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BOOK REVIEWS

Advances in Quantum Chemistry, Vol. 44: Manifestations of Vibronic Coupling in Chemistry and Physics. Edited by John R. Sabin (University of Florida) and Erkki Brändas (Uppsala University, Sweden). With Guest Editors: Arnout Ceulemans, Liviu Chibotaru, and Eugene Kryachko (Katholieke Universiteit, Leuven, Belgium). Elsevier Academic Press: San Diego, CA. 2003. xxxvi + 674 pp. $175.00. ISBN: 0-12-034844-6.

This book is based on presentations given at the 16th International Jahn−Teller conference held in late August and early September in Leuven, Belgium in 2002. It contains 43 chapters, which are divided into the following sections: General Theory; Molecular Systems: Hydrocarbons; Molecular Systems: Fullerenes; Molecular Systems: Main-Group and Transition Elements; Impurity Systems; and Solid State. A subject index completes the book.

JA040923K

10.1021/ja040923k

The Chemical Physics of Solid Surfaces, Volume 11, Surface Dynamics. Edited by D. P. Woodruff (University of Warwick). Elsevier: Amsterdam. 2003. xvi + 378 pp. $250.00. ISBN 0-444-51437-6.

This is the 11th volume in a highly successful series of books which, when taken together, provide a comprehensive overview of developments in surface science. The book consists of 11 chapters written by well-respected scientists in the field. As with other volumes in the series, this book does a very good job presenting recent developments in the field and putting them into their historical context. As such, this volume will be a good resource for graduate students and others just entering the field.

Although broadly titled "Surface Dynamics", this volume focuses almost exclusively on the chemical reaction dynamics of small molecules, such as NO, CO, CH_4, and NH_3, with metal and supported metal surfaces; some other areas of surface dynamics, particularly those involving growth, have been covered in previous volumes. The intellectual focus is primarily in understanding the dynamics of adsorption, dissociation, and, to a somewhat lesser extent, desorption. With the exception of the last three chapters, this book mainly focuses on the results of studies of surface reactivity using molecular beams.

The book opens with three chapters on theoretical investigations of surface dynamics. Most of the discussion is centered on computationally tractable systems, such as the dissociation of H_2 and reaction of H atoms on metal surfaces; however, the challenges of nonadiabatic reactions are also mentioned.

The heart of the book lies in the seven chapters that focus on studies of surface dynamics with molecular beams. There are extensive discussions of angle- and quantum-state-resolved scattering, as well as the effect of molecular orientation and surface defects on reactivity. Precursor-mediated chemisorption is discussed in depth. Significantly, this book devotes an entire chapter to studies of supported metal catalysts, an industrially important area of research that has only recently begun to attract fundamental investigations. This chapter ends with a particularly compelling discussion of future directions for the field. Although there is some overlap among the middle chapters, there are also curious omissions. For example, there is little mention of the elegant measurements of quantum-state-specific reactivity of molecules toward surfaces, nor is there significant discussion of direct measurements of electron−hole pair creation during surface reactions.

The last three chapters of the book cover laser-induced desorption and STM investigations of the diffusion of surface atoms on metal and semiconductor surfaces. The contrast between diffusion mechanisms on metals and semiconductors is especially striking when presented in this back-to-back fashion.

In summary, this book is a worthy addition to a notable series. Unfortunately, this slim volume is aimed at the institutional market, and few individuals will be able to justify its steep price.

Melissa A. Hines, *Cornell University*

JA033668X

10.1021/ja033668x

Handbook of Zeolite Science and Technology. Edited by Scott M. Auerbach (University of Massachusetts, Amherst), Kathleen A. Carrado (Argonne National Laboratory), Prabir K. Dutta (The Ohio State University). Marcel Dekker, Inc.: New York, Basel. 2003. xii + 1184 pp. $235.00. ISBN 0-8247-4020-3.

