

Preface

1,1'-Binaphthyls represent an important class of chiral organic compounds. In the past several decades, the 1,1'-binaphthyl-based molecules have received very broad research attention. Since early 1970s, Cram and Lehn started the use of the optically active 1,1'-binaphthyls to build the structurally diverse molecular hosts for chiral recognition. In 1980s, Noyori and Takaya initiated the study of the transition metal complexes of the 1,1'-binaphthyl-based phosphorus ligands for the asymmetric hydrogenation of alkenes and carbonyl compounds. These monumental achievements have been awarded with the Nobel Prize in Chemistry. In addition to these studies, tremendous amount of reports by other researchers on the use of the 1,1'-binaphthyls for asymmetric catalysis and molecular recognition have also appeared, and many enantioselective catalysts and molecular receptors have been obtained. Since 1990s, our laboratory has launched a program to use the optically active 1,1'-binaphthyls to build novel chiral materials such as the main chain chiral-conjugated polymers, light harvesting chiral dendrimers, polymeric and monomeric chiral catalysts, and enantioselective fluorescent sensors. This book presents the findings from this research program as well as the fundamental knowledge about 1,1'-binaphthyls.

There are six chapters in this book. In Chapter 1, some basic concepts on the 1,1'-binaphthyl molecules and a general background on the study of 1,1'-binaphthyls are provided. In Chapter 2, the synthesis of the main chain chiral-conjugated polymers is described. In these materials, the optically active 1,1'-binaphthyl units are incorporated into the main chain of conjugated polymers. The conductivity, light emission, electroluminescence and non-linear optical properties of some of these polymers are investigated.

In Chapter 3, a systematic study of the 1,1'-binaphthyl-based rigid and sterically regular polymeric chiral catalysts is discussed. Highly enantioselective polymeric catalysts have been obtained. Chapter 4 presents the application of BINOL and other non-polymeric binaphthyl compounds in asymmetric catalysis. Catalysts with high enantioselectivity have been discovered for diverse organic reactions. Chapter 5 focuses on the development of the 1,1'-binaphthyl-based dendrimers, macrocycles and acyclic molecules for the enantioselective fluorescent recognition of chiral α -hydroxycarboxylic acids, amines, amino alcohols and amino acids. Highly enantioselective as well as sensitive fluorescent recognition of chiral molecules has been achieved. In Chapter 6, some miscellaneous studies on the materials related to 1,1'-binaphthyls are described, including the chiral molecular wires, polybiphenols and the supramolecular chemistry of propargylic alcohols.

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