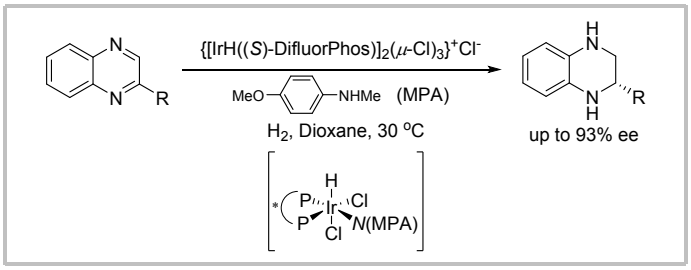
9. Jie Qin, Fei Chen, Ziyuan Ding, Yan-Mei He, Lijin Xu, and Qing-Hua Fan.* Asymmetric Hydrogenation of 2- and 2,3-substituted Quinoxalines with Chiral Cationic Ruthenium Diamine Catalysts. *Org. Lett.* **2011**, *13*, 6568-6571.



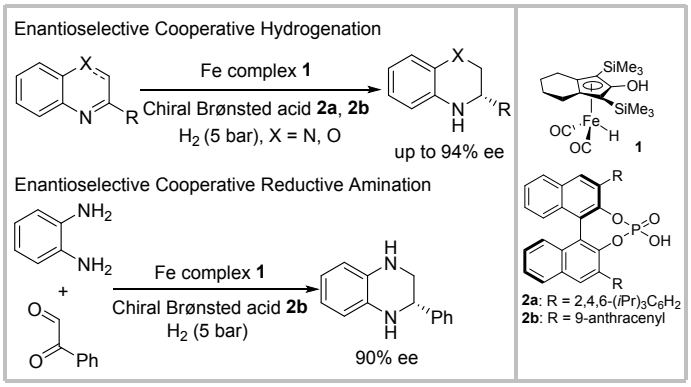
10. Damien Cartigny, Farouk Berhal, Takuto Nagano, Phannarath Phansavath, Tahar Ayad, Jean-Pierre Genêt, Takashi Ohshima, Kazushi Mashima, and Virginie Ratovelomanana-Vidal.* General Asymmetric Hydrogenation of 2-Alkyl- and 2-Aryl-Substituted Quinoxaline Derivatives Catalyzed by Iridium-Difluorphos: Unusual Halide Effect and Synthetic Application. *J. Org. Chem*. **2012**, *77*, 4544-4556.



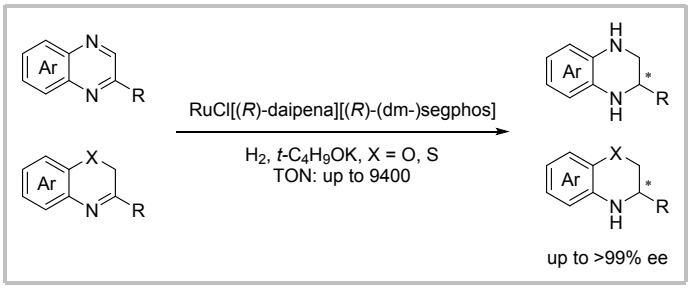
11. Takuto Nagano, Atsuhiro Iimuro, Rino Schwenk, Takashi Ohshima, Yusuke Kita, Antonio Togni and Kazushi Mashima.* Additive Effects of Amines on Asymmetric Hydrogenation of Quinoxalines Catalyzed by Chiral Iridium Complexes. *Chem. Eur. J.* **2012**, *18*, 11578-11592.



12. Steffen Fleischer, Shaolin Zhou, Svenja Werkmeister, Kathrin Junge, and Matthias Beller.* Cooperative Iron-Bronsted Acid Catalysis: Enantioselective Hydrogenation of Quinoxalines and 2*H*-1,4-Benzoxazines. *Chem. Eur. J.* **2013**, *19*, 4997-5003.

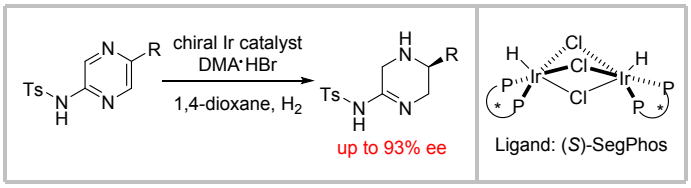


13. Noriyoshi Arai, Yu Saruwatari, Kotaro Isobe, and Takeshi Ohkumaa.* Asymmetric Hydrogenation of Quinoxalines, Benzoxazines, and a Benzothiazine Catalyzed by Chiral Ruthenabicyclic Complexes. *Adv. Synth. Catal.* **2013**, *355*, 2769-2774.

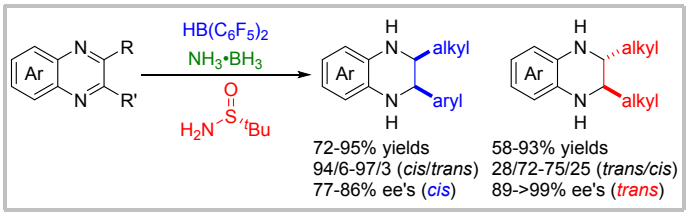


14. Kosuke Higashida,a Haruki Nagae,a and Kazushi Mashimaa.* Iridium-Catalyzed Asymmetric Hydrogenation of Tosylamido-Substituted Pyrazines for Constructing Chiral Tetrahydro-pyrazineswith an

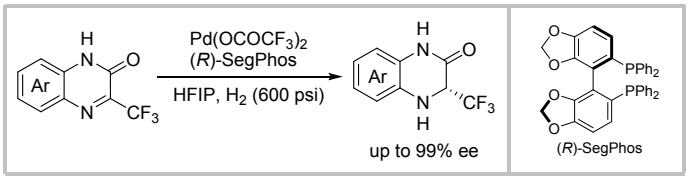
Amidine Skelton. *Adv. Synth. Catal.* **2016**, *358*, 3949-3954.



15. Songlei Li, Wei Meng, and Haifeng Du.* Asymmetric Transfer Hydrogenations of 2,3-DisubstitutedQuinoxalines with Ammonia Borane. *Org. Lett.***2017**, *19*, 2604-2606.



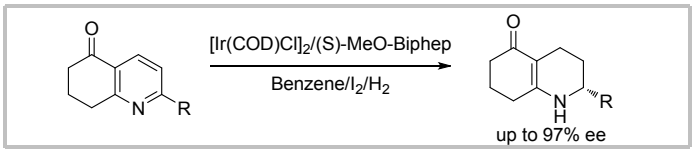
16. Mu-Wang Chen, Zhihong Deng, Qin Yang, Jian Huang and Yiyuan Peng.*Enantioselective Synthesis of TrifluoromethylatedDihydroquinoxalinones via Palladium-catalyzed Hydrogenation. *Org. Chem. Front*. **2019**, *6*, 746-750.



