Preface

During the last two decades, chemists have witnessed the explosive growth of organocatalysis, which provides a robust methodology for the preparation of numerous valuable compounds. The importance of organocatalysis in organic chemistry had been highlighted through the Nobel Prize in Chemistry 2021 was given to Prof. David W.C. MacMillan and Prof. Benjamin List for outstanding contributions to "the development of asymmetric organocatalysis". Compared to the classical transition-metal catalysis and biocatalysis, organocatalysis has a number of unique properties, such as transition-metal-free, very good structural amenability, novel modes of activations, easy availability of a broad variety of naturally occurring small organic catalysts, including natural sources of chiral amino acids, Cinchona alkaloids, carbenes and others. Today, organocatalysis has been a powerful technology for organic synthesis. In addition to the applications in organic synthesis and catalysis, organocatalysis has also been used in the production of enantiomers, in fine chemistry, pharma, crop-protection, and fragrance chemistry. As one important type of organic catalyst, N-heterocyclic carbenes (NHCs) have broad applications in organic synthesis. Inspired by the natural coenzyme thiamine (vitamin B1) catalysis, chemists developed various NHCs and used them to catalyze a broad variety of transformations, including benzoin reaction, Stetter reaction, homoenolate transformations, redox reactions, cycloadditions, photo-reactions and other reactions. On the other hand, aldol condensation reaction is one of the most important reactions for the construction of carbon-carbon bonds. Based on the unique Lewis basicity of NHCs, we and other groups realized efficient activation of different silylated nucleophiles and developed a variety of aldol-type reactions of carbonyl compounds. As a result, different functionalized alcohols and their derivatives were prepared through NHC catalysis.

This book can be used as a reference for scholars, graduate students, and researchers in the field of organic chemistry, fine chemistry and drug synthesis.