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BOOK REVIEWS

Inorganic Reactions in Water. By Ronald L. Rich (Bluffton University, OH). Springer-Verlag: Berlin, Heidelberg. 2007. xxii + 522 pp. $239.00. ISBN 978-3-540-73961-6.

This book provides a representative description of inorganic reactions, primarily in water, of most of the elements and their simpler compounds. Emphasis is on the similarities in chemical behavior rather than on electronic structures and theories. An index and the following four appendices complete the book: (A) Periodic Charts; (B) Atomic and Ionic Energy Levels; (C) Electrode/Reduction Potentials; and (D) Abbreviations and Definitions. The author has notified us of errors in the book—notably the splitting of formulas at the end of a line and the inappropriate appearance of hyphens—that appeared post-proof. These errors are identified and clarified in a link to the author's Web page from the Springer Web page regarding this book.

JA804032J

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Turning Points in Solid-State, Materials and Surface Science: A Book in Celebration of the Life and Work of Sir John Meurig Thomas. Edited by Kenneth D. M.Harris (Cardiff University, U.K.) and Peter P. Edwards (University of Oxford, U.K.). Royal Society of Chemistry: Cambridge. 2008. xxxviii + 910 pp. $229.00. ISBN 978-0-85404-114-5.

This book was created to provide "a state-of-the-art survey of some of the most important recent developments across the solid-state, materials and surface sciences", to quote from the Preface, and to pay tribute to the life and work of Sir John Meurig Thomas. The chapters are organized under four main sections: (A) Inorganic Solid State Chemistry (Nanoporous Solids, Complex Oxides, Zeolites, Minerals, Non-Stoichiometry, Computation and Modeling; (B) Organic Solid State Chemistry; (C) Solid Catalysts, Surface and Materials Science; and (D) Electron Microscopy and its Contribution to Chemistry and Materials Science. These sections also represent the major areas in which Thomas established his reputation. Sir Thomas himself has contributed the final chapter to this volume "Design and Chance in my Scientific Research," and there are also 14 chapters in tribute to Thomas in the Appendices.

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Bioconjugate Techniques, 2nd ed. By Greg T. Hermanson (Pierce Biotechnology, Thermo Fisher Scientific, Rockford, IL). Academic Press (an imprint of Elsevier): London, Amsterdam, Burlington, San Diego. 2008. xxx + 1202 pp. $99.95. ISBN 978-0-12-370501-3.

The second edition of this book continues to be a handy resource for designing and synthesizing bioconjugates. Its 24 chapters are organized into three parts: (I) Bioconjugate Chemistry; (II) Bioconjugate Reagents; and (III) Bioconjugate Applications. Each chapter is well illustrated, and detailed protocols are given. Techniques that appeared in the first edition have been revised and updated, and many entirely new chapters have been added, including such titles as "Dendrimers and Dendrons"; "Silane Coupling Agents"; "Microparticles and Nanoparticles"; and "Buckyballs, Fullerenes, and Carbon Nanotubes" to name a few. To keep the reader updated, the author has also provided a number of Web sites in the Preface that should aid the reader in finding recent references to bioconjugation; links to patent databases are also provided in a short prechapter on intellectual property. An extensive list of references and a subject index complete the book.

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Carbohydrate Chemistry and Biochemistry: Structure and Mechanism. By Michael L. Sinnott (The University of Huddersfield, U.K.). Royal Society of Chemistry: Cambridge. 2007. xviii + 748 pp. $199.00. ISBN 978-0-85404-256-2.

Over the past several years a number of books on carbohydrates have been published, but all have focused heavily on synthetic carbohydrate chemistry, i.e., protecting group strategies and methods of glycosylation. This book, written by a leading physical organic chemist, is different; although synthetic topics are covered, it focuses on structure and mechanism in carbohydrate chemistry and biochemistry. Thus, it fills a gap in publishing in this area and will undoubtedly become a valuable and trusted resource to glycoscientists.

The book is written to serve as a graduate-level text and does not require previous knowledge of carbohydrate chemistry or biochemistry. Chapters 1 and 2 provide sufficient background information on the structure and conformation of carbohydrates to prepare the reader for subsequent chapters. Also presented are a number of basic concepts in physical organic chemistry, e.g., kinetic isotope and stereoelectronic effects. A chapter focusing on substitution reactions at the anomeric center of carbohydrate rings follows these introductory chapters. Among the topics covered are synthesis of glycosides, their acid-catalyzed hydrolysis, and the effect of neighboring groups on the hydrolysis reaction.

