Preface

In 1942, triptycene was synthesized by Bartlett and his coworkers, which was served as the first and simplest member of iptycene family. In the next 40 years, iptycene family had not attracted much attention until Hart first formally proposed the concept “iptycene” in 1981. Since then, iptycene chemistry has truly established. Iptycenes are a class of aromatic compounds with arene units fused to bicyclo[2.2.2]octatriene bridgehead system. These unique three-dimensional rigid structures make them promising candidates for more and more applications in molecular machines, supramolecular chemistry, material science, coordination chemistry, sensor applications in the last decade. Iptycene chemistry is walking into its golden age with great opportunities and challenges. However, during the 70 years of iptycene chemistry, there were only some relevant reviews. Thus, a comprehensive book, which reviews the retrospections and prospects of iptycenes chemistry, is not only an urgent need but also of great significance. In addition, this year also marks the 70th anniversary for the development of iptycene chemistry (1942–2012). This current situation inspired us to prepare this comprehensive book *Iptycene Chemistry: From Synthesis to Applications*.

Overall, this book contains three parts. Part I includes a brief introduction of the basic naming rules and general properties of iptycenes and their derivatives. Part II details the various methods for synthesis and functionalized reactions of triptycenes, pentiptycenes, other higher iptycenes, heterotriptycenes, and iptycene-based polymers. Chapter 2 aims at the synthetic methods and the reactions of triptycene and its derivatives, as well as the synthesis of the extended triptycenes containing fused rings. In Chap. 3, the synthesis and reactions of pentiptycenes and their derivatives are discussed in details. In addition, the method for the preparation of extended pentiptycenes is also provided. The preparation of the other iptycenes, including the heptipycene, noniptycene, and other iptycene members containing the more complicated framework will be talked about in Chap. 4. According to the different positions of the hetero atom(s), Chap. 5 is divided into three subsections: (1) the bridgehead-substituted heterotriptycenes, (2) heterotriptycenes with heterocycles, and (3) miscellaneous heterotriptycenes and their derivatives. The last chapter (Chap. 6) in this part mainly describes the methods for the preparation of various iptycene-derived polymers. After that, the applications of iptycenes in different areas
are discussed in Part III. First, the varied molecular machines capable of mimicking the behaviors of macroscale objects, including gearings, brakes, ratchets, compasses, gyroscopes, wheelbarrows, and the rotaxane-based molecular machines are described in Chap. 7. In Chap. 8, we talk about the iptycene-based materials, involving the long alkyl or alkoxy-substituted triptycenes and iptycenes (and iptycene-based polymers) with the unusual internal free volumes (IFVs) on the applications of liquid crystals. Then, the materials containing good optical and electrical properties, and the porous materials based on iptycene moieties with adsorption and separation capacities are also shown in this chapter. In Chap. 9, we mainly depict the design and synthesis of various novel triptycene- and pentiptycene-derived hosts, and their complexation behaviors with different kinds of guests. Three aspects of iptycenes in self-assembly, including self-assembly in crystal with multiple supramolecular interactions, the construction of self-assembled monolayers with iptycenes and surface modification, and the self-assembly in solution based on the novel iptycene-derived synthetic host, are discussed in Chap. 10. Chapter 11 describes the iptycene molecules served as the building blocks for the metal complexes and the varied and novel complexes with special properties. Then, the varied chemosensors and biosensors based on the iptycene derivatives, especially, the iptycene-based conjugated polymers are discussed in Chap. 12. The varied triptycene-based molecules served as molecular balances to offer the attractive platforms for the study of noncovalent interactions are depicted in details in Chap. 13. Finally, another four applications are shown in Chap. 14, including the different drug activities, especially, antitumor activities of the iptycenes and their derivatives; the iptycenes act as models for Jahn–Teller effect systems and artificial photosynthesis, as well as the iptycenes applied in preparation of carbene. We sincerely hope this book will not only be useful and helpful for the researchers in iptycene chemistry, but can stimulate and facilitate future researches also.

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