

Fluorescence Spectroscopy, Imaging, and Probes: New Tools in Chemical, Physical, and Life Sciences.

Edited by Ruud Kraayenhof (Vrije Universiteit, Amsterdam), Antonie J. W. G. Visser (Wageningen University), and Hans C. Gerritsen (University of Utrecht). Springer-Verlag: Berlin, Heidelberg, New York. 2002. xxvi + 390 pp. \$109.00. ISBN 3-540-42768-6.

This book was developed from the 7th Conference on Methods and Applications of Fluorescence: Spectroscopy, Imaging, and Probes (MAF), held in Amsterdam in September of 2001. Its 23 chapters cover subjects that fall into the following four categories: Fluorescence Spectroscopy: New Approaches and Probes; Fluorescence Spectroscopy of Single Molecules and Molecular Assemblies; Application of Fluorescence in Biological Membrane and Enzyme Studies; and Microscopic Imaging Techniques and Their Application for the Study of Living Cells. A subject index completes the book.

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Carbene Chemistry: From Fleeting Intermediates to Powerful Reagents.

Edited by Guy Bertrand (University of California, Riverside). FontisMedia S. A.: Lausanne and Marcel Dekker, Inc.: New York, Basel. 2002. xvi + 302 pp. \$165.00. ISBN 0-8247-0831-8.

Carbenes remain a fascinating class of molecules in organic chemistry. In this very nice compilation, current topics in carbene chemistry from the viewpoint of the 11 authors are covered. The title of the text serves it well, and the nine chapters confirm the maturation of carbene chemistry. Carbenes have evolved from the transient intermediates first speculated on in the 1930's and 1940's to real intermediates whose existence could be demonstrated via kinetic studies as well as trapping studies in the 1950's to the stabilized forms currently being studied and reviewed in this book. A reading of this text also confirms that there is much to be learned and that the field remains as vibrant as ever.

Some of the authors have given their chapter a personal touch, describing how they became involved in carbene chemistry and how their thinking in this field has evolved. I personally recall first hearing about carbenes in the 1960's. At the time, they were described as incredibly indiscriminant molecules that reacted with virtually any organic substance and were practically incapable of distinguishing between different types of hydrogens. Of course, this was a description of CH₂, the simplest and so-called "parent" carbene. It is useful to point out how this thinking has changed due, in large part, to the some of the fascinating findings covered in this book.

Unsigned book reviews are by the Book Review Editor.

Fittingly, the book opens with a discussion of highly reactive carbenes that can be "tamed" using the matrix isolation technique. Some of the carbenes studied are so electrophilic that they insert into H₂ and even coordinate with the noble element Xe. The technique of laser flash photolysis for observing short-lived carbenes is described in conjunction with the "pyridine ylide" method for observing invisible carbenes. As a result, rates of carbene reactions can now be conveniently measured. The early belief that carbenes behaved mainly as potent electrophiles or radical-like species is also challenged in this book. They are shown to be electrophilic, nucleophilic, as well as ambiphilic, using classic physical organic studies as well as modern computational and laser flash methodologies. One chapter deals with triplet carbenes that were once only observable at 77 K. They can now be stabilized by substitution so that they are observable at room temperature with half-lives of several minutes. There are two chapters dealing with room-temperature stable singlet carbenes that have been isolated, crystallized, and distilled. They are so stable that it is even debated whether they should really be called carbenes. Two chapters also deal with the taming of carbenes by early and late transition metals. This has led to the isolation of the so called Fischer-type and Schrock-type carbene complexes, which have significantly different properties. The synthesis of such complexes has led to the powerful olefin metathesis reaction, as well as to numerous other transformations of synthetic utility. The last chapter describes the generation of polycarbenes and attempts to form magnetic materials based on these high-spin substances.

Although the writing styles are, as expected, quite different, the chapters are generally well written. However, some could have been proofread more thoroughly. Also, the structural drawings in the various chapters are not all of the same quality. Although the drawings in most chapters are well done, I would characterize the drawings in one chapter as poor.

In summary, this book would be a fine addition to the scientific collections of carbene chemists and of those interested in reaction mechanisms in organic and organometallic chemistry. The references are quite up-to-date – in fact, unpublished work is discussed in a number of instances. The presentation is definitely at an advanced level; for easier reading, some prior exposure to the topics would be desirable.

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Fiesers' Reagents for Organic Synthesis, Volume 21.

By Tse-Lok Ho (National Chiao Tung University, China). John Wiley & Sons, Inc.: Hoboken. 2003. xvi + 590 pp. \$99.95. ISBN 0-471-21393-4.

Volume 21 of this classic series covers the chemical literature from 1999 to 2000. A typical entry, which appears in alphabeti

cal order, lists the reagent, descriptions of its uses, in the form of both chemical equations and written summaries, and references to the current literature and to earlier volumes of this series in which the reagent has been discussed. The book opens with lists of general and reference abbreviations and is completed by an author and a subject index.

