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BOOK REVIEWS

Review of Scanning Auger Electron Microscopy. Edited by Martin Prutton and Mohamed M. El Gomati (University of York, UK). John Wiley & Sons, Ltd: Chichester. 2006. xviii + 368 pp. $200.00. ISBN 0-470-86677-2.

This monograph is an excellent addition to academic and industrial libraries as well as to laboratories focused on research and development involving characterization of surfaces using modern techniques. Scanning Auger Electron Microscopy (SAM) is one of a few reliable methods that provide qualitative, quantitative, and microscopic details of the composition of surfaces with high spatial resolution and in-depth analysis. The major limitation of scanning Auger methods in applications is due to the nature of the kilovolt electron probe beam. However, the fields in which these methods are commonly used, such as materials surface chemistry, physics, and engineering of semiconductor and composite materials, metals, alloys, and catalysts, provide a wide range of applications in important areas, including corrosion, adhesion, and semiconductor manufacturing and processing.

The book was edited by a team at the University of York, who developed the scanning Auger electron microscope into a custom-designed instrument, the multispectral Auger microscope. The experience derived from this project has, in my opinion, allowed the editors to take a different approach to the writing of this useful book.

The book comprises nine chapters, a well-documented set of references, and two very fine indices of authors cited and subjects. The opening chapters include a graduate-level introduction and two basic chapters on the physics of the Auger process and instrumentation. The latter two chapters, while obvious, are well written and illustrated with a variety of figures that utilize color presentation at a high production level, as is the case throughout the book. The following four chapters on spatial resolution, forming an Auger image, image processing and interpretation, and quantification of Auger images make up the heart of the book and provide the justification for reading it. They feature reviews of basic information, scripts to predict measurement conditions for the informed operator, details of processing the Auger image, and a thoughtful discussion of quantification. It is very clear that the authors and editors have taken their experience in instrument development and documented it here for broader use as a basic review of innovative Auger imaging science, technology, and application. This section is not written as a case study of the authors' own work but rather as a general treatment of a variety of subjects describing the particulars of measurement to the professional.

The final two chapters are on applications of SAM in materials science and in semiconductor manufacturing. The examples are well illustrated and informative for student and professional.

For the researcher familiar with balancing the demands of innovation in measurement with the driving force of application, this book provides a superb level of depth in both areas. This reviewer was particularly struck by the very high quality of the figures, in terms of both innovative content and use of color design and production. Figures are used to illustrate key points as well as to introduce comprehensive examples of image production and processing. They provide detailed diagrams of instrumentation and also act as roadmaps to determine instrumental conditions.

The book is well written, and the quality is consistent from chapter to chapter—a result of strong editing—in spite of the fact that multiple authors are involved. In summary, this book fills a key gap for researchers and graduate students: it goes beyond the well-written graduate text in surface analytical methods, which would typically provide only an overview of SAM and compare and contrast the technique with other methods, such as X-ray photoelectron spectrometry; secondary ion mass spectrometry; ion scattering spectrometry; electron, tunneling, and atomic force microscopies; etc. This book provides the informed researcher and operator with the details to allow for innovative measurement and application. There are very few such books available in this field that are up-to-date and offer new information about instrumentation.

The only downside to the book is the cost, which is not out of line with the high standards of the content and production but beyond the means of graduate students (and some professors) who would benefit the most.

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Radicals in Synthesis I: Methods and Mechanisms. Topics in Current Chemistry, 263. Edited by Andreas Gansäuer (Universität Bonn, Germany) Springer: Berlin, Heidelberg, New York. 2006. xii + 204 pp. $ 209. ISBN 3-540-31329-X.

The addition of two volumes dealing with synthetic applications of radical chemistry to the highly popular *Topics in Current Chemistry* series highlights the importance of this rapidly growing area. The first volume, reviewed here, deals with development of new methods and the physical organic underpinnings of radical methodology, while the second volume addresses the applications of these methods in complex molecule synthesis. Although such a division is totally arbitrary, it provides a convenient platform to categorize this otherwise diverse area.

The first volume is divided into five chapters beginning with one by Crich et al., who provide a highly readable account of the generation and applications of alkene radical cations by heterolysis of β-substituted radicals. The authors provide a detailed account of the methods of generation, kinetic and mechanistic aspects, and the eventual fate of these intermediates generated from diverse sources. As is clear from the second half of this article, serious applications of these methods in

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organic synthesis have yet to emerge, and this review should stimulate further developments.

