INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title:
Organocatalytic Asymmetric Addition/Cyclization of Carbon/Sulfur Nucleophiles to *in situ*-Generated *ortho*-Quinone Methides

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SHORT ABSTRACT

The present thesis, entitled as "**Organocatalytic Asymmetric Addition/Cyclization of Carbon/Sulfur Nucleophiles to *in situ*-Generated *ortho*-Quinone Methides**" is divided into five chapters, based on the obtained results of experimental works performed during the complete course of the Ph.D. research period.

Chapter I: highlights on the basic introduction of asymmetric synthesis, different strategies of asymmetric induction, organocatalysis and its bifunctional applications on *ortho*-quinone methides in a nutshell. Herein, several chiral Brønsted phosphoric acids, thiourea/squaramide catalyzed asymmetric reactions of *ortho*-quinone methides were briefly discussed.

Chapter II: demonstrates highly diastereo- and enantioselective synthesis of tri-substituted chromans having three contiguous stereogenic enters *via* [4+2] cycloaddition of *in situ*-generated *ortho*-quinone methides and acyclic enecarbamates. This was a fascinating catalytic asymmetric reaction where a variety of *ortho*-hydroxybenzyl alcohols and *trans*-acyclic enecarbamates were smoothly incorporated in the reaction. The reaction was catalyzed by commercially available chiral TRIP. The mild reaction conditions and operational simplicity are the main feature of this method and which could be applied in natural product synthesis.

Chapter III: describes first bifunctional squaramide catalyzed an enantioselective acyl transfer sequence for the construction of chiral O-acyl 2-(1-arylethyl)phenols *via* a domino Michael/acyl transfer reaction between *α*-nitroketones and *in situ*-generated *ortho*-quinone methides. Various *ortho*-hydroxybenzyl sulfones and *α*-nitroketones were employed in basic reaction conditions under biphasic medium. Few synthetic transformations were also performed to highlight the potentiality of our method. The reaction conditions are very mild and operationally simple procedure. In general, synthesis of chiral 2-(1-arylethyl)phenols are quite difficult. Thus our methodology would be helpful for chiral 2-(1-arylethyl)phenols synthesis and other natural products.

Chapter IV: illustrates first enantioselective synthesis of 5-Substituted-5*H*-benzoxathiepine-2(3*H*)-ones *via* cinchona derived squaramide catalyzed asymmetric addition of thioglycolates to *in situ*-generated *ortho*-quinone methides. Various *ortho*-hydroxybenzyl sulfones and alkyl thioglycolates were utilized as the reaction partners to deliver the desired thia-Michael products as well as seven membered heterocyclic benzoxathiepine-2(3*H*)-ones. Wide substrate scope and the important synthetic applications to diastereo-, enantioselective chiral sulfoxides, sulfone formation are the synthetic potential of this methodology. Although this is an overall three step processes, owing the pharmaceutical significance of benzoxathiepines this might be useful in medicinal industry.

Chapter V: delineates highly diastereo- and enantioselective synthesis of *trans*-3,4-dihydrocoumarins and tetra-substituted chromans *via* an organocatalyzed first asymmetric addition of aromatic *α*-cyanoketones to *in situ*-generated *ortho*-quinone methides. Here also, cinchona derived bifunctional squaramide catalyst was found to be the best catalyst for the activation of substrates under oil/water interface. Broad substrate scope and the reaction scale up are the key features of this methodology. Tetra-substituted chromans were also synthetically transformed to valuable chiral chromenes bearing cyano group. Thus the mild reaction conditions and simple execution might be helpful in biologically significant 3,4-dihydrocoumarins, tetra-substituted chromans and chromenes synthesis.

Overall, the present thesis depicts organocatalyzed some new and effective asymmetric methodologies for the enantioselective synthesis of various O-acyl 2-(1-arylethyl)phenols and other heterocyclic compounds using carbon/sulfur nucleophiles and *in situ*-generated *ortho*-Quinone methides.