

Book Review

**Modern Aspects of Electrochemistry, No. 38 Edited by B. E. Conway (University of Ottawa), C. G. Vayenas (University of Patras), Ralph E. White (University of South Carolina), Maria E. Gamboa-Adelco (Managing Editor, Superior, CO). Kluwer Academic/Plenum Publishers: New York. 2005. xx + 544 pp. \$155.00. ISBN 0-306-48703-9.**

Johna Leddy

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**Reviews in Fluorescence 2004, Volume 1.** Edited by Chris Geddes (University of Maryland Biotechnology Institute, Baltimore, MD) and Joseph R. Lakowicz (University of Maryland Biotechnology Institute). Kluwer Academic/Plenum Publishers: New York. 2004. x + 410 pp. \$149.00. ISBN 0-306-48460-9.

The maiden volume of the much anticipated Springer serial, *Reviews in Fluorescence*, showcases some of the latest advances in the field of fluorescence. This volume, divided into 16 chapters, contains mini reviews covering the breadth of methods from fluorescent sugar and zinc signaling, molecular thermometry, logic switches, and high-throughput drug screening to phospholipid membrane phase transitions and raft-localization of proteins, single molecule fluorescence, metal-enhanced fluorescence, and quantum dot nanoassemblies, each with the latest refinements. As the armamentarium of fluorescence tools continues to gain the attention of a broader scientific community, this volume and subsequent ones are sure to reach an increasingly interdisciplinary readership. In this regard, the first book of this new series—with a new volume set to appear annually—complements the *Springer Series on Fluorescence* (three volumes since 2001). In this reviewer's opinion, *Reviews in Fluorescence* will be the authoritative international reference for a broad audience involved in fluorescence research.

The internationally accredited editors Lakowicz and Geddes, both well recognized fluorescence aficionados, have done an outstanding job in assembling a fine collection of contributions from several leading researchers while keeping a balanced perspective from both U.S. and European authors. As with any multi-author volume, there is some degree of variability in the thoroughness with which different chapters treat their topics. However, the format and style of the chapters are rather uniform. Each starts with a broad overview of the topic and ends with a brief summary of the major findings, and many include an outlook section addressing potential applications and the challenges that remain. A well-structured index caps the effort. References are given with their full titles, a feature helpful for navigating the primary literature.

There are a handful of places that could be improved further to enhance the quality of future volumes, including the removal of inconsistencies in the formats of references and more liberal use of color. References to original work, review articles, and basic textbooks are amply given for each chapter; however, citations from 2002 and 2003 are rare, casting some doubt in some cases on the claim that the volume “summarizes the year's progress in fluorescence”. This does not detract from the achievement, however, and this volume will have lasting value. One or two chapters, although excellently written, might be too narrow in their focus and too centered on local achievements to appeal to a broad audience. In particular, the chapter “New Analysis of Single Molecule Fluorescence Using Series of Photon Arrival Times” may bury many readers under excessive

mathematical detail and seems a bit misplaced among the many other highly readable chapters.

Overall, the volume is a clear success and represents an excellent and well-arranged compilation of a staggering range of fluorescence techniques. It is certain to attract many newcomers from other scientific disciplines, much to the editors' aim. The series should be useful both to those who have a great deal of experience in this area and to those wishing to embark on new techniques. This book should be especially interesting for chemists who want to gain insight into the entire spectrum of strategies for modern fluorescence or simply to keep pace with the latest trends. I recommend *Reviews in Fluorescence 2004* without hesitation; both fluorescence specialists and new recruits will benefit greatly from this book. With these editors at the helm, the future success of the series seems assured.

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**Modern Aspects of Electrochemistry, No. 38.** Edited by B. E. Conway (University of Ottawa), C. G. Vayenas (University of Patras), Ralph E. White (University of South Carolina), Maria E. Gamboa-Adelco (Managing Editor, Superior, CO). Kluwer Academic/Plenum Publishers: New York. 2005. xx + 544 pp. \$155.00. ISBN 0-306-48703-9.

Since its inception in 1954, many excellent reviews have been published in the series *Modern Aspects of Electrochemistry*, and this volume is no exception. The excellent chapter by Appleby on electron-transfer reactions with and without ion transfer provides a rigorous perspective on this topic while also establishing the historical context of electron-transfer theory. Stonehart and Wheeler characterize phosphoric acid fuel cells and discuss their technological constraints within useful conceptual guidelines that build a framework for coherent thinking about such cells. The chapter carefully avoids the pitfall of simple description. In a review of metal composites incorporating co-deposited particles, Hovestad and Janssen provide insight into a lesser-known form of electrodeposition and describe both experimental details and models useful to the design of new materials. Nicolíć, Radočević, and Popov give a clear discussion of the phenomenological relationship between nanostructure and bright metal surfaces in another chapter, and in the chapter on electrosorption valency and partial charge transfer, Guidelli and Schmickler state that the link between the two is difficult to establish, which is manifest in their discourse throughout the chapter. Finally, Maier's chapter on the thermodynamics and kinetics of charge carriers in solids, which opens the book, does not effectively serve the needs of either solid-state scientists or electrochemists. The chapter is unnecessarily complex in its solid-state chemistry notation and yet only incorporates the simplest of electrochemical concepts. Overall, however, this is

a solid volume with several excellent chapters and is recommended for libraries and other general electrochemistry collections.