In Chapter 4, there is a discussion of methods used for the structural characterization of polysaccharides and the determination of their conformation. Classical methods, such as methylation analysis, are covered as are more modern methods, such as mass spectrometry and atomic force microscopy. In all cases, each experimental approach is presented together with the fundamentals of the method, making the material accessible to those without previous exposure to the technique. The chapter

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ends with discussion of a number of important polysaccharides, including starch and the glycosaminoglycans.

A thorough coverage of enzyme-catalyzed glycosyl transfer is presented in Chapter 5. The chapter starts with a discussion of the basics of enzyme kinetics and methods for determining the mechanisms of enzymes. This introductory material is followed by a discussion of the various families of glycosyl hydrolases and glycosyltransferases. This chapter should prove invaluable to individuals with interests in these enzymes and the mechanisms by which they catalyze glycosyl transfer reactions.

Chapter 6 covers reactions of carbohydrates not occurring at the anomeric center and includes many classical transformations, such as aldose−ketose interconversions and formation of osazones. A significant fraction of this chapter addresses manipulations involving protecting groups, oxidation reactions, and elimination and additions. Where relevant, enzyme-catalyzed processes are also discussed. The final chapter in the book deals with one-electron processes in carbohydrate chemistry and includes a discussion of electron spin resonance. Among the topics covered are ascorbic acid chemistry; one-electron oxidation processes, e.g., galactose oxidase-mediated reactions; hydrogen abstraction; and radical reactions.

Overall, this is a valuable book that fills a gap among existing texts on carbohydrate chemistry and biochemistry. The coverage is thorough, and the book is concisely written. It is also extensively referenced with the citations presented in a user-friendly manner at the end of each chapter. A detailed index for the entire book is also provided. This text should be a useful addition to the library of individuals with interests in the glycoscience field, as well as students wishing to learn more about this area.

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Calixarenes: An Introduction, 2nd ed. By C. David Gutsche (University of Arizona, Tucson). Royal Society of Chemistry: Cambridge. 2008. xiv + 276 pp. $119. ISBN 978-0-85404-258-6.

Calixarenes are macrocyclic host molecules, which have been described by Seiji Shinkai as the "third generation of supramolecules", following the crown ethers and the cyclodextrins. This book is an update of Gutsche's 1989 volume *Calixarenes* and is the third volume of a series on calixarene chemistry from the author, following *Calixarenes Revisited* in 1998. The book is divided into eight chapters and has the same line-up of chapters as in the first edition, with the exception of the addition of a chapter concerning multicalixarenes, an aspect of calixarene chemistry that has largely developed since the 1989 edition. The author takes the reader through a logical progression of calixarene chemistry in the first three chapters, beginning with a history of the discovery of the calixarenes, followed by a discussion of the available methods for their synthesis and characterization. The fourth chapter is devoted to conformations of calixarenes, an important aspect of their behavior in the solid state and solution. In Chapters 5 and 6, Gutsche discusses the introduction of functional groups and the formation of bridged calixarenes, respectively. The availability of a wide variety of calixarenes, derivatized at the *endo* and/or *exo* rims, is a major reason for the success of these host molecules. The final two chapters deal with the formation of host−guest complexes and their applications. The references in the chapters in the second half of the book are primarily from the past 10 years.

The author has also included four appendices containing comprehensive lists of books and long, midlength, and short reviews on the chemistry and applications of calixarenes, covering the literature up to 2007. Specific citations of these references are conveniently included in the appropriate section headings of the chapters. The variety of sections and subsections of the chapters has been expanded to reflect the considerable increase in the sizes, types, and derivatives of calixarenes that are now available and the applications to which they have been put. Because of significant growth in the field since 1989, it was not possible, as the author indicates in his Preface, to cover every aspect of calixarene chemistry in equal detail while also maintaining only a modest increase in the length of the book since the first edition. In the section on theoretical aspects of calixarenes, for example, readers are merely provided with a set of references to reviews on such topics as the thermodynamics and molecular dynamics of calixarene complexations, as well as quantum mechanical calculations. The patent literature is only covered up to 1995 but serves as an illustration of the applications in which these host molecules have been utilized. Appropriate tables of data have been updated, such as that for the pK_a values of water-soluble calixarenes.