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Progress in the Chemistry of Organic Natural Products 84. Edited by W. Herz (Florida State University, Tallahassee), H. Falk (Johannes-Kepler-Universität, Linz, Austria), and G. W. Kirby (University of Glasgow, U.K.). Springer-Verlag: Wein, New York. 2002. 253 pp. \$159.00. ISBN 3-211-83707-8.

The most recent contribution from this excellent series begins with the chapter *Naturally Occurring Cyclic Tetrapyrroles* by Montforts and Glasenapp-Breiling. A highly readable abbreviated overview is presented of the structure, biological activity, and biosynthesis of the most important classes of cyclic tetrapyrrole natural products (porphyrins, chlorins, bacteriochlorins, isobacteriochlorins, higher saturated hydroporphyrins, and corrins) along with a more limited discussion of some aspects of their synthesis. The rapidly expanding field of synthetic porphyrinoids is not covered. A brief introduction provides the nonexpert with an appreciation for the structure and classification of the various broad classes of porphyrinoid ring systems. General aspects of tetrapyrrole biosynthesis are also introduced here. It is unfortunate that a summary of previous reviews and treatises in this field was not included in this introductory section. The chapter is generally well-written, except for a few minor problems with punctuation and typographical errors. The excellent use of figures that effectively support the text makes for an enjoyable read. One concern is that a largely historical overview of the field is provided and relatively few recent examples are included (only about 10% of the references are since 1998), which limits the value of this chapter for practitioners in the field. That said, it provides an excellent entry point for graduate students and others previously unfamiliar with the chemistry and biosynthesis of tetrapyrrole natural products.

The second chapter by Kingston et al. reviews developments in *The Chemistry of Taxol and Related Taxoids* during the past decade. Given the vast amount of recent literature in this area, including numerous monographs and reviews, the authors wisely focus their primary coverage on the chemistry of the intact baccatin nucleus of the taxoids, which is discussed in a highly systematic fashion. Limited qualitative highlights of the biological activity seen for many of the final taxoid products provide the reader with some insight into the structure–activity profile of these compounds. Informative but less exhaustive overviews of other topics (e.g., synthesis and incorporation of the taxol side chain, taxol analogues and prodrugs—including variously labeled analogues—and the interaction of taxol with tubulin) are also included. Brief sections dealing with metabolites and

simplified/unusual analogues of taxol are less valuable. An excellent synopsis of the six published total syntheses of taxol provides a summary of each approach along with full details in complete synthetic schemes. The literature coverage in this chapter is excellent and appropriately includes the relevant patent literature. The main body of the chapter provides coverage through mid-2000; a valuable addendum updates this coverage through the beginning of 2002. Many of the 568 references are from the past five years. While the quality of the writing is generally excellent, the sections dealing with the chemistry of taxol side chains suffer from some awkward English usage. Other minor problems include the presence of occasional errors in the figures and an inconsistent use of journal abbreviations among the cited references. However, these minor issues do not significantly diminish the overall quality of this review, which is quite different in scope and emphasis from other recent taxol-related reviews. It will be of value both to practitioners in the field as well as to others interested in learning about the complex and novel chemistry of the taxoids.

The overall artwork and production quality of this volume are excellent, except for some typographical and grammatical errors. Full article titles, but not page ranges, are provided for each reference. The author index facilitates the location of contributions from a particular research group, even those discussed in the addendum. A shorter subject index is less valuable—it appears to have been assembled rather mechanically such that solvents and simple reagents mentioned in the text are included, whereas more important concepts are omitted.

Although the high cost may limit the number of individuals who will purchase this volume, I would recommend that it find its way onto the shelves of all chemistry libraries because it will prove of interest to many workers in both organic and natural products chemistry.

Paul Sampson, Kent State University

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An Introduction to Laser Spectroscopy, 2nd Edition. Edited by David L. Andrews (University of East Anglia, Norwich, U.K.) and Andrey A. Demidov (LaserSharp Corporation, Boston). Kluwer Academic/Plenum Publishers: New York. 2002. xii + 376 pp. \$95.00. ISBN 0-306-47298-8.

In a field expanding as rapidly as laser spectroscopy, the idea of publishing a book covering both the theory and the applications of this field is always a good one. One must be aware, however, that coverage cannot be complete or totally up-to-date because of such rapid development. The first edition of this book originated from lectures given at a summer school on laser spectroscopy. The choice of topics, therefore, reflects the aim and scope of the school. Finally, as is common with multiauthored chapters, the style and treatment of the chapters vary considerably from a purely theoretical to a strongly

practical or instrumental orientation. Given the nature of the book, the questions facing the reviewer are (1) does the book fulfill one's expectations, and (2) does it represent a useful addition to the existing books dealing with different aspects of laser spectroscopy? With due regard to the considerations given below, the book successfully meets both criteria. The editors should therefore be commended for having brought together many authoritative presentations of a number of relevant topics.

