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BOOK REVIEWS

Trace Environmental Quantitative Analysis: Principles, Techniques and Applications, 2nd Edition. By Paul R. Loconto (Michigan Department of Community Health, Lansing). CRC Press/Taylor and Francis Group: Boca Raton, FL. 2006. xii + 732 pp. $139.95. ISBN 0-8247-5853-6.

Approaches in traditional trace environmental analysis are typically based upon discrete sampling methods followed by routine laboratory analysis. Unfortunately, these approaches do not improve our understanding of the natural processes governing species behavior, their transport and bioavailability, or the relationship between anthropogenic releases and their long-term impact on environmental systems. This warrants the need for a comprehensive source of information covering all aspects of trace environmental analysis, including both laboratory and field-based techniques.

Loconto's book does a superlative job of introducing the concept of trace environmental quantitative analysis with an expanded introduction of the main concepts and their relevance to current U.S. environmental legislation. He uses a unique approach including the use of questions as headings and a brief "Chapter at a Glance" section to allow readers to scan for topics of immediate interest. Subsections are clearly organized with the use of quality tables and figures. I particularly liked the addition of specific laboratory experiments in Part 5. Such material would be a valuable reference for those working in this field as well as a limited resource guide for university instructors teaching relevant laboratory courses.

In this 2nd edition, Loconto has expanded the instrumental section in Part 4 with updated references and descriptions of modern laboratory techniques including an informative section on ICP-MS. Unfortunately, he fails to present information on current in situ and field-based chemical sensing techniques that are vital in modern trace environmental analysis. Such techniques provide the high temporal and spatial resolution data needed to study environmental system dynamics. I also found the appendices to be too extensive in content because they contained information that was unnecessary or material that could have been placed in the various chapters. Appendix D, for example, introduces photographs of current analytical instrumental designs. Such photographs would have been better utilized in the various chapters in which these techniques were presented.

In summary, Loconto's book provides a well-written, comprehensive introduction to trace environmental analysis but lacks discussion of the recent trend toward miniaturization, the use of field-based instrumentation, and the need for high-resolution monitoring. Moreover, I question the book's overall appeal to an international audience. The techniques presented are universal in nature, but the book is bogged down by expanded descriptions of current U.S. environmental regulations. In my opinion, this book is well suited as a resource for environmental chemists working in an industrial or regulatory-based setting with limited appeal to academics.

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CRC Handbook of Chemistry and Physics, 86th Edition. Edited by David R. Lide (National Institute of Standards and Technology). CRC Press (an imprint of Taylor and Francis Group): Boca Raton, FL. 2005. 2544 pp. $125.96. ISBN 0-8493-0486-5.

The 86th edition of this famous handbook continues to provide up-to-date, critically evaluated chemical and physical data in a one-volume format. Several new topics are included in this edition: Electron Inelastic Mean Free Paths, Proton Affinities, Vapor Pressures (Solvent Activities) for Binary Polymer Solutions, Selected Properties of Semiconductor Solid Solutions; and Electrical Conductivity of Aqueous Solutions. A number of tables have also been expanded and updated. All of the information in this edition may also be found on the CD-ROM, Version 2006 edition, which includes many features for quick and easy data searching.

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Ion Mobility Spectrometry, 2nd Edition. By Gary A. Eiceman (New Mexico State University, Las Cruces, NM) and Zeev Karpas (Nuclear Research Center, Beer-Sheva, Israel). CRC Press (an imprint of Taylor and Francis Group): Boca Raton, FL. 2005. xvi + 350 pp. ISBN 0-8493-2247-2.

A recent increase in the demand for field-deployable instrumentation has heightened the visibility of ion mobility spectrometry (IMS) as an important analytical tool, specifically in the detection of explosives, chemical weapons, and illicit drugs. Furthermore, new applications have been developed in the areas of toxic industrial chemical monitoring as well as biological and medical analysis and diagnosis. With the significant advancements in IMS and its expansion into new applications, the second edition of this book provides a timely update to the fundamental theory, advancements in instrumentation, and the development of new applications of IMS.