This updated monograph, with its very logical layout, would be an excellent introduction to this important family of macrocyclic hosts for those interested in entering the field. It will also be very useful as a reference book in institutional libraries and in the personal libraries of practicing supramolecular chemists, including those who work with calixarenes and those who study the behaviors of other related host molecules, such as cyclodextrins or cucurbiturils.

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Microporous Framework Solids. By Paul A. Wright (St. Andrews University, Fife, U.K.). Royal Society of Chemistry, Cambridge. 2008. xiv + 430 pp. $159.00. ISBN 978-0-85404-812-0.

The author has created an excellent text for both experienced researchers and those new to the area of zeolites and molecular sieves. Microporous frameworks are an ever-increasing class of inorganic materials, in terms of not only known structure types but also properties and applications. The book offers an excellent treatment of the traditional established areas—synthesis, structures, and properties—as well as up-to-date references and developments on applications. These combined features make this text an easy complement or perhaps replacement of classic older texts on zeolites and molecular sieves, such as those by Barrer, Breck, and Szostak.

The author first discusses the various known zeolite and metal-substituted microporous structures. This chapter includes the more recently discovered classes of nonoxides, organic-lined and organic-linked (metal organic) frameworks, mesoporous materials, and hypothetical nets. Although broad, the text covers each area in-depth and is very informative. A chapter on the experimental methods of characterizing these materials seemed

out of place at first glance but is in fact a very convenient reference, covering the standard methods that are used. The first half of the book concludes with a chapter on theoretical studies and another on solvothermal synthesis, including all the key topics: gel chemistry, nucleation and crystal size, structure-directing agents, fluoride methods, combinatorial methods, and surfactant templating.

The second half of the book deals with properties and applications. This area is vast, and the arrangement of chapters and subsections is well chosen, giving an accurate reflection of the industrial importance of this class of materials. Aspects of both as-synthesized and postsynthetically modified materials are described. Again, the classic issues, such as cation-exchange, adsorption, and diffusion, are dealt with, but recent developments in the literature are also included. The theory, methods, and applications of each property are described. There are also two chapters on catalysis, another main area of importance with regard to these materials. In the last chapter, the author describes advanced applications and recent trends, such as zeolite thin films, medical applications, and gas storage properties.

In summary, it is difficult to think of another monograph that treats both the basic aspects of zeolites and their advanced applications together in such a descriptive manner. The depth to which the author describes the known chemistry and importance of these materials is another strength of this book. I would have preferred that the word "Nanoporous" were used instead of "Microporous" in the title, as this would have been more in line with the way this area is currently described, e.g., in this year's Gordon Research Conference. Microporous, however, is the traditional name and still the standard in many parts of the world. Although the text is probably too specialized for any conceivable graduate course, it is ideal for anyone interested in or researching nanoporous and mesoporous materials. This includes zeolites/zoetypes as well as the rapidly expanding area of mesoporous materials and metal organic frameworks.

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Recent Research Developments in Heterocyclic Chemistry, 2007. Edited by Teresa M. V. D. Pinho e Melo and by Chief Editorial Consultant, António M. d'A. Rocha Gonsalves(University of Coimbra, Portugal). Research Signpost: Trivandrum, India. 2007. viii + 476 pp. $233. ISBN 81-308-0169-8.

If first impressions are important, this volume gets off to a bad start. For example, the first sentences of Chapter 1 (on chiral aziridines) are riddled with misspellings, e.g., "azirididdines", "mitomicyn", "mytomicin," and "Tamyflu", errors in syntax, and generally poor writing. In the first chapter, there continue to be variations in the spelling of mitomycin, misplaced commas, misused prepositions, mixed tenses, etc., in much the style of the first draft of a student thesis, detracting from otherwise interesting chemistry and well-presented schemes. It is to be hoped that copyediting is included for a book priced at $233, particularly in view of the fact that for the majority of the authors, all of whom are from institutions in Portugal, Spain, and Argentina, English may not be their first language. I lay the blame for poor copyediting squarely with the publishers.

Poor editing also plagues many of the remaining seven chapters, dealing mostly with nitrogen-containing rings and covering topics such as addition reactions of 2*H*-azirines, radical approaches to small-ring heterocycles, pyrrole-based oxidation catalysts, fullerene-fused heterocycles, green heterocyclic synthesis, matrix isolation IR in heterocyclic chemistry, and advanced NMR spectroscopic techniques for the characterization of *N*-heterocycles.