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**Chemistry at Extreme Conditions.** Edited by M. Riad Manaa (Lawrence Livermore National Laboratory). Elsevier B.V.: Amsterdam, 2005. xiv + 522 pp. \$193.00. ISBN 0-444-51766-9.

This book is a timely and very interesting summary of selective progress toward characterizing matter under stress. "Extreme conditions" here means matter under high pressure and/or temperature related to events such as collisions of bodies, deformation, astronomical and geological events, shock, and detonation. That is, the pressure and temperature ranges of interest exceed those normally encountered at laboratory or industrial conditions. Many of the advances described have come about as a result of recent investments in computational power and experimental capability.

The topics include static conditions, but mostly relate to dynamic reactive events. As such, four of the chapters deal with bioorganic and inorganic systems, another four present static temperature and pressure studies of simple source molecules of the universe (e.g. CO<sub>2</sub>, N<sub>2</sub>O, NO, NO<sub>2</sub>, H<sub>2</sub>O, and N<sub>2</sub>), and nine concern simulation and experiments on shock and detonation phenomena, mostly as applied to energetic materials. The authors of these chapters are all respected members of their respective research communities, and the editor is to be commended for doing an excellent job of ensuring consistency of style among the group. One could quibble with the emphasis on shock and detonation to the exclusion of other important areas, such as the formation of novel solid-state materials, but the orientation is understandable in that it reflects the editor's personal research interests.

This book may be of greatest interest to researchers in the fields of energetic materials and detonation, but they are by no means the exclusive audience for it because of the enlightening chapters on the formation and behavior of biomolecules and other nonenergetic materials. In my opinion this book is a valuable addition to the broad scientific community.

**Thomas B. Brill**, *University of Delaware*

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**Impedance Spectroscopy: Theory, Experiment, and Applications, 2nd ed.** Edited by Evgenij Barsoukov (Texas Instruments Inc.) and J. Ross Macdonald (University of North Carolina, Chapel Hill). John Wiley & Sons, Inc.: Hoboken, NJ, 2005. xvii + 596 pp. \$125.00. ISBN 0471-64749-7.

In the past several decades, impedance analysis has become increasingly important in electrochemistry and material science. The first edition of *Impedance Spectroscopy*, published in 1987, has established itself as an important and authoritative source

for beginners and experts. The substantially expanded second edition retains the structure of four main sections covering fundamentals, theory, measuring techniques, and applications, but more than half of the space is now dedicated to the latter. Most significantly, a new and detailed chapter on electrochemical power sources is included, and a practical overview of experimental configurations with reference to available commercial systems as well as an up-to-date treatment of high-resistivity solids have been added. Furthermore, the sections on solid-state devices, materials characterization, and corrosion are significantly enhanced with new figures and references. In contrast, modifications to fundamental discussions on theory, measurement techniques, and data analysis have been kept to a minimum, reflecting the high quality of the original presentation.

One could speculate that assembling in-depth contributions from more than 15 authors into an updated edition might result in a somewhat disjointed book. However, while this tradeoff is sometimes noticeable (e.g., the cross-referencing and the indexing could be improved), the wealth and quality of information more than compensate for the shortcomings. This book should be consulted, if not owned, by any present and future practitioners in the field.

**Tal M. Nahir**, *California State University, Chico*

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**Progress in Heterocyclic Chemistry, Volume 16.** Edited by G. W. Gribble (Dartmouth College) and John A. Joule (The University of Manchester). Elsevier B. V.: Amsterdam, 2004. viii + 476 pp. \$268.00. ISBN 0-08-044482-2.

This book presents a critical review of the literature on important heterocyclic ring systems published during 2003. It opens with two specialized reviews: (1) "Lamellarins: Isolation, activity and synthesis" and (2) "Radical additions to pyridines, quinolines and isoquinolines". The remaining chapters cover three- through eight-membered and larger ring systems, respectively. A subject index completes the book.

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**Organic Reaction Mechanisms, 2000.** Edited by A. C. Knipe (University of Ulster). Founding Editors: A. C. Knipe and W. E. Watts. John Wiley & Sons, Ltd.: Chichester, U.K. 2004. x + 668 pp. \$565.00. ISBN 0-470-85439-1.

This book is a survey of research described in the literature on organic reaction mechanisms from December 1999 to December 2000. It includes the following chapters: (1) Reactions of Aldehydes and Ketones and their Derivatives, (2) Reactions of Carboxylic, Phosphoric, and Sulfonic Acids and their Derivatives, (3) Radical Reactions: Part 1, (4) Radical Reactions: Part 2, (5) Oxidation and Reduction, (6) Carbenes and Nitrenes, (7) Nucleophilic Aromatic Substitution, (8) Electrophilic Aromatic Substitution, (9) Carbocations, (10) Nucleophilic Aliphatic Substitution, (11) Carbanions and Electrophilic Aliphatic Substitution, (12) Elimination Reactions, (13)

Addition Reactions: Polar Addition, (14) Addition Reactions: Cycloaddition, and (15) Molecular Rearrangements. An author index and a subject index complete the book.