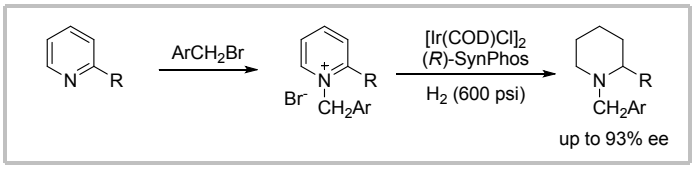
Pyridines

Our work

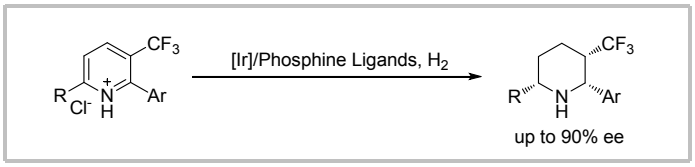
1. Xiao-Bing Wang, Wei Zeng, and Yong-Gui Zhou*. Iridium-catalyzed Asymmetric Hydrogenation of Pyridine Derivatives 7,8-Dihydro-quinolin-5(6H)-ones. *Tetrahedron Lett*. **2008**, *49*, 4922-4924.



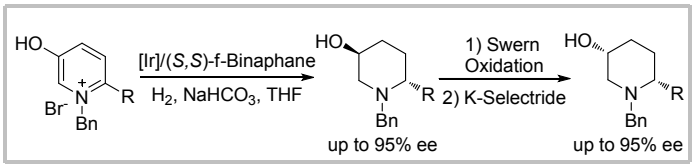
2. Zhi-Shi Ye, Mu-Wang Chen, Qing-An Chen, Lei Shi, Ying Duan and Yong-Gui Zhou.* Ir-Catalyzed Asymmetric Hydrogenation of Pyridinium Salts. *Angew. Chem. Int. Ed*. **2012**, *51*,10181-10184.



3. Mu-Wang Chen, Zhi-Shi Ye, Zhang-Pei Chen, Bo Wu and Yong-Gui Zhou.* Enantioselective Synthesis of TrifluoromethylSubstituted Piperidines with Multiple StereogenicCenters via Hydrogenation of Pyridinium Hydrochlorides. *Org. Chem. Front*. **2015**, *2*, 586-589.

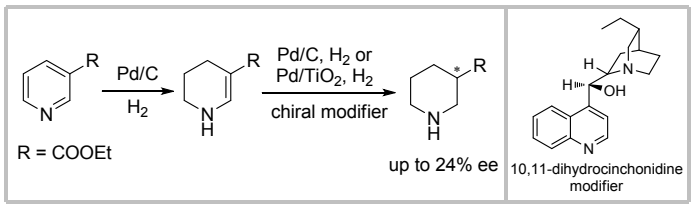


4. Wen-Xue Huang, Chang-Bin Yu, Yue Ji, Lian-Jin Liu and Yong-Gui Zhou.* Ir-Catalyzed Asymmetric Hydrogenation of Heteroaromatics Bearing a Hydroxyl Group, 3-Hydroxypyridinium Salts. *ACS Catal.* **2016**, *6*, 2368-2371.

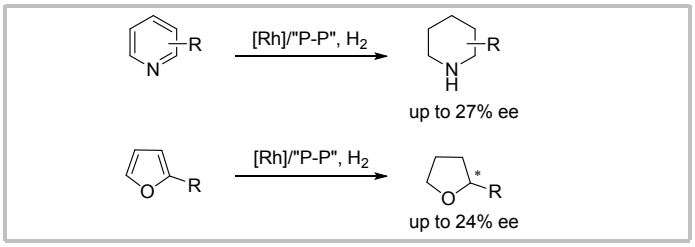


Others' work

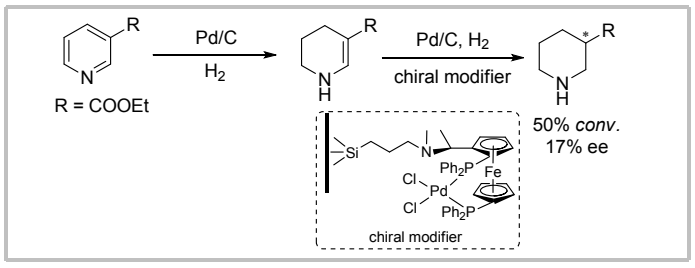
1. H.-U. Blaser, H. Honig, M. Studer, C. Wedemeyer-Exl. Enantioselective Synthesis of Ethyl Nipecotinate Using Cinchona Modified Heterogeneous Catalysts. *J. Mol. Catal. A: Chem.***1999**, *139*, 253-257.



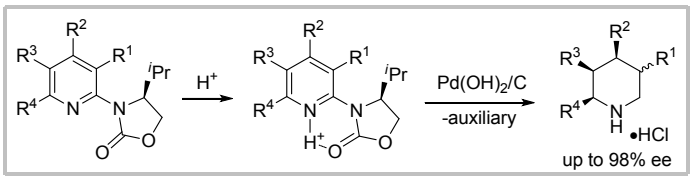
2. Martin Studer,* Christina Wedemeyer-Exl, Felix Spindler, and Hans-Ulrich Blaser. Enantioselective Homogeneous Hydrogenation of Monosubstituted Pyridines and Furans. *Monatsh. Chem*. **2000**, *131*, 1335-1343.



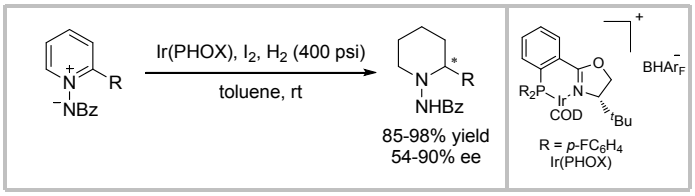
3. Stuart A. Raynor, John Meurig Thomas,* Robert Raja, Brian F. G. Johnson,* Robert G. Bell and Mike D. Mantle. A One-step, Enantioselective Reduction of Ethyl Nicotinate to Ethyl Nipecotinate Using a Constrained, Chiral, Heterogeneous Catalyst. *Chem. Commun.***2000**, 1925-1926.



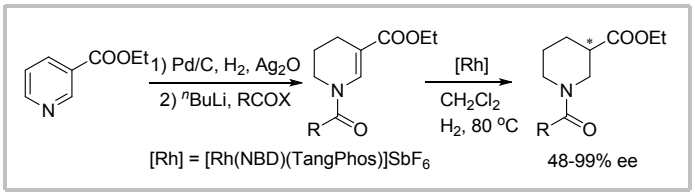
4. Frank Glorius,* Nick Spielkamp, Sigrid Holle, Richard Goddard, and Christian W. Lehmann. Efficient Asymmetric Hydrogenation of Pyridines. *Angew. Chem. Int. Ed*. **2004**, *43*, 2850-2852.



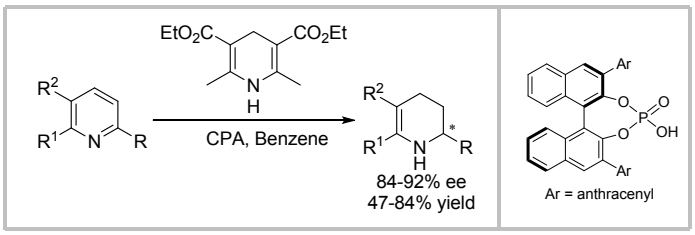
5. Claude Y. Legault and Andre B. Charette*. Catalytic Asymmetric Hydrogenation of N-Iminopyridinium Ylides: Expedient Approach to Enantioenriched Substituted Piperidine Derivatives. *J. Am. Chem. Soc.***2005**, *127*, 8966-8967.



