INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: **"Catalytic applicability of NNS and SNS ligand derived air-stable Ru complexes towards de(hydrogenative) construction of carbon-carbon and carbon-nitrogen bond"**

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SHORT ABSTRACT

The contents of the present thesis entitled as **"Catalytic applicability of NNS and SNS ligand derived air-stable Ru complexes towards (de)hydrogenative construction of carbon-carbon and carbon-nitrogen bond"** have been divided into five chapters based on the results achieved from the experimental works performed during the entire course of the PhD research programme.

Chapter 1 contains a brief introduction about the literature review of acceptorless dehydrogenative and borrowing hydrogen reactions of alcohols via homogeneous catalysis. Each of these chapters (Chapter 2- Chapter 4) contains an introduction, previous reported works, present results and discussion, an experimental section, and references, along with characterization data of products including spectral data. Overall, this thesis demonstrates some new and efficient approaches for the synthesis of different functionalized target compounds.

Chapter 2 highlights for the synthesis and characterisation of of NNS and SNS ligand derived air stable-Ru pincer complexes and investigated their catalytic applicability towards dehydrogenative aza-Wittig and Wittig reactions for the construction of C=N and C=C bonds. This protocol was also used for the synthesis of pyrrolo[1,4] benzodiazepines derivatives as they are important class of compounds having useful biological activity. The scope of this reaction is quite broad for different substrates such as alkyl, aryl as well as heterocyclic moieties.

Chapter 3 demonstrates an efficient and atom-economic method for the facile synthesis of 1,8-Dioxo-decahydroacridine derivatives via Ru-catalyzed acceptorless dehydrogenative multicomponent reaction. This protocol is quite general to access the desire products in a wide range of substrates with good to excellent yields. In addition, mechanistic and kinetic studies were performed to understand the plausible reaction pathway involved for the target product formation which is discussed in this section in details. A time-dependent product distribution experiment is also presented and the reaction scale-up is performed to highlight the practical utility of this strategy.

Chapter 4 describes selective synthesis of C-3 alkylated of 1H-indoles with various aliphatic primary and secondary alcohols including cyclic alcohols as well as benzylic alcohols. The selective synthesis of bisindolylmethane derivatives is also achieved from the same set of indole and alcohol just by altering the reaction parameters. Furthermore, the sustainable synthesis of C-3 alkylated indoles directly from 2-(2-. nitrophenyl)ethan-1-ol and alcohols catalysed by a Ru-complex via "borrowing hydrogen" strategy is reported. This protocol provides an atom-economical sustainable route to access structurally important compounds like arundine, vibrindole A and tryptamine based derivatives.

Chapter 5 represented the activity of acridine derived SNS-Ru pincer for the activation of methanol to apply it as a C1 building block towards β-C(sp3)-methylation reaction of 2-phenylethanols to provide good to excellent yields of the methylated products. Furthermore, mechanistic details, kinetic progress and temperature dependent product distribution of the reaction have been showed. To establish the environmental benefit of this reaction, green chemistry metrics have been reported. In addition, dimerization of 2-Naphthol via methylene linkage and formation of N-methylation of amine are also described in this study which offers a wide range of substrate scope with good to excellent yield.