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**The Chemistry of Pheromones and Other Semiochemicals II. Topics in Current Chemistry, 240.** Edited by Stefan Schulz (TU Braunschweig). Springer: Berlin, Heidelberg, New York. 2005. xii + 334 pp. \$249.00. ISBN 3-540-21308-2.

In the second volume of this two-volume series on the chemistry of pheromones and other semiochemicals, the editor gives a concise, comprehensive overview of the topics covered and not covered in this volume. This review focuses on the excellent attributes of the book as an integral entity; comments are also offered on individual chapters, and several suggestions are made for future volumes.

Although an enormous amount of the chemistry of pheromones is presented in this book, it is not overwhelming because the presentations are well-organized and readable. Most authors offer thoughts for future directions or correlations and summaries based on long experience and reflection, which generally stimulate the interest of a diversity of readers. Not only does this volume provide detailed and useful knowledge, it also presents thought-provoking concepts throughout the volume. Examples include the generality that defensive chemicals are usually present in higher concentrations than pheromones thus matching their purpose and manner of reception, the paramount importance of assessing biological activity in original secretions or exudates to allow accompanying correlations of chemistry and behavior, and the universality of selected compounds as chemical signals.

The opening chapter by Leal is a good overview of pheromone reception in insects, including recent work on *Drosophila* and *Bombyx mori* odorant-binding proteins (OBPs) and encapsulins. The excellent discussion on insect OBPs emphasizes some complications involved in deciphering function based on various protein-based or gene-based techniques. Regrettably, mammalian pheromone reception was neither discussed in this chapter nor in the chapter on mammalian semiochemicals.

Two chapters are organized based on taxonomy. Considering the diversity of kinds of insects, this organization is friendly to readers unfamiliar with them. It is immediately helpful in Chapter 2 by Millar on the 38 000 species of true bugs, where, after short sections on methods and the defensive chemistry of bugs, she discusses pheromones of various families of bugs based on their taxonomic order. The discussion of pheromones reveals general difficulties in studying them among the true bugs and the fascinating changes in chemical signals with the maturation of insects. The impressive progress on the identification of chemicals and their blends and the importance of chirality as foundations from which more recent studies on the interactions of chemical signals with other modalities of signals have branched are also detailed in this chapter and reveal an ever-increasing complexity of pheromonal functions. In the case of

pentatomid bugs, the sensory repertoire of both vibrations and chemicals interplay to elicit biological responses. Interesting cases, such as manipulation by female plant bugs of the ratios of a three-component pheromone blend, produced by both sexes, to specifically attract males and the constancy of cis–trans ratios for an individual bug during its lifetime, are given.

Chapter 5 on mammalian semiochemicals is organized by animal classification. Much chemical information is presented on mammalian secretions, but less emphasis is placed on the importance of related biological response. The chemistry of African mammals, a topic that does not usually receive much attention, is presented, but there is no mention of recent studies on Australian mammals. There is good coverage of studies on mice, including protein investigations, but the studies of beavers and hamsters are not up-to-date, and the comprehensive studies of the pig and rabbit are missing, as are references to such recent reviews as Wyatt's *Pheromones and Animal Behaviour* (2003).

Compared to Millar's chapter on true bugs that involves 38 000 species, Francke and Dettner have a 10-fold larger task with 350 000 species of beetles in Chapter 3. This well-organized chapter has an informative technological approach. The use of microreactions to figure out both structural chemical details and the synthesis of chemicals in the body is insightful. Sections on biogenetic principles of acetogenins, propanogenins, and isoprenoids are informative. The division of each order into defensive compounds and attractive compounds is particularly useful to readers. At times the chemistry may seem overwhelming to biologists, but the many fascinating interactions of biology and chemistry presented here make the chemistry approachable for the chemically less knowledgeable reader. The authors also state the recurrent theme of the striking universality of chemical signals, i.e., that almost all common insect pheromones are found as chemical compounds in mammals, but also point out that refined techniques are revealing increasing numbers of unusual chemical compounds. This chapter goes into important details on chirality, emphasizing its importance in chemical signaling. The reference lists for all chapters are useful, but are especially impressive here with its list of 514.

Chapter 4 by Laurent, Braekman, and Dalose is a discussion of defensive chemistry in insects. There is some repetition between this chapter and Chapter 4 on the Chrysomelidae and Tenebrionidae families, but as the perspectives of the different authors vary, this reiteration is actually helpful to the reader. There is also an interesting section on biological and pharmacological activities. The last chapter on bacteria by Chhabra et al. adds a different perspective to this volume and includes a very useful table (1) for the reader who is unfamiliar with the topic.

On the whole, this volume does a remarkable job in covering a huge area; future volumes that encompass the pheromone chemistry of fishes, amphibians, reptiles, and birds are to be anticipated. This book is an important contribution to both the chemical and biological community, forming a firm bridge between the two disciplines.

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