

case of hydrogen bonding by a C–H bond, which is a weak H-bond donor. My own interests are addressed in an extensive treatment of hydrogen bonds between ions and neutral species. These are unusually strong and show the possibility of being centrosymmetric, a question that can authoritatively be addressed by high-level computations. The relation between H-bond strength and the basicity of the atoms involved is discussed. Another topic is the relative basicity and H-bond ability of the syn and anti lone pairs in carboxylate ions. Finally, Scheiner considers the energetics of hydrogen transfer, which converts $AH\cdots B$ into the gas-phase ion pair $A^-\cdots HB^+$, as well as the extent to which this latter may be stabilized in a polar solvent, as modeled by a dielectric continuum.

One aspect that I much appreciate is that there are frequent references to experimental values, permitting comparisons between the calculated and experimental results. Also, Scheiner displays a healthy skepticism and a recognition of the limitations of the methods. I found a couple of minor misstatements (pp 54 and 61), but as far as I could tell the book is otherwise quite faithful to the topic.

The book is logically organized, with a good table of contents, a list of abbreviations, a subject index, and an index to H-bonded complexes, but there is no author index to the ca. 1100 references. A large number of tables throughout the book provide concise comparisons of the data, such as listings of the geometry of the water dimer at various levels of theory and of the change of vibrational frequencies of HF upon dimerization. Each chapter concludes with a useful summary.

In summary, this book offers an authoritative guide to the current status of a wide range of high-level calculations on diverse aspects of hydrogen bonds. It will provide much information for anyone doing research in hydrogen bonding.

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Industrial Enzymes and Their Applications. By Helmut Uhlig. Wiley: New York. 1998. xii + 454 pp. \$94.95. ISBN 0-471-19660-6.

The objective of this book is to examine in detail a wide range of enzymes that have proven industrially valuable by virtue of their efficiency in catalyzing specific commercial processes. This book achieves its objective and provides an excellent overview of the field of industrially important enzymes. Consisting of eight chapters and two appendices, this book is extensively referenced and does include recent citations. The material in each chapter is presented in a logical and understandable manner, and each chapter is well-illustrated with relevant figures and tables.

The initial chapter provides a general overview of the historical aspects of enzymes plus indicates newly developed biotechnological applications for enzymes. Basic principles of enzymology are explained in simplified terms in the second chapter. In addition to outlining enzyme kinetics and nomenclature, this chapter defines specific types of enzyme units, which proves helpful in understanding the material covered in later chapters. In the third chapter, detailed descriptions of enzymes relevant to the hydrolysis of carbohydrates, proteins, or lipids and of commercially important oxidoreductases are provided. The nature of the reactions catalyzed by these industrial enzymes and their respective properties are examined in this chapter. In addition, the manufacturers of technical enzyme preparations are indicated throughout this chapter. The techniques employed in the immobilization of enzymes are described concisely in the fourth chapter. Despite the potential of such techniques, the limited commercial use of only two types of immobilized enzymes, namely, glucose isomerase and penicillin amidase, is clearly explained from an economic perspective. Speculation on the future outlook of using other immobilized enzyme systems in industrial processes is also noted in Chapter 4. The specific applications of commercially available technical enzyme preparations are described in Chapter 5, which is the longest chapter in the book. This chapter indicates which technical enzyme preparations can be used to enhance the wet milling of grains, the brewing of grains, the production of alcohol, the processing of baking and milk products, the production of juices and wines, the hydrolysis of animal and plant proteins, the processing of leather, the sizing of textiles, the cleansing action of detergents, the modification or hydrolysis of fats and oils,

the nutritional availability of animal feeds, and the lysis of microbial cells. This chapter concludes with a discussion of the commercial utilization of glucose oxidase alone or in conjunction with catalase to stabilize various food and beverage products by reducing their glucose or oxygen content. The legal considerations of using technical enzyme preparations in foods are explored in Chapter 6 by outlining the regulatory requirements set by agencies of various countries as well as by indicating the enzymes approved for food use in selected countries. In addition, the technical information regarding an enzyme preparation that should be documented prior to submitting an enzyme approval application is presented in Chapter 6. In Chapter 7, the economic importance of developing processes that have increased product yields, improved product quality, or enhanced raw material utilization is emphasized. This chapter explains how the utilization of industrial enzymes can lessen the energy consumption costs of commercial processes as well as can lower the filter clarification and sterilization costs of processes involving beverages or fermentation broths. An examination of what determines the current costs of technical enzymes is also made in this chapter. The eighth and final chapter of the book estimates the worldwide market for technical enzyme preparations used in food and nonfood processes. A minor concern regards the length of some of the chapters in the book. For example, Chapter 5 encompasses 181 pages while Chapters 7 and 8 are only 6 and 2 pages long, respectively. It might have improved the presentation quality of the book if some chapters were subdivided and others were combined.

Overall, I would recommend this well-written book as an excellent reference source. Its comprehensive approach to the understanding and use of industrial enzymes should make this book valuable to chemists interested in enzyme research and development.

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Progress in Inorganic Chemistry, Volume 45. Edited by Kenneth D. Karlin (Johns Hopkins University). Wiley and Sons: New York. 1996. vii + 510 pp. \$125.00. ISBN 0-471-16357-0.

This is the 45th volume of the series. It is comprised of six well-written and highly authoritative reviews. Selective Recognition of Organic Molecules by Metallohosts (Canary and Gibb) reviews host-guest chemistry involving metal ions functioning in various ways. Both first and second coordination sphere effects are discussed. Metallacrowns: A new Class of Molecular Recognition Agents (Pecoraro et al.) discusses the synthesis and properties of a wide variety of metallacrown complexes. Much of the work that is reviewed was carried out in Pecoraro's laboratories. The Interpretation of Ligand Field Parameters (Bridgeman and Gerloch) is not intended to be a comprehensive review of ligand field studies. Rather, it is more a tutorial focusing on the principles of interpretation of ligand field parameters and on the ligand fields themselves. Chemistry of Transition Metal Cyanide Compounds: Modern Perspectives (Dunbar and Heintz) for the most part reviews work of the last twenty years. There is particular emphasis on the supramolecular motifs that have been reported such as those based on the Hofmann clathrates and on the prussian blues. Assembling Sugars and Metals: Novel Architectures and Reactivities in Transition Metal Chemistry (Piarulli and Floriani) describes studies directed at the systematic preparation of metal-sugar complexes. Oxygen Activation Mechanism at the Binuclear Site of Heme-Copper Oxidase Superfamily as Revealed by Time-Resolved Resonance Raman Spectroscopy (Kitagawa and Ogura) reviews work on the subject, much of which was carried out by the authors and their associates.

The 45th volume of *Progress in Inorganic Chemistry* is an essential component of any research library.

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