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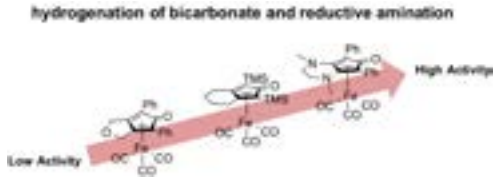
Bifunctional iron catalysts: synthesis and applications

Economic constraints and environmental concerns in chemistry have led to increased demand for the replacement of noble metals used in chemical processes by Earth-abundant ones. Iron-catalyzed reduction has received intensive attention and some iron complexes have shown activities and selectivity that are competitive with those of noble metals. However, exchanging noble metals for cheap, abundant, and biocompatible iron complexes to perform reduction is not the sole criterion to render such complexes attractive for industrial applications; the catalytic activities and the price of the ligand must also be taken into account. Based on a "transition metal frustrated Lewis pair" approach, cyclopentadienone iron tricarbonyl complexes have been designed. Their application in reduction and alkylation, as well as a detailed mechanistic, study will be presented (Figure 1).



Recent Publications

1. Bauer I and Knölker H (2015) Iron Catalysis in Organic Synthesis. Chemical Reviews 115:3170-3387.
2. Renaud J L and Gaillard S (2016) Recent Advances in Iron- and Cobalt-Complex-Catalyzed Tandem/Consecutive Processes Involving Hydrogenation. Synthesis 48(21):3659-3683.
3. Moulin S, Dentel H, Pagnoux-Ozherelyeva A, Gaillard S, Poater A, Cavallo L, Lohier J F and Renaud J L (2013) Bifunctional (cyclopentadienone)iron-tricarbonyl complexes: synthesis, computational studies and application in reductive amination. Chemistry - A European Journal 19(52):17881-90
4. Thai T T, Mérel D S, Poater A, Gaillard S and Renaud J L (2015) Highly active phosphine-free bifunctional iron complex for hydrogenation of bicarbonate and reductive amination. Chemistry - A European Journal 21(19):7066-7070.
5. Mérel D S, Lohier JF, Gaillard S and Renaud J L (2013) Bifunctional Iron Complexes: Efficient Catalysts for C=O and C=N Reduction in Water. ChemCatChem 5:2939-2945.

Biography

Jean-Luc Renaud obtained his Ph.D. degree in 1998 under the supervision of Aubert and Malacria (Paris VI University). He was a Lavoisier Postdoctoral fellow in 1999 with Lautens (University of Toronto) then moved to the University of Louvain-La-Neuve in the team of Prof. Riant. In 2000, he was appointed as Maître de Conférences at the University of Rennes and accepted a Professor position at the University of Caen in 2008. The research interests focus on organometallic catalysis (Fe, Co, Cu, Ru, Ir) and their application in fine chemical synthesis (hydrogenation, cycloaddition and coupling reactions).

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