Enantiomerically pure (or enriched) secondary alcohols occupy an important place in chiral chemistry because several chiral secondary alcohols are medicinally useful compounds. Due to the remarkable applications of chiral secondary alcohols as medicinally relevant molecules and also as synthon for obtaining various biologically active compounds there has been an increasing interest in developing simple and practical methodologies for synthesis of different chiral secondary alcohols. Among various available and known methods, asymmetric reduction of prochiral ketones has become one of the most important methods for obtaining enantiopure (or enriched) secondary alcohols.

This thesis deals with the synthesis and application of chiral catalytic sources containing N-P=O structural framework, diamines and amides for the borane-mediated asymmetric reduction of prochiral ketones and it contains three chapters: 1) Introduction, 2) Objectives, Results & Discussion and 3) Experimental. The first chapter presents brief/relevant and also recent literature on the application of chiral borane based reagent and borane-mediated asymmetric reduction of prochiral ketones under the influence of various catalysts.

The second chapter deals with the synthesis and application of chiral catalysts including phosphoramides, diamines and amides in case of borane-mediated asymmetric reduction of representative prochiral ketones with the following objectives.