The book accomplishes the objectives outlined by the authors, which are to update the reader on advances in the technology of IMS, its computational capabilities, models underlying gas-phase ion chemistry, applications, and the demand for field-deployable detectors since the publication of the first edition in 1994. This edition maintains pertinent information from the first edition but includes the following significant additions: the development of field asymmetric ion mobility spectrometry or

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differential mobility spectrometry, the miniaturization of drift tubes, the development of nonradioactive ionization sources, the use of electrospray for the detection of bioorganic molecules, and the use of IMS as a prefilter for mass spectrometry. The book also comes with a CD that contains information about building an ion mobility spectrometer with supporting electronics and software. The CD, a useful and practical addition to this book, also contains a database of spectra for several chemical classes along with a reprint of an article pertaining to the kinetics and thermodynamics of ion solvation.

Overall this book should be useful to experts in IMS research as well as to those new to the technology, since it provides both reference material as well as an introduction to IMS technology. As a practical book, it offers a well-balanced combination of theory and application. Furthermore, the authors recognize at the end of the book potential future directions in IMS research and areas that need to be developed. I highly recommend it to anyone interested in ion mobility spectrometry.

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Handbook of Industrial Biocatalysis. Edited by Ching T. Hou (United States Department of Agriculture, Peoria, IL). CRC Press (an imprint of Taylor and Francis): Boca Raton, FL. 2005. 616 pp. $179.95. ISBN 0-82472-423-2.

This multiauthor book covers all types of industrial biocatalysis, with the first 19 chapters encompassing "the world's newest biotechnology, including bioprocesses on producing potential industrial products from hydrophobic substrates such as oils and fats." In the next five chapters, the production of "value-added products from carbohydrate substrates" is described, and in the remaining five, other possible industrial bioprocesses are discussed. Pages are numbered according to each chapter, and the subject index reflects this: thus, the number of the chapter is given first and then the page within that chapter. This can be useful for showing the reader which chapter has the most information pertaining to a certain keyword, although it does create extra work when actually trying to find the word itself.

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Templates in Chemistry II. Topics in Current Chemistry, 249. Edited by Christoph A. Schalley, Fritz Vögtle, and Karl H. Dötz (Kekulé-Institut für Organische Chemie und Biochemie, Bonn). Springer: Berlin, Heidelberg, New York. 2005. x + 372 pp. $279. ISBN 3-540-23087-4.

This second monograph in the series *Templates in Chemistry* begins with a detailed review by Busch describing the progress and various strategies developed in templated synthesis during the past four decades. The author starts with an analysis of four different types of templates ranging from metal ions and strong coordinative bonds to weak, yet more dynamic, templates based on the hydrophobic effect. A historic perspective is then given on the "quest and discovery" of catenanes, rotaxanes, and molecular knots. The latter is the most recent and intriguing example of complex molecular entities, which would remain inaccessible were it not for recent progress in this fascinating area of organic chemistry.

The next two chapters focus on the synthesis of macrocyclic structures. Gibb and co-workers describe at least seven different strategies to assemble cyclic precursors that are subsequently locked in place either by a Grubbs catalyst or by functional complementary linkers. The authors also review the combinatorial libraries and the dynamic covalent approach that have proved particularly useful in the synthesis of topologically complex molecules. The following chapter by Bauerle and Kaiser gives a comprehensive overview of macrocycles and cagelike structures based on Pt(II) coordinative bonds with electron-rich organic ligands. The authors provide a very logical and coherent review with numerous figures and X-ray crystal structures that make this chapter very clear and easy to read. Their description of new developments in the synthesis of 3D well-defined structures is particularly interesting and worth mentioning.

