



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: “**Organocatalytic Asymmetric Synthesis of Oxygen, Nitrogen and Sulfur Heterocycles**”

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SHORT ABSTRACT

Asymmetric organocatalysis is an economical and environment-friendly process where a purely organic small molecule is used to catalyze organic transformations. Most of the naturally occurring compounds are optically active: they are not superimposable on their mirror images. Moreover, the different enantiomers can have different odor, taste and more importantly different pharmacological properties. The thesis have been divided into six chapters. Chapter 1 contains a brief discussion on asymmetric organocatalysis particularly enamine/iminium ion catalysis and also bifunctional thiourea and squaramide catalysis. A brief description of Michael and Mannich reaction are also presented here. A direct asymmetric double Michael addition reaction between γ/δ -hydroxy- α,β -unsaturated carbonyls and enals for the synthesis of 2,3,4-trisubstituted tetrahydrofurans and tetrahydropyrans using tandem iminium/enamine catalysis has been demonstrated in the chapter 2. In chapter 3, a mild and operationally simple protocol for the organocatalytic asymmetric synthesis of tetrahydrofuran/tetrahydropyran fused 3,4-dihydrocoumarin has been developed via a cascade reaction between 2-hydroxycinnamaldehydes and γ/δ -hydroxyenones followed by PCC oxidation. Prolinol TMS ether catalyst in combination with acetic acid was found to be the most effective for the cascade reaction. In the chapter 4, we have reported a highly diastereo- and enantioselective cascade oxa-Michael/Michael reaction between unsaturated pyrazolones and γ -hydroxyenones using bifunctional tertiary amino squaramide catalyst. Primary amino acid catalyzed one pot asymmetric synthesis of 2-aryl-2,3-dihydro-4-quinolones and also employ of a variety of 2-aminoacetophenones for the first time has been reported in the chapter 5. In chapter 6, we have reported a mild and operationally simple protocol for the asymmetric synthesis of pentasubstituted tetrahydrothiopyrans bearing a quaternary centre using bidentate ketothioether enones and *trans*- α -cyano- α,β -unsaturated ketones employing proline derived bifunctional tertiary amino thiourea catalyst.