Preface

Hydrogen bonding is the electrostatic attraction between the hydrogen atom of a molecule or molecular fragment and an atom or group of higher electronegativity. Since its establishment as a noncovalent force in the 1920s and 1930s by Pauling and others, hydrogen bonding has been continuously intensively studied and applied in chemistry, biology, and materials science. Fundamental studies on hydrogen bonding have continuously provided insights into its inherent electronic property and factors that affect it. However, for most researchers, hydrogen bonding is mainly a versatile tool for controlling or tuning the structure and property of molecules, macromolecules, and supramolecules and a noncovalent interaction for explaining or rationalizing experimental phenomena, properties, or functions at molecular and supramolecular levels.

Due to its low electronegativity, hydrogen atoms connected to O, N, and C are partially positively charged. Therefore, organic molecules and macromolecules containing hydrogen atoms all have the possibility of forming hydrogen bonding. Hydrogen bonding formed by single groups, such as hydroxyl, carboxylic acid, amide, and urea, is strong and has been well established. In recent years, weak hydrogen bonding concerning carbon-connected hydrogen atom(s) has received increasing attention. Although there have been very few quantitative studies reported in solution, this weak intermolecular interaction motif has been frequently observed in the solid state. Because most organic molecules contain hydrogen atom(s), hydrogen bonding plays a central role in the investigation of many intermolecular binding affairs.

Single hydrogen bonding motif is relatively weak for enhanced recognition and self-assembly in solution. To achieve specific binding in water, Nature has evolved nucleic acid–base pairs, which are stabilized by two or more integrated hydrogen bonds and work in a cooperative manner to drive, together with hydrophobic interaction, the formation of double helix. This simple, but useful strategy has inspired chemists to design artificial triply, quadruply, and more complicated hydrogen bonding motifs for fundamental and practical applications.

Supramolecular chemistry refers to chemistry beyond molecules and focuses on chemical systems consisting of assembled molecular subunits or components.

Intermolecular forces that hold molecular subunits or components together may be hydrogen bonding, coordination, solvophobicity, and electrostatic (ion pair or donor–acceptor) interaction. Among other interactions, hydrogen bonding has several advantages. It is relatively strong and directional. Quantitative evaluation of its stability or strength is relatively easy. The strength can be further enhanced by creating multiple hydrogen bonding motifs, and in this way the stability can be regulated, to a great extent, for different purposes. No transition metal ions are involved, which is a prerequisite for many biologically related researches. As a result, hydrogen bonding has, to a great extent, seized the central position not only in constructing new supramolecular structures, but also in modulating or improving supramolecular functions.

The two volumes, *Hydrogen Bonded Supramolecular Structures* and *Hydrogen Bonded Supramolecular Materials*, belonging to the series of *Lecture Notes in Chemistry*, are aimed at providing undergraduates, graduates, and young researchers in the field with an overview of the important role of hydrogen bonding in supramolecular chemistry. In the first volume, *Hydrogen Bonded Supramolecular Structures*, recent progresses in the construction and assessment of new hydrogen bonding patterns, which is the foundation for future design of new supramolecular structures and supramolecular approaches to creating new scientific phenomena and technological applications, are first summarized. It then introduces several kinds of important recognition phenomena in solution and the solid state. Moreover, it further describes several aspects in the construction of macrocyclic systems and advanced supramolecular architectures, many of which exhibit interesting properties or functions. The second volume, *Hydrogen Bonded Supramolecular Materials*, mainly presents topics on the utility of hydrogen bonding in creating functional architectures and supramolecular materials. Given the breadth of supramolecular chemistry, the book is also of interest to researchers already involved in the field, because it offers references of pioneering contributions, representative researches, as well as inspiring review articles on many specific aspects.

We would like to express our gratitude to all the authors of the chapters, whose great efforts made the publication of this book a reality.

August, 2014

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Springer

http://www.springer.com/978-3-662-45779-5

Hydrogen Bonded Supramolecular Materials

Li, Z.-T.; Wu, L.-Z. (Eds.)

2015, IX, 231 p. 234 illus., 39 illus. in color., Hardcover
ISBN: 978-3-662-45779-5