The second chapter is dedicated to epoxide opening through electron transfer. Except for a few citations from other workers, this chapter reflects the personal interests of the editor and the other authors and reads like a detailed research summary. A companion chapter dealing with applications of the Cp_2TiCl appears in Volume 2. One could question whether such disproportionate use of space in two such relatively small books is warranted. These two chapters could have been combined into a single one focusing on synthetic aspects while providing the essential mechanistic details.

The third chapter by Darmency and Renaud gives the best account to date of the use of organoboron compounds in radical chemistry. I particularly liked the classification system the authors have employed. Although this chapter reads like a catalog of reactions, it should be said in the authors' defense that this is unavoidable, due to the very nature of the topic. In this chapter, synthetic chemists have a single, up-to-date source of valuable information on one of the most important topics in modern radical chemistry.

Any discussion of radicals in synthesis would be incomplete without the inclusion of stereoselective synthesis, and a number of reviews, often redundant, on stereoselective radical reactions have appeared recently. The fourth chapter by Zimmerman and Sibi provides an update. Finally, the last chapter by Zipse deals with computational aspects of radical stability. While this reviewer feels inadequate to make any substantive comments on this chapter, the data provided by the author on radical stabilization energies on carbon and heteroatom-based radicals will come in handy for synthetic chemists planning radical reactions. The nice discussions on captodative and fluorine-substituted radicals are a case in point. With the availability of many user-friendly computational methods, knowledge of which theoretical method or level of theory is applicable in a given situation is also very valuable. The authors have provided a large number of references to original papers that deal with radical stability in a highly readable form.

In summary, the importance of the topics in this book is uneven, with some chapters being more useful than others and some too specialized to be of wider use. The book is handsomely designed and highly readable with excellent graphics and minimal mistakes. With a companion volume dealing with synthetic applications, this collection could be quite useful. However, the steep price (>$1/page) may make it too expensive for many practicing chemists.

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Organofluorine Chemistry. By Kenji Uneyama (Okayama University, Japan). Blackwell Publishing, Ltd.: Oxford. 2006. x + 340 pp. $179.99. ISBN 1-4051-2561-6.

Organofluorine Chemistry is an important addition to recently published monographs on this topic and is aimed at researchers in academia and industry who need to keep up with this exciting and ever-expanding field. Its contemporary presentation is refreshingly different from introductory treatises and stimulates the informed reader throughout the chapters. The fundamental features that govern the unique properties and chemical behavior of fluorinated species are presented as powerful tools for the syntheses and applications of such compounds.

The foundation of this book is a brief introduction to the physical properties of fluorinated molecules, followed by a more elaborate analysis of electronic and steric effects. The author quotes several classic and various recent examples to illustrate the concepts succinctly. I particularly enjoyed the detailed discussion of halogen-bonding and arene−perfluoroarene interactions, two topics that have gained importance in the context of nanostructured materials. In two shorter chapters on the reactivity of fluorinated compounds, Uneyama describes the mechanistic facets of useful synthetic transformations, which are sometimes counterintuitive and difficult to predict. Interactions between several metal ions and aromatic or aliphatic fluorinated compounds are described as important to initiate unusual reactions. In addition to introducing fluorinated ligands in catalysis and glancing at fluorine's increasing importance in drug design, the author gives a balanced presentation of controversial issues like hydrogen-bonding of organofluorine compounds, quoting leading authors like Dunitz.

Roughly a third of the book is a survey of the recent literature on the preparation of organofluorine compounds by either introducing fluorine de novo or by using fluorinated building blocks. Each entry in this compilation of reactions includes at least one citation. I should point out that some sections have imprecise titles, e.g., the introduction of a difluoromethylene unit by a CF_2 synthon should hardly be called "Difluorination", as it is in Chapter 7. Overall, however, this last chapter will certainly be helpful to chemists mastering synthetic challenges in the laboratory.

One minor nuisance is the quality of a few figures and formula schemes, some typographical errors, certain inconsistencies in style, and a rather frugal index. In spite of these few shortcomings, this book is a detailed and thorough review as well as a valuable source of information with numerous tables, detailed formula schemes, some helpful illustrations, and well-referenced citations from the recent literature. Graduate students and research chemists working in the field should read this book to deepen their understanding of organofluorine chemistry and in particular to gain more insight into their enormous synthetic potential. I strongly recommend it to every practitioner of organofluorine chemistry.

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Chemical Dynamics in the Condensed Phases: Relaxation, Transfer, and Reactions in Condensed Molecular Systems. By Abraham Nitzan (Tel Aviv University). Oxford University Press: Oxford, New York. 2006. xxii + 720 pp. $89.50. ISBN 0-19-852979-1.