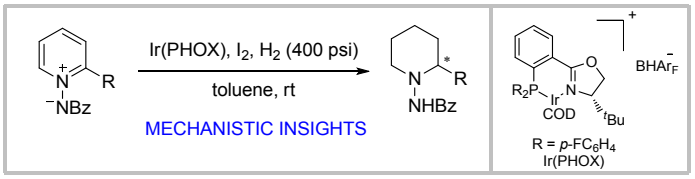
6. Aiwen Lei,* Mao Chen, Minsheng He, and Xumu Zhang*. Asymmetric Hydrogenation of Pyridines: Enantioselective Synthesis of Nipecotic Acid Derivatives. *Eur. J. Org. Chem*. **2006**, 4343-4347.



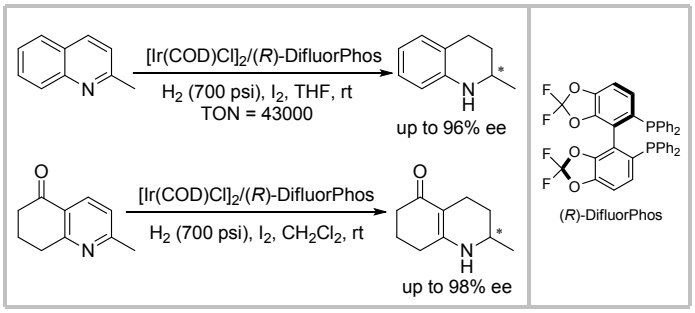
7. Magnus Rueping* and Andrey P. Antonchick. Organocatalytic Enantioselective Reduction of Pyridines. *Angew. Chem. Int. Ed*. **2007**, *46*, 4562-4565.



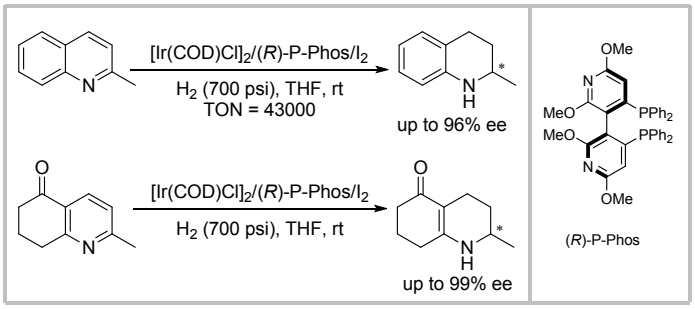
8. Claude Y. Legault, André B. Charette,* and Pier G. Cozzi. Iridium Catalyzed Enantioselective Hydrogenation of N-iminopyridinium Ylides: Mechanistic Insights. *Hetereocycles***2008**, *76*, 1271-1283.



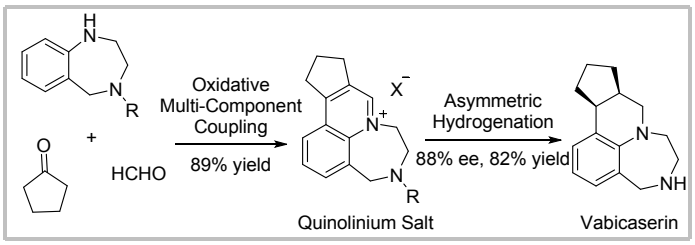
9. Weijun Tang, Yawei Sun, Lijin Xu,* Tianli Wang, Qinghua Fan, Kim-Hung Lam and Albert S. C. Chan. Highly Efficient and Enantioselective Hydrogenation of Quinolines and Pyridines with Ir-Difluorphos Catalyst. *Org. Biomol. Chem*. **2010**, *8*, 3464-3471.



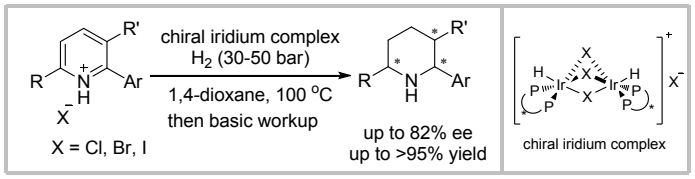
10. Wei-Jun Tang, Jing Tan, Li-Jin Xu,* Kim-Hung Lam, Qing-Hua Fan, and Albert S. C. Chan. Highly Enantioselective Hydrogenation of Quinoline and Pyridine Derivatives with Iridium-(P-Phos) Catalyst. *Adv. Synth. Catal*. **2010**, *352*, 1055-1062.



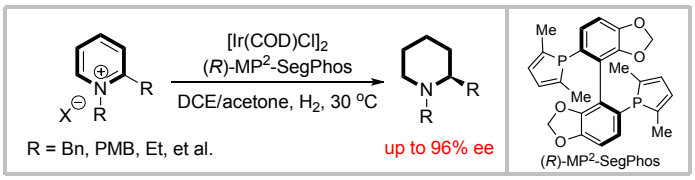
11. Vladimir Dragan, J.* Christopher McWilliams,* Ross Miller,* Karen Sutherland, John L. Dillon, and Michael K. O'Brien. Asymmetric Synthesis of Vabicaserin via Oxidative Multicomponent Annulation and Asymmetric Hydrogenation of a 3,4-Substituted Quinolinium Salt.*Org. Lett.***2013**, *15*, 2942-2945.



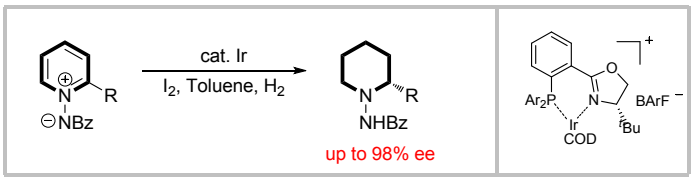
12. Yusuke Kita, Atsuhiro Iimuro, Shoji Hida, and Kazushi Mashima.* Iridium-Catalzed Asymmetric Hydrogenation of Pyridinium Salts for Constructing Multiple Stereogenic Centers on Piperidines. *Chem. Lett.***2014**, *43*, 284-286.



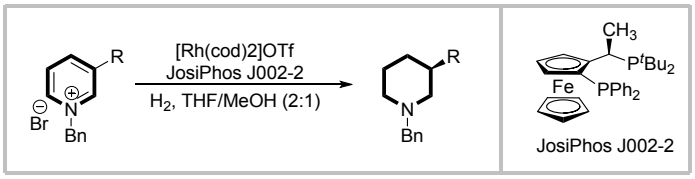
13. Mingxin Chang, Yuhua Huang, Shaodong Liu, Yonggang Chen,* Shane W. Krska, Ian W. Davies and Xumu Zhang.* Asymmetric Hydrogenation of Pyridinium Salts with an Iridium Phosphole Catalyst. *Angew. Chem. Int. Ed*. **2014**, *53*, 12761-12764.



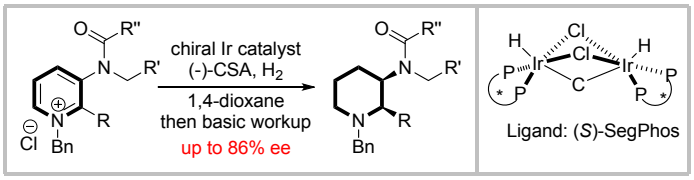
14. Alban Cadu, Puspesh K. Upadhya, and Pher G. Andersson.* Iridium-Catalyzed Asymmetric Hydroge- nation of Substituted Pyridines. *Asian J. Org. Chem.***2013**, *2*, 1061-1065.



