Abstract

Transition metal pincer complexes composed of tridentate chelated pincer ligands have unique stability and reactivity in organometallic catalysis. Pincer complexes provide opportunity to fine tune the reactivity by changing the electronic and steric properties of the pincer ligands. Cobalt-pincer complexes gained much interest in recent years due to cheap, abundant and biocompatible alternative for catalytic applications.

In chapter-1 cobalt pincer complexes and their catalytic activities for various hydrosilylation reaction, deoxygenation reactions were discussed. The subsequent chapters a simple NNN pincer complex and bidentate cobalt complex were employed in catalytic reductive transformations of oxo-compounds using silane as a reductant. In chapter 2 cobalt catalyzed selective and exhaustive reduction of esters to alkanes using diethylsilane was discussed. Furthermore, involvement of diethylsilyl acetal and diethylsilyl ether intermediates was established through mechanistic studies. Diverse esters were reductively transformed to methyl arenes. Chapter 3 describes the cobalt catalyzed double C–O bond activation of ethers was developed in which diverse (un)symmetrical arylmethyl ethers (ArCH2OCH2Ar′) and arylmethyl alkyl ethers (ArCH2OR) were selectively transformed to 1,2-diaryl alkanes and linear alkyl arenes, respectively. Biologically active molecules such as lunularin and dihydroresveratrol were successfully synthesized using this protocol. Mechanistic investigation revealed that the reaction proceeds through molecular intermediates with participation of arylmethyl radical intermediacy. In chapter 4, bidentate cobalt catalyzed selective deoxygenative silylation of aryl aldehydes to benzyl silanes was discussed. In chapter 4, KOH catalyzed deoxygenative cyclopropanation of chalcones was described. Tetralone-, 4-chromanone-, and cyclohexanone-derived chalcones were amenable to base-catalyzed cyclopropanation reactions with a very good substrate scope. Tetralone-, 4-chromanone-, and cyclohexanone-derived chalcones were amenable to base-catalyzed cyclopropanation reactions with a very good substrate scope.

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