The next chapter by Stoddart et al. is a highly authoritative review of the synthesis and real-life applications of interlocked molecules, i.e., catenanes and rotaxanes. The authors cover different types of noncovalent interactions that can drive the formation of supramolecular precursors and describe the general strategies to increase the efficiency of molecular interlocking. Examples that include building blocks with reversibly formed covalent bonds represent the most interesting part of the chapter. A detailed analysis and comparison of kinetic and thermodynamic regimes as well as the multivalency effect demonstrate how exceedingly complex structures can be produced in high yield and with great chemical precision. The big plus of this chapter is the description of rotaxane-based molecular switches and their applications in molecular electronics.

Perhaps, the most interesting chapter is the one by Sauvage et al. about molecular knots. The authors review two major synthetic approaches based on multiple coordination bonds and hydrogen bonding. The discussion of chirality and the preparation of enantiomerically pure molecular knots is a particularly intriguing part that should be of great interest to many synthetic chemists. The theme of controlling the chirality of complex molecular assemblies is continued in the following chapter by Crego-Calama et al. The authors begin by discussing the general synthetic routes to rosettelike molecular objects based on complementary hydrogen bonds. The noncovalent synthesis of supramolecular enantiomers, the memory effect of supramolecular chirality, and the amplification thereof via the "sergeant-and-soldiers" principle are truly fascinating components of this chapter. The use of numerous NMR spectra and X-ray crystal structures provides much chemical insight into the mechanism of templated self-assembly. Finally, the last chapter by Sellergren et al. is a description of imprinted polymers and their potential use in catalysis. The authors did a great job describing the design of binding sites in noncovalent and metal-mediated imprinting of various polymers and dendrimers.

Overall, this is an interesting book that should capture the attention of researchers working in the area of classical supramolecular host−guest chemistry. However, one drawback

should be mentioned. As discussed by Busch in the end of the first chapter, the term "template" is not well defined and it has many different meanings. I believe the title of this book may be a little bit misleading because it mainly considers the traditional *molecular* templates, such as individual ions of transition metals and small organic molecules. Today, templates in chemistry include an enormous number of much larger objects that measure from a few nanometers to hundreds of microns in size. Very often, templating implies the process of copying the size and the symmetry of a given object, regardless of whether it is a molecular, macromolecular, or supramolecular object. Examples include DNA, enzymes, bacteria, dendrimers, block copolymers, micelles, peptide nanofibers, organic nanoribbons, liquid crystals, metallic and polymeric microspheres, and many more. It is unfortunate that these systems are not mentioned in this book with such a general title. It will confuse a number of researchers who work in the area of organic and inorganic materials chemistry. If a third part of this series is planned, it would be most appropriate for the editors to cover the above-mentioned systems, which represent an overwhelming and rapidly growing majority of templates in chemistry.

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Reagent Chemicals: Specifications and Procedures, 10th Edition. By the ACS Committee on Analytical Reagents, Paul A. Bouis, Chair. American Chemical Society: Washington, DC and Oxford University Press: New York. 2006. x + 806 pp. $274.50. ISBN 0-8412-3945-2.

As with earlier volumes, this edition of *Reagent Chemicals* continues to publish the specifications and validated methods for determining the purity of analytical reagents. For the first time, however, the 10th edition also includes general physical properties and analytical uses of the reagents listed. Thirty-two new reagents and three new classes of standard-grade reference materials have been added, and inductively coupled plasma mass spectrometry as an instrumental method for trace metal analysis has also been included. To make this edition easier to read and navigate, the committee members have also introduced an index by CAS number and a separate one for standard-grade reference materials, complete assay calculations with titer values, an updated table of atomic weights, a list of frequently used mathematical equations, a short tutorial and diagram on how to read an entry, and a detailed table of contents for each section.

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Anticancer Agents from Natural Products. Edited by Gordon M. Cragg (National Cancer Institute, Frederick, MD), David G. I. Kingston (Virginia Polytechnic Institute and State University, Blacksburg, VA), and David J. Newman (National Cancer Institute, Frederick, MD). CRC Press/Taylor & Francis Group: Boca Raton, FL. 2005. xiv + 578 pp. $179.95. ISBN: 0-8493-1863-7.