The editors of this handbook sought to accomplish a very difficult task: to provide a comprehensive source of accumulated information concerning the synthesis, characterization, and application of zeolites. The difficulty corresponds to the fact that comprehensive surveys of this nature exist already, and what is truly needed at this time is both a review of the current state of the field *as well as* a guide to where the field is headed. With this in mind, the editors have done a remarkable job. The organization of the book proceeds from a review of introductory concepts to discussions of synthesis and characterization and culminates in what amounts to the largest section of the handbook: a comprehensive survey of established and emerging technological applications.

As the editors point out in their preface, the nature of zeolite science extends well beyond inorganic chemistry, as is evidenced by the list of contributors, which spans a diverse cross section of disciplines and at the same time reads as a who's who of zeolite science. The handbook is presented in five parts: (I) Introduction, (II) Synthesis and Structure, (III) Characterization, (IV) Host-Guest Chemistry, and (V) Applications. The editors

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10.1021/ja040923k CCC: $27.50

do a nice job of combining synthesis with both traditional characterization techniques as well as characterization and analysis through molecular simulation, including classical and density function theoretical simulations of adsorption, diffusion, and nucleation. Parts IV and V cover traditional applications such as catalysis, ion exchange, and gas separations, but also include surveys of zeolite applications in photonics, organic photochemistry, electrochemistry, nuclear waste management, and medical applications.

What this handbook is missing is an in-depth survey of catalysis with zeolites, both in scope and detail. However, as the editors clearly state, there are several well-established reviews in the area of catalysis and duplicating such treatment was intentionally omitted. With that in mind, I would recommend this book to any who work in the fields of zeolite science and technology. It provides an excellent review for graduate students and researchers just starting out in the field and at the same time provides the more established researcher with a fresh vision and introduction to several exciting new applications.

Kendall T. Thomson, *Purdue University*

JA0336067

10.1021/ja0336067

Macromolecules Containing Metal and Metal-Like Elements, Volume 2: Organoiron Polymers. Edited by Alaa S. Abd-El-Aziz (University of Winnipeg), Charles E. Carraher, Jr. (Florida Atlantic University), Charles U. Pittman, Jr. (Mississippi State University), John E. Sheats (Rider University), and Martel Zeldin (Hobart and William Smith Colleges). John Wiley & Sons, Inc.: Hoboken, NJ. 2004. xvi + 287 pp. $125.00. ISBN 0-471-45078-2.

This is the second volume in a series that began with a volume devoted to the history of metal-containing macromolecules, a series that will presumably be supplemented with many more element-specific volumes. A quick glance at this volume reveals that iron was a good place to start the series, as the chemistry of organoiron complexes, based upon the initial discovery of ferrocene by Kealy and Pauson in the early 1950s, has been both exciting and exhaustive, perhaps even exhausting. As the innumerable, excellently displayed structures found throughout this volume demonstrate, it seems ferrocene may be introduced into almost any and every type of macromolecule and/or polymer. The practical uses of the resulting materials are very broad, which is shown by their applications as nanostructured ceramic precursors, as redox active catalysts, in fabrication of resist masks for optical lithography, as models for multistep intramolecular electron transfer, as drug delivery systems, and in bioengineering. Indeed, this volume is very successful in communicating the facility and versatility of ferrocene and its derivatives, such as the silyl-substituted ferrocenes and the various [1]ferroceneophanes, as well as the various related cyclopentadienyliron arene derivatives, in the synthesis of new self-assembled or layer-by-layer assembled diblock and triblock copolymers and nanostructured supermolecular arrays. The book also deals with the highly ordered ceramic materials, which are often magnetic, that can result from the controlled pyrolysis of ferrocene-containing precursors. A very informative and fundamental chapter covers the importance of proton-coupled intramolecular electron transfer in ferrocene−quinone conjugated polymers, a topic that is surely of interest in a wide range of chemical systems. Most of the chapters present the details of the synthesis and characterization of specific organoiron-based macromolecules or polymers and their subsequent specific practical applications. As such, this volume will be a treasure trove for scientists seeking new ideas and directions in the above-mentioned applications. Fortunately, the book seems quite current, with many post-2000 references to the primary research literature.

