

## SHORT ABSTRACT

The contents of this thesis entitled “*Organocatalytic Asymmetric Michael and Aza-Henry Reactions for the Synthesis of Nitrogen- and Oxygen- Containing Heterocyclic Compounds*” have been divided into five chapters based on the results of experimental works performed during the complete course of the PhD research period. **Chapter 1** describes a general overview of organocatalysis with special emphasis on Michael and aza-Henry reactions. In the **chapter 2**, a series of highly enantioselective 3-acyloxy-pyrazoles are presented. Concerned method was established for the Michael/hemiketalization/retro-aldol reaction of  $\alpha$ -nitroketones and unsaturated pyrazolones. A couple of simple derivatization of the products is also presented. **Chapter 3** demonstrates an alternative approach for the Michael/acetalization/acyl transfer reaction to provide enantiopure 2,4-disubstituted chromans with single diastereomeric ratio by using a wide range of 2-hydroxycinnamaldehydes instead of unsaturated pyrazolones. This protocol was again extended for the synthesis of the chiral 2,4-disubstituted chromans by valuable synthetic transformations such as reduction of nitro to amine and protection of this amine by Boc-anhydride and benzoyl anhydride, reduction of ester to alkane. **Chapter 4** represents Michael-oxa-Michael reaction of deconjugated enones having  $\alpha'$ -CH groups with electron poor oxadienes bearing cyano group. The following reaction was performed using quinine derived primary amine catalyst and benzoic acid as an additive for the synthesis of oxygen-containing heterocyclic compounds (3,4-dihydropyrans) with excellent enantioselectivities. Penultimately, **chapter 5** depicts both nitrogen and oxygen-containing heterocyclic compounds (tetrahydropyrano[2,3-*c*]pyrazolones) which have been synthesized from alkylidene pyrazolones and cyclic ketones *via* domino Michael-hemiketalization reaction with high enantioselectivities and diastereoselectivities. Also, few synthetic transformations of the product including a spiro derivative formation have been demonstrated. Lastly, in **chapter 6** aza-Henry reaction was illustrated to construct a series of tetrahydroquinolines where the nitroalkanes and aldehydes in the presence of quinine derived thiourea catalyst were employed to provide enantiomerically pure tetrahydroquinolines with moderate to good yields *via* intra molecular cyclization.