From this reviewer's perspective, the title of the book should have included the word "molecular" because much of the current coverage involves molecular laser spectroscopy. Indeed, applications of laser spectroscopy imply that atoms would also be included and that such techniques as diode laser atomic absorption, laser-enhanced ionization, laser-induced atomic fluorescence, laser ablation, and laser-induced breakdown spectroscopy would be covered in the book. An atomic flavor does exist in a few places, for example, in Chapter 2, dealing with absorption and fluorescence techniques, in Chapter 9, in connection with tunable short-wavelength generation and application—with resonance-enhanced multiphoton ionization being mentioned in relation to ionization of atoms—and in Chapter 10, dealing with femtosecond laser interaction. The inclusion of atomic spectroscopy would have resulted in a much thicker book. To defend the predominant molecular aspect, however, one should note that the number of publications in recent years dealing with laser applications to molecules far exceeds those dealing with atoms.

The book adequately covers existing principles and offers the possibility for a novice reader to become familiar with the field. The basic concepts of absorption and fluorescence and a detailed treatment of Raman spectroscopy are presented. The reader learns about many well-established methods and is introduced to new developments. A variety of recent techniques are mentioned briefly enough to give the idea of the technique without entering into details to make them understandable in every operational characteristic (this, for example, applies to cavity ringdown spectroscopy and cavity techniques in general). Pump and probe methods, time-resolved polarized fluorescence, and fluorescent probes in biochemistry are all treated in detail, because this important area of research (immunoassays, DNA sequencing) is extremely active. Environmental applications (remote sensing) are also well covered.

In addition, very helpful discussions of different types of lasers as well as the characterization and measurement of their properties (e.g., the optical power and wavelength) can be found in different chapters. An additional chapter on the manipulation of atoms and molecules with lasers (laser cooling and trapping) would have been welcome.

The book reads well, and the literature coverage is adequate. In essence, this book provides a valuable resource for those starting in one particular research topic. For those already involved in the use of lasers for molecular spectroscopy, the book offers updated coverage of many important topics. For those involved in atomic spectroscopy with lasers, the book does not treat specific atomic applications, but still provides useful information on laser sources, nonlinear optics, and wavelength generation techniques. In conclusion, the book is beneficial, in different degrees, to different categories of readers, but it will

in general serve as a handy reference to all those involved in the use of lasers in spectroscopy and chemical analysis.

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Targets in Heterocyclic Systems: Chemistry and Properties. Volume 5 (2001). Reviews and Accounts on Heterocyclic Chemistry. Edited by Orazio A. Attanasi (University of Urbino) and Domenico Spinelli (University of Bologna). Italian Society of Chemistry: Rome. 2002. xviii + 520 pp. \$89.95. ISBN 88-86208-19-7.

Volume 5 of this series contains 17 chapters and covers, in the words of the Editors, "the synthesis and reactivity, as well as some medicinal and mass spectrometric properties of different heterorings". A sampling of the chapter titles includes "Stereo-selective synthesis of tetrahydrofurans and tetrahydropyrans via seleniranium ions", "Mass spectrometry of β -lactam antibiotics", and "Cycloimmonium ylides. Structure and electrocyclization reactions". References are current through 2001.

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Atlas of Plastics Additives: Analysis by Spectrometric Methods. By Dietrich O. Hummel (University of Cologne, Germany). Springer-Verlag: Berlin, Heidelberg, New York. 2002. viii + 538 pp. \$400.00. ISBN 3-540-42414-8.

This book, which covers the application of vibrational, electronic, nuclear magnetic, and mass spectrometries to describe various plastic additives, is divided into two parts: Part A, Theory and Practical Applications, and Part B, FTIR Spectral Atlas of Plastics Additives. It also features (in Part B) the FTIR spectra of 752 additives, which include structures and listings of their major absorption bands. An index of chemical names and a list of "trivial/trade" names complete the book.

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Structural and Electronic Properties of Molecular Nanostructures. AIP Conference Proceedings, Volume 633. Edited by Hans Kuzmany (Universität Wien), Jörg Fink (Institut für Festkörper- und Werkstoff-Forschung, Dresden), Michael Mehring (Universität Stuttgart), and Siegmund Roth (Max-Planck-Institut für Festkörperforschung, Stuttgart). American Institute of Physics: Melville, New York. 2002. xx + 636 pp. \$210.00. ISBN 0-7354-0088-1.

This book features the proceedings of the 16th International Winterschool on Electronic Properties of Novel Materials, held

in Kirchberg, Austria, in March, 2002. The focus of the 130+ papers is on new nanostructured materials, non-carbon nanotubes, and new biological nanostructures. The chapters are organized into the following topics: Fullerenes, Endohedrals, and Fullerides; Functionalization and Filling of Carbon Nanotubes; Nanostructure Synthesis; Properties of Nanostructures;

Characterization of Nanostructures; Theory of Nanostructures; Biological Nanostructures and New Materials; and Applications. An author index completes the book.

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