The field of condensed phase dynamics is the heart and soul of all chemistry since by and large most chemical processes occur either in or on some condensed media. Nitzan has undertaken the enormous task of creating a comprehensive text in which most of the important theoretical techniques and methods are developed, explained, and explored in careful and

thoughtful detail and precision. The book is aimed toward graduate students in physical chemistry and is certainly well suited for advanced courses.

The book is divided into three main parts. The first is largely a review of some basic mathematical concepts and physical topics and their application in time-dependent quantum mechanics, solid-state physics, and the statistical mechanics of liquid. This section establishes the language and foundation upon which to build the theoretical methods necessary for describing chemical dynamics in a microscopic context. Most of this material can be found in other texts; however, its inclusion here establishes a common notation and style of presentation. The second section deals with theoretical methods: time correlation functions, stochastic processes, quantum relaxation, linear response, and the ever-popular spin-boson model. As in the first section, much of the raw material can be found in the literature or in other texts. However, here it is digested, synthesized, and presented in a way that dramatically illustrates the underlying assumptions, foundations, and connections between different theoretical approaches. Finally, in the last third of the book, Nitzan presents a series of applications of the techniques developed thus far in the text: vibrational relaxation, transition state theory, solvation dynamics, electron transfer, and spectroscopy.

One of the most important aspects of the book as a whole is the order of presentation and the constant effort to put forth different well-known results in a common language and mathematical apparatus. Since this text was intended for graduate students, all of the mathematical and formal concepts are presented in careful detail and with insight. In spite of the rigor, it does not lose the reader in the forest of detail. It should not be a problem for even nonspecialists to understand the mathematical techniques, especially in their application to realistic physical problems. It is amazingly comprehensive.

It is quite fitting that the author has chosen passages from *De Rerum Natura* (translated as *On The Nature of Things* or *The Way Things Are*) by Lucretius as the preface for each chapter. Just as Lucretius explores the metaphysics of existence in this poem and attempts to banish fear and superstition by arguing that the world is composed of atoms and collections of atoms that obey quite ordinary rules, rather than the whimsy of the gods, Nitzan shows how complex chemical processes can be understood in terms of the fundamental microscopic laws and principles that are the cornerstone of modern chemical physics. As a field matures, it is important for one of its leaders to establish a canon of its current state. Nitzan has succeeded in putting together in one volume a snapshot of our current understanding of how chemistry occurs in liquids, on surfaces, and at interfaces. I highly recommend this book to any serious student of this field.

Happy is he who has discovered the causes of things and has cast beneath his feet all fears... (Virgil).

Eric R. Bittner, *University of Houston*

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Exploiting Chemical Diversity for Drug Discovery. Edited by Paul A. Bartlett (University of California, Berkeley) and Michael Entzeroth (S*Bio Pte Ltd, Singapore). Royal Society of Chemistry: Cambridge. 2006. xxiv + 420 pp. $219. ISBN 0-85404-842-1.

This latest title in the RSC Biomolecular Sciences series exploring the interplay between the biological and chemical sciences focuses on the generation of novel chemical matter in the quest for bioactive molecules. Scientists working in drug discovery will find it contains excellent review articles covering advances in synthesis and screening, while providing a roadmap for how science meets technology to generate unique and diverse starting points for projects in drug discovery.

At any medicinal chemistry conference, one is immediately struck by how much the pharmaceutical industry has invested in the paradigm that the success of drug discovery programs is driven by the uniqueness and quality of the initial lead series. The editors have picked up this concept and presented the underlying science in a very meaningful way. The book is very well organized and balanced between a high-level overview of lead identification and detailed descriptions of technologies. The layout of the chapters provides a strong framework for understanding how all of the pieces can fit together in the modern pharmaceutical endeavor. The sections are divided first between chemistry and screening, and each of these sections is subdivided between operational advances, conceptual advances in generating leads, and conceptual advances in hit-to-lead processes. This construct allows for chapters on technologies as diverse as high throughput chemistry, compound acquisition, microfluidics, genetically modified cell lines, and in silico toxicology predictions to be presented without the reader ever feeling as if they were lost in the middle of an exposition on technology.

The chapters themselves are written clearly and with a sufficient level of detail so that those working in technology-focused groups will find them meaningful. The references are reasonably current; however some for the "older" technologies are slightly dated. Nevertheless, the book is an excellent source of reference for the most widely used technologies in drug discovery. In addition to technologies, the book also has several chapters that address the process of identifying lead compounds, including important discussions on screening strategies, applications of focused chemical libraries, automation, and quality criteria. Overall, the book reduces a very complex area of drug discovery into meaningful categories and provides orientation to scientists confronted by the broad range of options in lead discovery.

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