

Recent Advances in Asymmetric Iron Catalysis in Organic Synthesis

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The objective of our research program is the development of new synthetic methods, with emphasis on catalytic and enantioselective procedures for the simple preparation of molecules. Our program targets major advancements in green chemistry, which is an area of major strategic and industrial importance. Iron-derived Lewis acids have been developed as green catalysts for asymmetric synthesis. Chiral iron complexes have been employed in selected asymmetric C–C, C–N, and C–S bond-forming reactions, such as the Mukaiyama aldol, epoxide opening, thia-Michael and Diels-Alder reactions.¹ As we focused our interest on the ligand design of 2,2'-bipydiols, both steric and electronic properties of these ligands were tackled.² The synthesis of a bulky (S,S)-2,2'-bipyridine- α,α' -1-Adamantyl-diol ligand was developed and its synthetic value was demonstrated in selected Fe^{II/III}-catalyzed benchmark reactions in terms of chiral induction when compared to other 2,2'-bipydiol analogs. Also, we have been the first to develop an efficient chiral C₂-symmetric 2,2'-bipydiol ligand possessing a CF₃ group in the α,α' -positions. These results contribute to the development of iron catalysis for asymmetric synthesis.

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