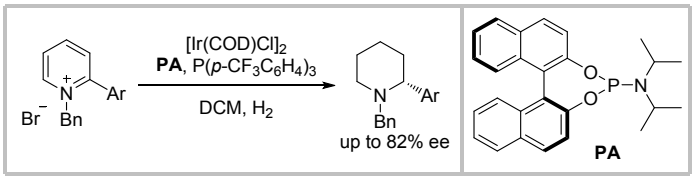
15. Marc Renom-Carrasco, Piotr Gajewski, Luca Pignataro, Johannes G. de Vries, Umberto Piarulli, Cesare Gennari and Laurent Lefort.* Asymmetric Hydrogenation of 3-Substituted Pyridinium Salts. *Chem. Eur. J. Org.* **2016**, *22*, 9528-9532.



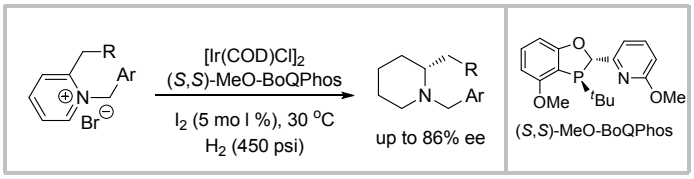
16. Atsuhiro Iimuro, Kosuke Higashida, Yusuke Kita and Kazushi Mashima.* Asymmetric Hydrogenation of 3-Amido-2-arylpyridinium Salts by Triply Chloride-Bridged Dinuclear Iridium Complexes Bearing Enan- tiopure Diphosphine Ligands: Synthesis of Neurokinin-1 Receptor Antagonist Derivatives. *Adv. Synth. Catal.***2016**, *358*, 1929-1933.



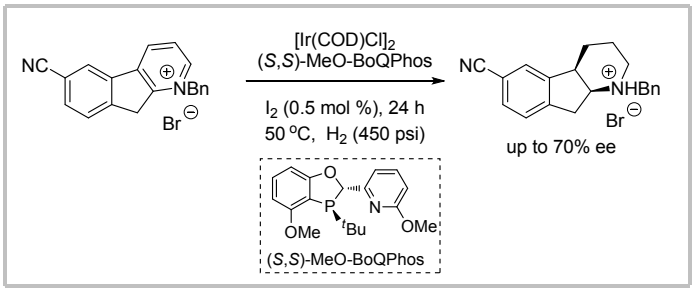
17. Marc Renom-Carrasco, Piotr Gajewski, Luca Pignataro, Johannes G. de Vries, Umberto Piarulli, Cesare Gennari, and Laurent Lefort.* A Mixed Ligand Approach for the Asymmetric Hydrogenation of 2-Sub- stituted Pyridinium Salts. *Adv. Synth. Catal.***2016**, *358*, 2589-2593.



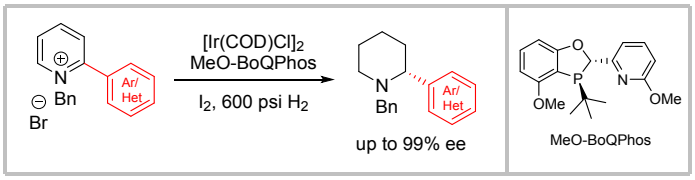
18. Bo Qu,* Hari P. R. Mangunuru, Xudong Wei et al. Synthesis of Enantioenriched 2-Alkyl Piperidine Derivatives through Asymmetric Reduction of Pyridinium Salts. *Org. Lett*. **2016**, *18*, 4920-4923.



19. Xudong Wei,* Bo Qu,* Xingzhong Zeng et al. Sequential C-H Arylation and Enantioselective Hydro- genation Enables Ideal Asymmetric Entry to the Indenopiperidine Core of an 11β-HSD-1 Inhibitor. J. Am. Chem. Soc. 2016, 138, 15473-15481.



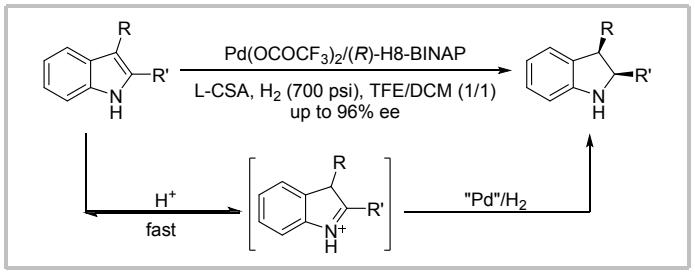
20. Bo Qu,* Hari P. R. Mangunuru, Sergei Tcyrulnikov, Daniel Rivalti, Olga V. Zatolochnaya,Dmitry Kurouski, Suttipol Radomkit, Soumik Biswas, Shuklendu Karyakarte, Keith R. Fandrick, Joshua D. Sieber, Sonia Rodriguez, Jean-Nicolas Desrosiers, Nizar Haddad, Keith McKellop, Scott Pennino, Heewon Lee, Nathan K. Yee, Jinhua J. Song, Marisa C. Kozlowski,*and Chris H. Senanayake.Enantioselective Synthesis of α-(Hetero)aryl Piperidines throughAsymmetric Hydrogenation of Pyridinium Salts and Its MechanisticInsights. *Org. Lett.***2018**, *20*, 1333-1337.



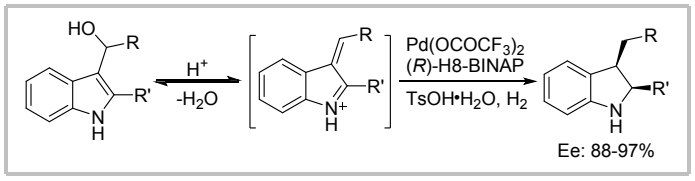
Indoles

Our work

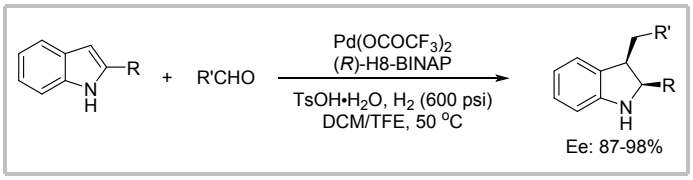
1. Duo-Sheng Wang, Qing-An Chen, Wei Li, Chang-Bin Yu, Yong-Gui Zhou,* and Xumu Zhang* Pd-Catalyzed Asymmetric Hydrogenation of Unprotected Indoles Activated byBronsted Acids. *J. Am. Chem. Soc.* **2010**, *132*, 8909-8911.



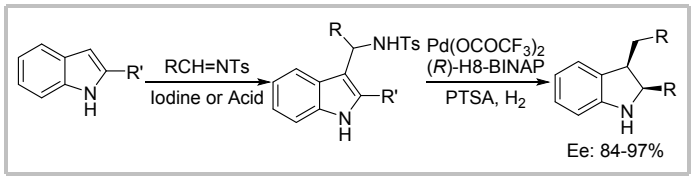
2. Duo-Sheng Wang, Jie Tang, Yong-Gui Zhou,* Mu-Wang Chen, Chang-Bin Yu, Ying Duanand Guo-Fang Jiang.* Dehydration triggered asymmetric hydrogenation of 3-(a-hydroxyalkyl)indoles. *Chem. Sci.* **2011**, 2, 803-806.