Sadly, this volume is replete with unnecessary, mind-jarring jargon, some of which is defined in the index, some of which is defined in the text, e.g., LCST or low critical solution temperature, and some of which is left to the ingenuity of the reader, e.g., ROP, which is often undefined in the text but, depending on the context, may refer to a reversible oxidation process or a ring opening polymerization; this reviewer never could decipher AIBN, which may be found in several chapters. The extensive use of jargon makes the text close to unreadable in some of the chapters, and in many instances this reviewer gave up trying to comprehend such passages. On behalf of the readers of future volumes, I would suggest that the editors eliminate such jargon. A few added pages will make future volumes much more accessible to the uninitiated reader.

There is an index, but it is not as comprehensive as I would have liked. As an example, for some unfathomable reason this reviewer has always been fascinated by $Fe(CO)_5$ and hence was interested in its use in the preparation of new organoiron macromolecules. Alas, neither iron pentacarbonyl nor $Fe(CO)_5$ appears in the index, although the text does cover the use of $Fe(CO)_5$ several times. Suffice it to say, a good index can be a great help to the reader of a book such as this one.

As might be expected of a volume containing 11 chapters by 23 authors, there is a divergence in the quality and style of the chapters. A few of them are basically an exhaustive and seemingly endless listing of different compounds and references to their preparation and study. Other chapters read like original research papers and sometimes contain several basically identical cyclic voltammograms and/or long lists of elemental compositions and IR and NMR absorption lines, etc. Fortunately, most of the chapters do serve to introduce the reader to a new topic by giving a broad overview of the field from the viewpoint of synthesis, characterization, and utilization.

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JA040907N

10.1021/ja040907n

Handbook of Spectroscopy, Volumes 1 and 2. Edited by Günter Gauglitz (University of Tübingen) and Tuan Vo-Dinh (Oak Ridge National Laboratory). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2003. 1168 pp. $435.00. ISBN: 3-527-29782-0.

Because of the expanding application of spectroscopic methods in modern research and industry, a concise and comprehensive handbook about spectroscopy is needed, and this two-volume handbook generally fulfills that need. Written by a diverse group of 41 industrial and academic scientists worldwide, this book provides broad coverage of different

spectroscopic technologies. The first two chapters deal with sampling methodology, whereas the following 11 cover methods, including fundamental and technical aspects of different spectroscopic technologies as well as detailed experimental procedures and examples of selected applications. The next section (Chapters 14−20) is devoted to applications, and the final four chapters cover hyphenated techniques and general data treatment.

One exceptional feature of this handbook is its organization. The book begins with a discussion of methods of preparing samples and of pretreatment, which are the problems that users of spectroscopic instrumentation usually face first. Descriptions of five categories of methods, including optical spectroscopy, nuclear magnetic resonance spectroscopy, mass spectroscopy, elemental analysis, and surface analysis follow. This orderly classification of methods gives readers a clear picture of the overall field of spectroscopy, which can be overwhelming to the newcomer because of its multitude of techniques. Another welcome feature of the handbook is its section on applications, which occupies a large fraction of Volume 2. The examples chosen show the strength and the limitations of the various spectroscopic techniques. Practical aspects, future perspectives, as well as valuable references are also provided here.

To improve the organization of the handbook, it might have been useful to eliminate the last section, "General Data Treatment: Data Bases/Spectral Libraries" and distribute its contents among the previous sections where the technique is discussed. A few additional references in certain sections would also have improved the utility of this handbook. For example, in Volume 1 in the section where sum frequency generation is discussed only two references are given. Adding two or three more references to review-type articles would provide readers with additional resources to further their knowledge.

To sum up, this two-volume handbook provides comprehensive coverage on a variety of modern spectroscopic techniques. Although the references may not be complete for every method, those that are provided can serve as a foundation for further research in the appropriateness of a particular spectroscopic method for addressing a scientific problem. This is a suitable reference book for any practitioner in spectroscopic analysis, and we would recommend it for any scientific library.

Gang Ma and Heather C. Allen, *The Ohio State University*

JA033666C

10.1021/ja033666c