ABSTRACT

Title of the thesis: **"Synthetic Studies towards the Fused Heterocycles and Carbocycles *via* Metal Mediated Domino Reactions"**

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Iron catalyzed activation of alcohols/acetals has emerged as a powerful tool to initiate a domino reaction which can effectively produce different biologically important hetero/carbocylic molecules. This thesis contains the development of general, efficient and convenient methodologies using the Iron catalyzed activation of alcohols/acetals to synthesize a variety of fused heterocycles and carbocycles *via* environmentally friendly iron catalyzed domino reactions.

In part 1, the significance of iron catalysts in the synthesis of heterocycles has been discussed and a concise overview of the diverse reactions catalyzed by iron for the production of benzo-fused heterocycles is presented.

In part 1, chapter 1, the synthesis of diverse 3-substituted indole derivatives were carried out through tandem carbon–carbon bond formation and isomerization of 3-benzylidene-1-tosylindoline by direct use of π-activated alcohols as alkylating agents in the presence of catalytic $FeCl_3$. A wide range of substrate scope and generality of the protocol has been presented with a plausible mechanism.

In part 1, chapter 2, a $Fe(OTf)_3$-catalysed carboarylation reaction has been introduced as a straightforward and efficient route to obtain densely substituted 1,2-dihydroquinolines, which are essential building blocks for the synthesis of complex heterocycles. The versatility of this methodology has been further demonstrated by successfully synthesizing substituted chromene and thiochromene derivatives with excellent yields. Furthermore, the synthesis of substituted quinoline derivatives has been achieved using $FeCl_3$ in a single step through a process involving detosylation and aromatization. After conducting the necessary control experiments, a mechanism has also been proposed.

Part II provides the importance of carbocycles and a short review of various iron catalyzed reactions to access different kinds of benzofused carbocyles.

In the part 2, chapter 1, a highly efficient and convenient method for the synthesis of 13-aryl-13*H*-indeno[1,2-*l*]phenanthrene is described by the $FeCl_3$ catalyzed double annulation of 2-alkynyl biaryls which is initiated by the activation of acetals. The key feature of this strategy is its ability to provide a regioselective synthesis of a wide range of indenophenanthrene derivatives with excellent yields, using readily available starting materials and mild reaction conditions.

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