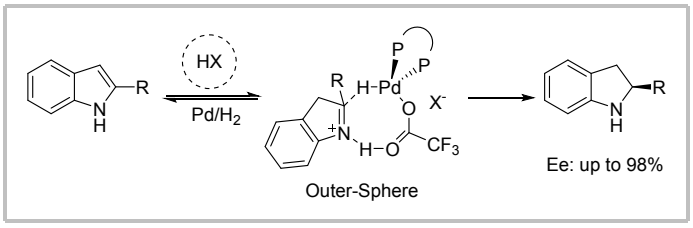
3. Ying Duan, Mu-Wang Chen, Zhi-Shi Ye, Duo-Sheng Wang, Qing-An Chen, and **Yong-Gui Zhou**.* An Enantioselective Approach to 2,3-Disubstituted Indolines through Consecutive Bronsted Acid/Pd-Complex-Promoted Tandem Reactions. *Chem. Eur. J.* **2011**, *17*, 7193-7197.



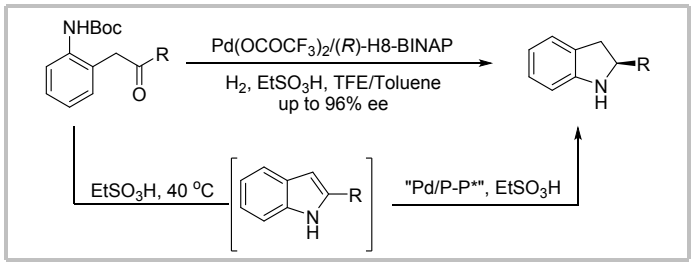
4. Ying Duan, Mu-Wang Chen, Qing-An Chen, Chang-Bin Yu and **Yong-Gui Zhou**.* Pd-Catalyzed Asymmetric Hydrogenation of 3-(Toluenesulfonamidoalkyl)indoles. *Org. Biomol. Chem.* **2012**, *10,* 1235-1238.



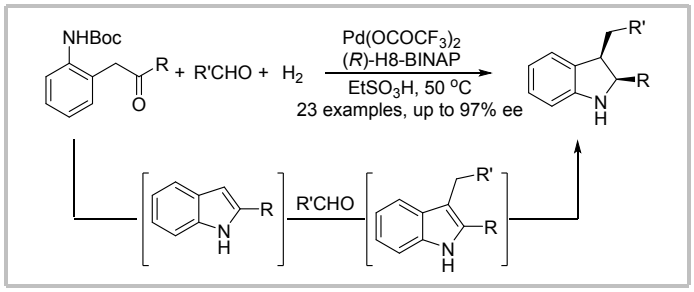
5. Ying Duan,Lu Li,Mu-Wang Chen,Chang-Bin Yu,Hong-Jun Fan*and **Yong-Gui Zhou**.* Homogenous Pd-Catalyzed Asymmetric Hydrogenation of Unprotected Indoles: Scope and Mechanistic Studies. *J. Am. Chem. Soc.* **2014**, *136*, 7688-7700.



6. Chang-Bin Yu, Jie Wang and Yong-Gui Zhou.* Facile Synthesis of Chiral Indolines through Asymmetric Hydrogenation of in situ Generated Indoles. *Org. Chem. Front.***2018**, *5*, 2805-2809.

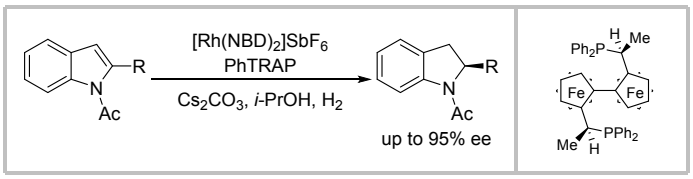


7. Chang-Bin Yu,* Xiang Li, Yong-Gui Zhou.* A Condensation/Reductive Alkylation/Hydrogenation Cascade for Facile Synthesis of Chiral 2,3-Disubstituted Indolines. *Asian. J. Org. Chem*. **2019**, *8*, 1118-1121.

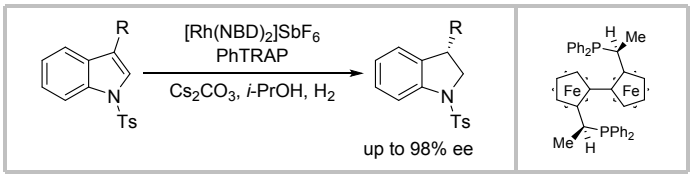


Others' work

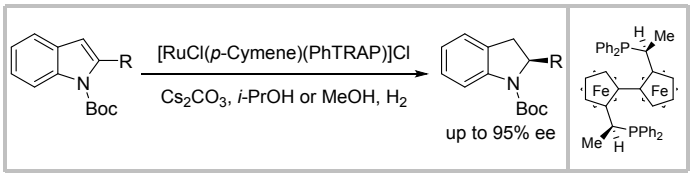
1. Ryoichi Kuwano,* Koji Sato, Takashi Kurokawa, Daisuke Karube, and Yoshihiko Ito.* Catalytic Asymmetric Hydrogenation of Heteroaromatic Compounds, Indoles. *J. Am. Chem. Soc.* **2000**, *122*, 7614-7615.



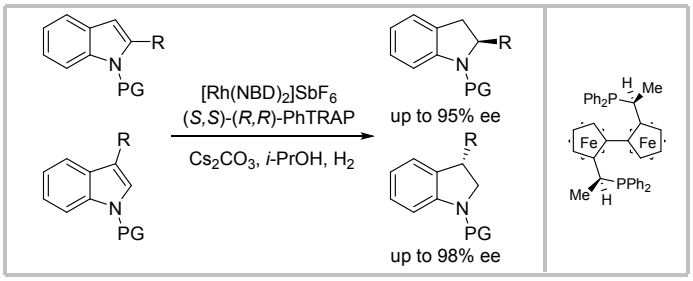
2. Ryoichi Kuwano,* Kohei Kaneda, Takashi Ito, Koji Sato, Takashi Kurokawa, and Yoshihiko Ito.* Highly Enantioselective Synthesis of Chiral 3-Substituted Indolines by Catalytic Asymmetric Hydrogenation of Indoles. *Org. Lett.* **2004**, *6*, 2213-2215.



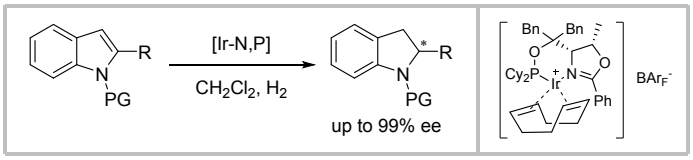
3. Ryoichi Kuwano* and Manabu Kashiwabara. Ruthenium-Catalyzed Asymmetric Hydrogenation of *N*-Boc-Indoles. *Org. Lett.* **2006**, *8*, 2653-2655.



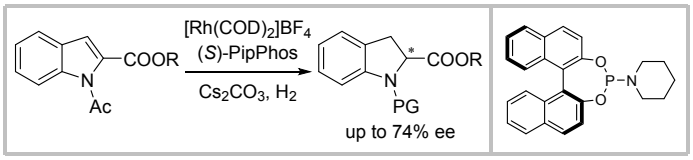
4. Ryoichi Kuwano,* Manabu Kashiwabara, Koji Sato, Takashi Ito, Kohei Kaneda and Yoshihiko Ito. Catalytic Asymmetric Hydrogenation of Indoles Using a Rhodium Complex with a Chiral Bisphosphine Ligand PhTRAP. *Tetrahedron: Asymmetry* **2006**, *17*, 521-35.