The book contains more than 2100 references, of which more than half are post-2000, has numerous informative schemes, tables, figures, and well-chosen examples, but unfortunately lacks an index. All of the authors have fully researched their respective subjects and bring together valuable information, some of which may not be readily available elsewhere. Unfortunately, this book sets a very bad example for graduate students and postdoctoral fellows using a volume such as this to polish their English while enhancing their knowledge of heterocyclic chemistry. However, if specialists in heterocyclic chemistry and well-heeled research libraries can tolerate the almost laughable English, as well as the high price, they may wish to purchase this book since it does contain useful information on several topics of current interest.

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Nanostructured Materials in Electrochemistry. Edited by Ali Eftekhari(Avicenna Institute of Technology, Cleveland, OH). Wiley-VCH GmbH & Co. KGaA: Weinheim. 2008. xxvi + 464 pp. $215. ISBN 978-3-527-31876-6.

Although electrochemistry inherently involves science in the nanoscale, we seldom find texts on electrochemistry in which the field is treated in the realm of nanoscale science and technology. *Nanostructured Materials in Electrochemistry* is unique in the sense that its focus is nanoscale phenomena in electrochemistry, ranging from the electrochemical fabrication of nanostructures, to the behavior of nanostructured electrodes, to the applications of nanostructured electrodes in chemical analysis. There are 12 independent chapters, offering a broad view of the field of nanoscale electrochemistry. The foreword and introduction do the book justice by detailing the importance of nanoscale control of the morphology of the electrode. In general, the book can be divided in two parts: one dealing with the preparation and properties of nanoscale structures of electrochemical relevance, and the other with the applications of such structures.

Chapter 1 begins with a discussion of the preparation and growth of nanoporous alumina via electrochemical anodization. The many approaches for the preparation of nanoporous alumina as well as the growth mechanisms for the processes are discussed in detail. Because of the importance of alumina in many disciplines, this chapter offers great insights for a wide variety of fields. Chapters 2−4 also cover different aspects of the fabrication of nanostructures via electrochemical methods. Chapter 2 offers a general view of fabrication of different structures, from alumina supports to nanowires and nanotubes. Although a very good overview, this chapter overlaps with Chapters 1, 3, and 4 and, as such, could have preceded them as an introductory chapter. I think the material would have contributed to a better flow of ideas if ordered this way.

Chapter 3 is a very solid overview of the many preparatory techniques based on high-resolution as well as nonhigh-resolution techniques that can yield nanostructured electrodes. The chapter is well referenced and covers all the bases. It would be an excellent chapter for those interested in preparing electrodes of nanostructured morphology. Chapter 4 is the final chapter dedicated strictly to the preparation of structures and covers the synthesis of nanowires in general, with particular emphasis on magnetic nanowires. Such structures are of utmost importance for the electronics and the semiconductor industries. Unfortunately, although the topic has very important implications, the references cited are somewhat dated. However, the chapter is an important contribution to the literature owing to the discussion of the conditions required to create desired magnetic nanostructures and to effect some structure/property relationships. It should prove an extremely valuable reference to those in this specific area of study.

The second part of the book, with the exception of Chapter 6, shifts from the fabrication of nanostructured electrodes to their applications and characterization and is the stronger of the two, in my opinion. Once again, I believe that the ordering of the chapters would have been improved by placing Chapter 6 before Chapter 5, since the former concerns the preparation of materials by electrodeposition, and the latter and remaining chapters deal with applications. Specifically, Chapter 5 covers the preparation and use of nanowires and nanotubes for sensing applications; Chapter 7 deals with the applications of nanostructured electrodes in areas of corrosion; and Chapters 8−10 are concerned with energy-related applications, e.g., Li-ion electrodes, hydrogen storage, and solar energy conversion, respectively. Chapter 11 focuses on biosensors based on carbon nanotubes, whereas Chapter 12 offers an excellent overview of metal nanoparticles and their role in electroanalysis. In general, the chapters on applications are very thorough, informative, and well referenced.

Overall, the book is very informative but suffers from some redundancy, which can be expected in a multiauthor book but could have been alleviated to some degree by ordering the chapters differently. For the reader who is familiar with the field of electrochemistry, especially the materials science aspect of it, the book should serve as a useful reference.

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