This reference book covers current anticancer agents in clinical use that are "natural products or are clearly derived from natural product leads". Organized by source organism, each entry generally includes a history of the drug, its mechanism of action, medicinal chemistry, synthesis, and clinical applications. The final chapters provide discussions of biosynthetic approaches to anticancer natural products and future trends and developments in the field of anticancer agents from natural products. A subject index completes the book.

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Polymeric and Inorganic Fibers. Advances in Polymer Science, 178. Springer: Berlin, Heidelberg, New York. 2005. x + 168 pp. $169.00. ISBN: 3-540-24016-0.

There are two chapters in this unedited volume of *Advances in Polymer Science*: "The Tensile Strength of Polymer Fibers" by Northolt, Decker, Picken, Baltussen, and Schlatmann and "Advances in Inorganic Fibers" by Ishikawa. An author index of Volumes 101−178 and a subject index complete the book.

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Handbook of Reagents for Organic Synthesis: Reagents for Glycoside, Nucleotide, and Peptide Synthesis. Edited by David Crich (University of Illinois at Chicago). John Wiley and Sons, Ltd.: Chichester. 2005. xiv + 769 pp. $170.00. ISBN 0-470-02304-X.

This handbook presents pertinent information about approximately 250 of the most widely used reagents required for glycoside, nucleotide, and peptide synthesis. Each entry provides a summary of the most important reactions involving the reagent, references to the original literature, an overview of the physical properties of the reagent, conditions for its handling and storage, and precautions. About one-third of the entries were taken from the *Encyclopedia of Reagents for Organic Synthesis (EROS)* published in 1995, with the remainder consisting of either new articles or updated versions of the original *EROS* articles.

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Heterocycles from Transition Metal Catalysis: Formation and Functionalization. Catalysis by Metal Complexes, Volume 28. By András Kotschy (Eötvös Lorand University, Budapest, Hungary) and Géza Timári (CHINOIN Co. Ltd of the Sanofi-Aventis Group, Budapest, Hungary). Springer: Dordrecht. 2005. xii + 202 pp. $159.00. ISBN 1-4020-3624-8.

When I first opened this book I was surprised, given the title, to find predominantly palladium-catalyzed transformations, with a few nickel- and copper-catalyzed processes, and no mention of other important processes, such as olefin metathesis. It was only after reading the foreword that the reasons for these omissions became clear. There, the authors explain that the goal of the book is to provide an overview of only palladium, nickel,

and copper catalysis. Toward this narrower goal, the book provides a nice overview of recent developments in the context of heterocyclic chemistry.

The book is organized into three sections, the first of which introduces the reader to the basic reaction steps in catalytic transformations. This section is probably most valuable to novices in the field who have not previously encountered the use of transition-metal catalysis in organic synthesis. It outlines the important reactions and provides a useful classification of these processes that may assist undergraduate students or junior graduate students in understanding the nuts and bolts of catalytic transformations.

The second and third sections provide up-to-date examples of how these three metals can be used in heterocyclic chemistry. To appreciate and understand these sections fully, the reader will need a fairly strong grasp of the fundamentals of transition-metal catalysis, as well as some of its more subtle aspects—a rather different audience from that of the first section. The chemistry in these sections is separated according to the ring size of the heterocycle being formed or used. At times this organization leads to a repetition of material: for example, very similar reactions are used in the functionalization of five- and six-membered heterocyclic rings, making their separation into separate subcategories somewhat redundant. On the whole, however, these chapters are well written and easy to understand. The care that the authors have taken to provide up-to-date examples creates a valuable resource for modern synthetic methods involving Pd, Ni, and Cu.

Some typographical errors and structural errors in the chemical drawings, unfortunately, detract from the quality of the work. Nonetheless, the authors can be commended for bringing together a vast amount of information and organizing it in a way that is both pedagogical and interesting to read. Overall, I think that this book would be a nice companion to the text *Palladium in Heterocyclic Chemistry: A Guide for the Synthetic Chemist* written by Li and Gribble in 2000, especially for those looking for updated examples of these interesting and useful transformations.

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