5. Alejandro Baeza and Andreas Pfaltz*. Iridium-Catalyzed Asymmetric Hydrogenation of *N*-Protected Indoles. *Chem. Eur. J.* **2010**, *16*, 2036-2039.

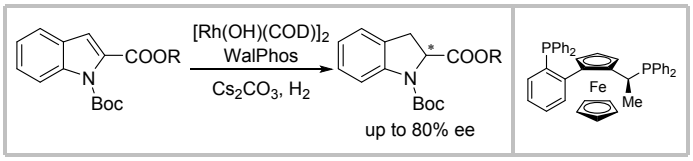


6. Nataša Mršić, Thomas Jerphagnon , Adriaan J. Minnaard,* Ben L. Feringa,* Johannes G. de Vries.* Asymmetric Hydrogenation of 2-substituted *N*-protected-indoles Catalyzed by Rhodium Complexes of BINOL-derived Phosphoramidites. *Tetrahedron: Asymmetry* **2010**, 7-10.

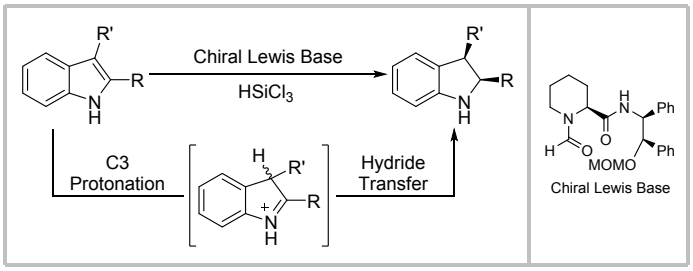


7. Anna M. Maj, Isabelle Suisse, Catherine Méliet and Francine Agbossou-Niedercorn.* Enantioselective

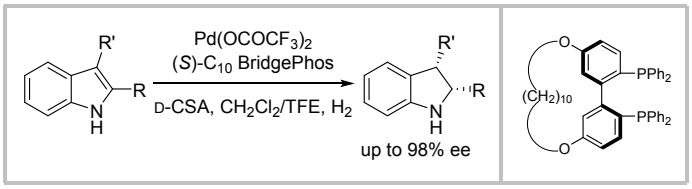
Hydrogenation of Indoles Derivatives Catalyzedby Walphos/Rhodium Complexes, *Tetrahedron: Asymmetry* **2010**, *21*, 2010-2014.



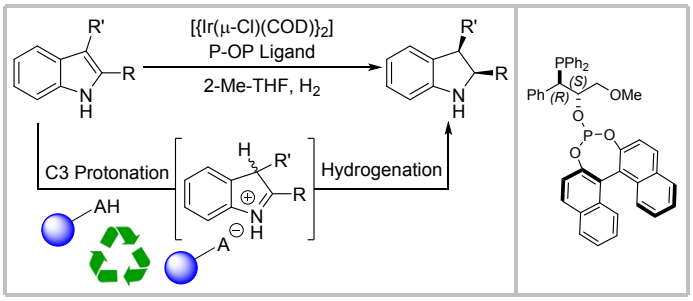
8. You-Cai Xiao, Chao Wang, Yuan Yao, Jian Sun and Ying-Chun Chen.* Direct Asymmetric Hydrosilylation of Indoles: Combined Lewis Base and Bronsted Acid Activation. *Angew. Chem. Int. Ed.* **2011**, *50*, 10661-10664.



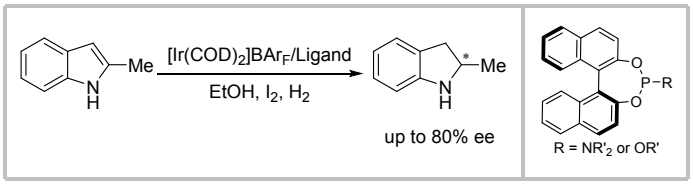
9. Chao Li , Jianzhong Chen, Guanghong Fu , Delong Liu, Yangang Liu*, Wanbin Zhang.* Highly Enantioselective Hydrogenation of *N*-unprotected IndolesUsing (*S*)-C10-BridgePHOS as the Chiral Ligand, *Tetrahedron* **2013**, *69*, 6839-6844.



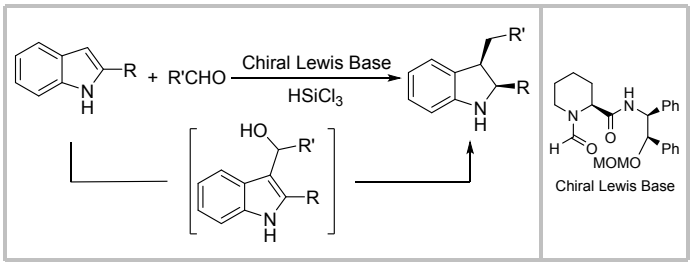
10. José Luis Núez-Rico,Héctor Fernández-Pérez, Anton Vidal-Ferran.* Asymmetric Hydrogenation of Unprotected IndolesUsing Iridium Complexes Derived from P–OPLigands and (reusable) Bronsted Acids, *Green Chem.* **2014**, *16,* 1153-1157.



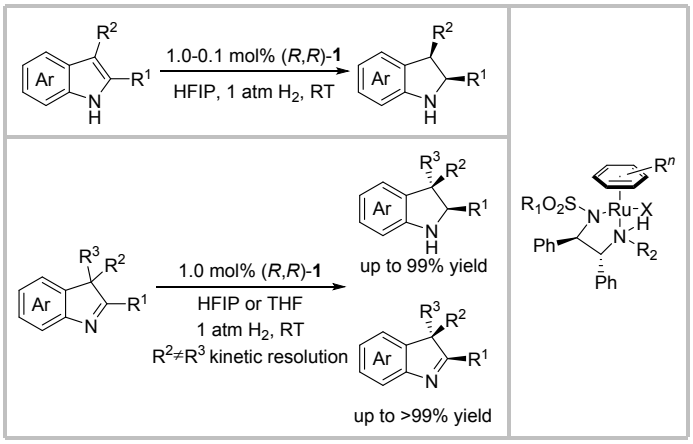
11. Sergey E. Lyubimov,* Dmitry V. Ozolin, Vadim A. Davankov. Asymmetric Iiridium-Catalyzed Hydrogenation of 2-Methylindole Using Phosphite Ligand, *Tetrahedron Lett.* **2014**, *55,* 3613-3614.



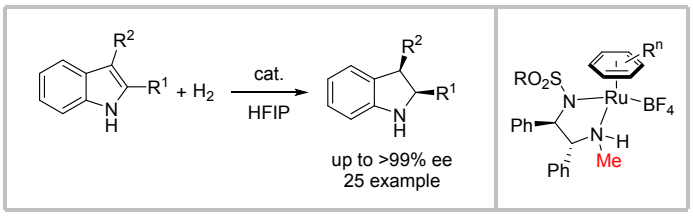
12. Lin Chen, Chao Wang,* Li Zhou and Jian Sun.* Chiral 2,3-Disubstituted Indolines from Indoles and Aldehydes by Organocatalyzed Tandem Synthesis Involving Reduction by Trichlorosilane. *Adv. Synth. Catal.* **2014**, *356*, 2224-2230.



