INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: Organocatalytic Asymmetric Michael and Cyclization Reactions Involving Electron Deficient Olefins

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SHORT ABSTRACT

The works described in the thesis involved organocatalytic Michael and cyclization reactions. Cinchona derived catalysts were highlighted in this context, since these catalysts were very easy to prepare. The first two chapters documents the asymmetric Michael addition reaction between α-branched enones and electron deficient olefines. 1-Acetylcyclohexene, 1-acetylcyclopentene and 1-acetylcyclobutene have been used in the enantioselective organocatalytic Michael addition reactions to nitroolefins and olefins containing keto and cyano groups. For the first case the cyclization has been achieved via an external base but delightfully for the second case simultaneous cyclization was attained via a formal [4+2] cycloaddition of olefin with cross dienamine intermediate. The bicyclic products having four contiguous stereogenic centres including one quaternary centre were obtained in high diastereo- and enantioselectivities. The development of a new organocatalytic asymmetric Tamura cycloaddition of α-branched nitroolefins with homophthalic anhydrides was also described in the thesis delivering highly functionalized 1-tetralone compounds bearing a quaternary center at the α-position. The cinchona derived chiral squramide catalysts can be synthesized easily and using them the tetralone products were obtained in moderate to high diastereo- and with good to excellent enantioselectivities. The development of the first organocatalytic DKR reaction of hemithioacetals was reported in the fifth chapter. Hemithioacetals were formed *insitu* via thiol addition and subsequently underwent an intramolecular oxa-Michael reaction furnishing sulphur containing 1,3-disubstituted-1,3-dihyroisobenzofurans. Cinchonidine derived urea was the best catalyst for this reaction and the dihyroisobenzofuran products were formed in good yields with high diastereo- and enantioselectivities. The scope of the reaction was quite broad ranging from aliphatic to aromatic substituents. The methodology for the synthesis of new chiral carbocyclic and heterocyclic compounds as developed in the works might be useful for the natural product synthesis and other bioactive compounds. The methods described in the thesis are very simple and have broader substrate scopes.