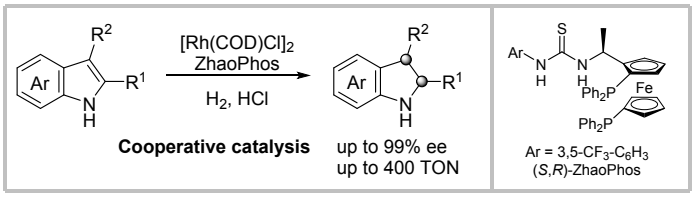
13. Zhusheng Yang, Fei Chen,* Yanmei He, Nianfa Yang, and Qing-Hua Fan.* Highly Enantioselective Synthesis of Indolines: Asymmetric Hydrogenation at Ambient Temperature and Pressure with Cationic Ruthenium Diamine Catalysts. *Angew. Chem. Int. Ed.* **2016**, *55*, 13863-13866.



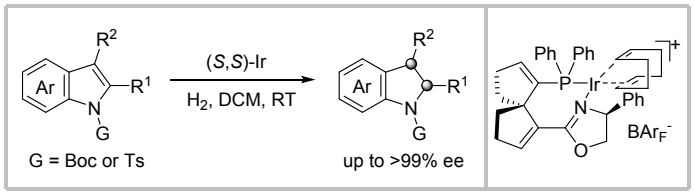
14. Taichiro Touge* and Takayoshi. Ara Asymmetric Hydrogenation of Unprotected Indoles Catalyzed by η^6-Arene/*N*-Me-sulfonyldiamine-Ru(II) Complexes. *J. Am. Chem. Soc.* **2016**, *138*, 11299-11305.



15. Jialin Wen, Xiangru Fan, Renchang Tan, Hui-Chun Chien, Qinghai Zhou, Lung Wa Chung,* and Xumu Zhang.*Brønsted-Acid-Promoted Rh-Catalyzed Asymmetric Hydrogenationof N−Unprotected Indoles: A Cocatalysis of Transition Metal andAnion Binding. *Org. Lett.***2018**, *20*, 2143-2147.



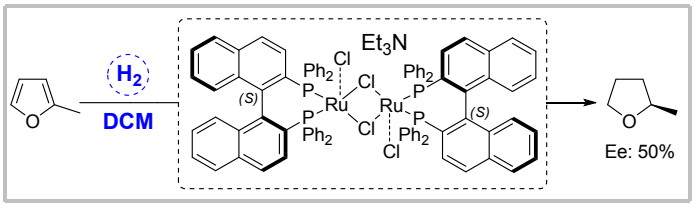
16. Yao Ge, Zheng Wang, Zhaobin Han, and Kuiling Ding.* Iridium-Catalyzed Enantioselective Hydrogenation of Indole and Benzofuran Derivatives. *Chem. Eur. J.* **2020**, *26*, 15482-15486.



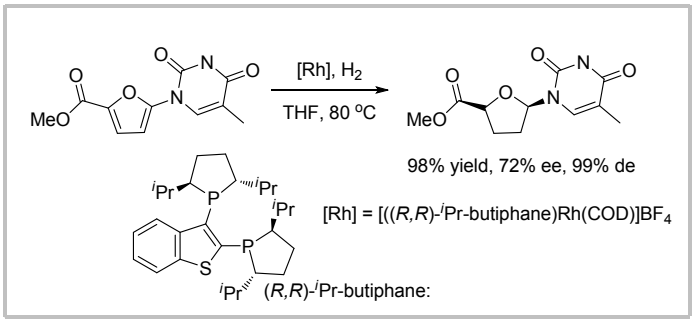
Furans

Others' work

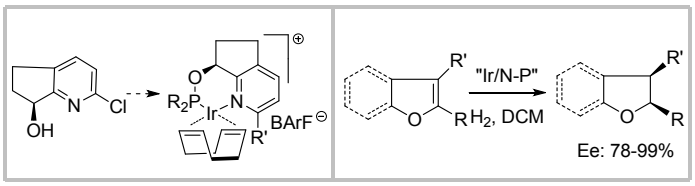
1. Tetsuo Ohta, Tsutomu Miyake, Nobuo Seido, Hidenori Kumobayashi, and Hidemasa Takaya*. Asymmetric Hydrogenation of Olefins with Aprotic Oxygen Functionalities Catalyzed by BINAP-Ru(I1) Complexes. *J. Org. Chem*. **1995**, *60*, 357-363.



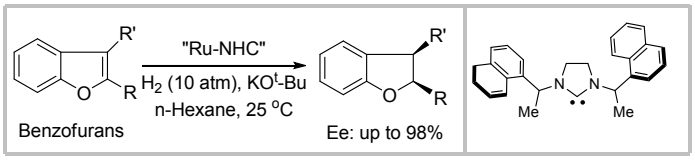
2. Petra Feiertag, Martin Albert,* Ulrike Nettekoven, and Felix Spindler. Asymmetric Homogeneous Hydrogenation of 2,5-Disubstituted Furans. *Org. Lett*. **2006**, *8*, 4133-4135.



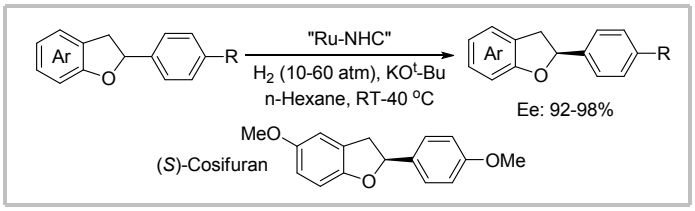
3. Stefan Kaiser, Sebastian P. Smidt, and Andreas Pfaltz*. Iridium Catalysts with Bicyclic Pyridine-Phosphinite Ligands: Asymmetric Hydrogenation of Olefins and Furan Derivatives. *Angew. Chem. Int. Ed*. **2006**, *45*, 5194-5197.



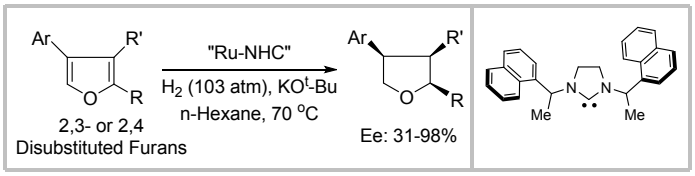
4. Nuria Ortega, Slawomir Urban, Bernhard Beiring and Frank Glorius.* Ruthenium NHC Catalyzed Highly Asymmetric Hydrogenation of Benzofurans. *Angew. Chem. Int. Ed*. **2012**, *51*, 1710-1713.



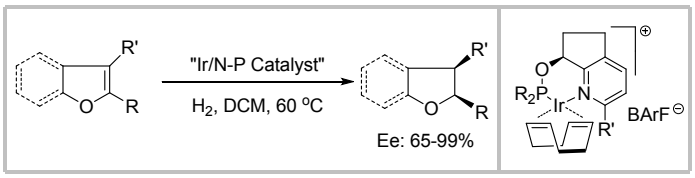
5. Nuria Ortega, Bernhard Beiring, Slawomir Urban, Frank Glorius.* Highly Asymmetric Synthesis of (+)-corsifuran A. Elucidation of the Electronic Requirements in the Ruthenium-NHC Catalyzed Hydrogenation of Benzofurans. *Tetrahedron*. **2012**, *68*, 5185-5192.



6. Jedrzej Wysocki, Nuria Ortega, and Frank Glorius.* Asymmetric Hydrogenation of Disubstituted Furans. *Angew. Chem. Int. Ed*. **2014**, *53*, 8751-8755.



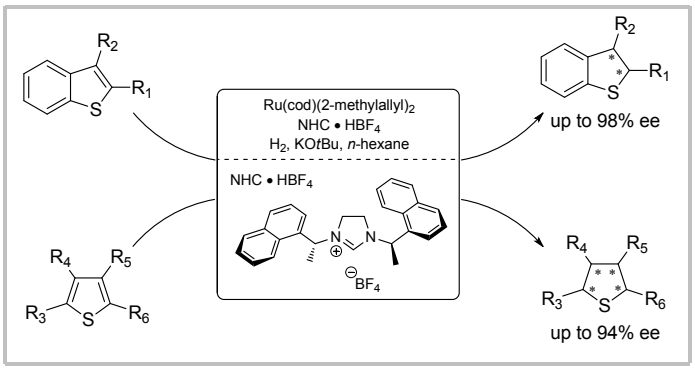
7. Larissa Pauli, Ren Tannert, Robin Scheil, and Andreas Pfaltz.* Asymmetric Hydrogenation of Furans and Benzofurans with Iridium-Pyridine-Phosphinite Catalysts. *Chem. Eur. J.* **2015**, *21*, 1482-1487.



Thiophenes and Benzothiophenes

Others' work

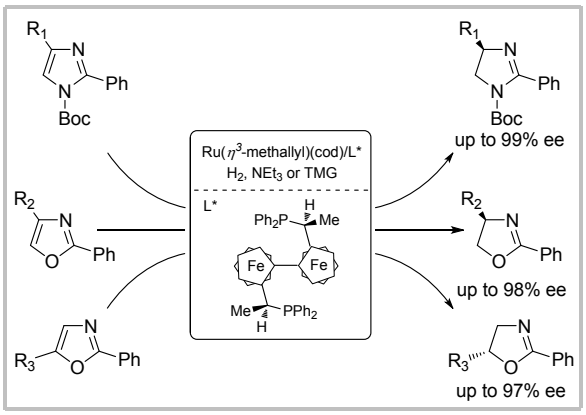
1. Slawomir Urban, Bernhard Beiring, Nuria Ortega, Daniel Paul and Frank Glorius.* Asymmetric Hydrogenation of Thiophenes and Benzothiophenes. *J. Am. Chem. Soc.***2012**, *134*, 15241-15244.



Imidazoles and Oxazoles

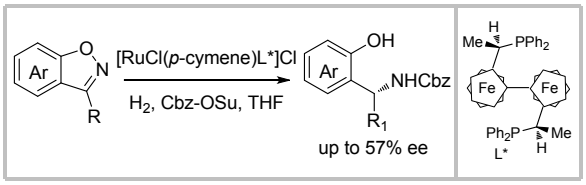
Others' work

1. Ryoichi Kuwano,* Nao Kameyama, and Ryuhei Ikeda. Catalytic Asymmetric Hydrogenation of N-Boc-Imidazolesand Oxazoles. *J. Am. Chem. Soc*. **2011**, *133*, 7312-7315.

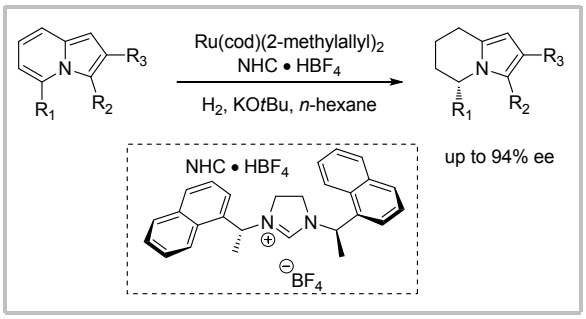


2. Ryuhei Ikeda and Ryoichi Kuwano.* Catalytic Asymmetric Hydrogenation of 3-Substituted Benzisoxazoles.

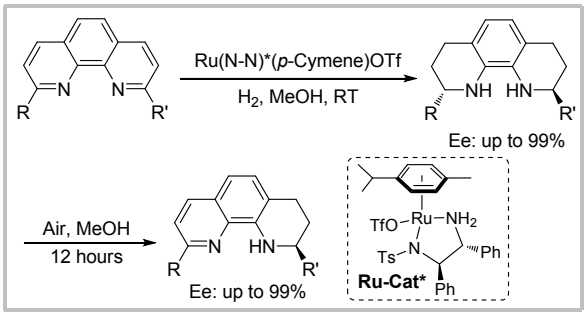
*Molecules***2012**, *17*, 6901-6915.



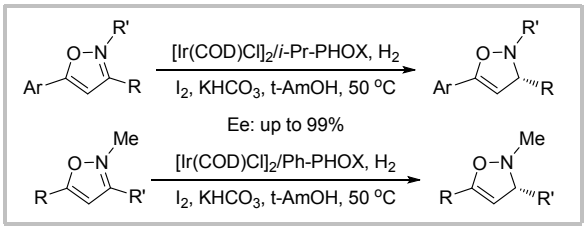
3. Nuria Ortega, Dan-Tam D. Tang, Slawomir Urban, Dongbing Zhao, and Frank Glorius*. Ruthenium–NHC-Catalyzed Asymmetric Hydrogenation of Indolizines: Access to Indolizidine Alkaloids. *Angew. Chem. Int. Ed.* **2013**, *52*, 9500-9503.



4. Tianli Wang, Fei Chen, Jie Qin, Yan-Mei He, and Qing-Hua Fan.* Asymmetric Ruthenium-Catalyzed Hydrogenation of 2- and 2,9-Substituted 1,10-Phenanthrolines. *Angew. Chem. Int. Ed*. **2013**, *52*, 7172-7176.



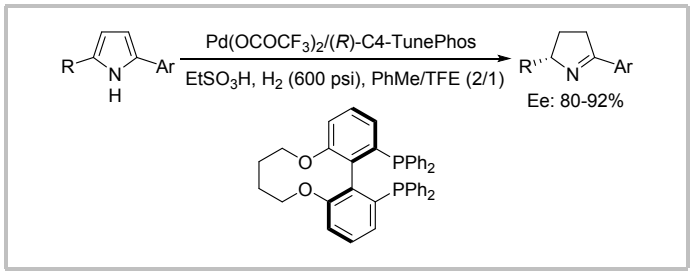
5. Ryuhei Ikeda and Ryoichi Kuwano.* Asymmetric Hydrogenation of Isoxazolium Triflates with a Chiral Iridium Catalyst. *Chem. Eur. J*. **2016**, *22*, 8610-8618.



Pyrroles

Our work

1. Duo-Sheng Wang, Zhi-Shi Ye, Qing-An Chen, **Yong-Gui Zhou**,* Chang-Bin Yu, Hong-Jun Fan,* and Ying Duan. Enantioselective Partial Hydrogenation of Simple Pyrroles: A Facile Access to Chiral 1-Pyrrolines. *J. Am. Chem. Soc.* **2011**, *133*, 8866-8869.



Other's work

1. Ryoichi Kuwano,* Manabu Kashiwabara, Masato Ohsumi and Hiroki Kusano. Catalytic Asymmetric Hydrogenation of 2,3,5-Trisubstituted Pyrroles. *J. Am. Chem. Soc.* **2008**, *130*, 808-809.