Book Review

Book Review of Ionic Liquids in Synthesis: Second, Completely Revised and Enlarged Edition, Volumes 1 and 2

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J. Am. Chem. Soc., **2008**, 130 (39), 13183-13184 • DOI: 10.1021/ja805338y • Publication Date (Web): 06 September 2008

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BOOK REVIEWS

Trace Quantitative Analysis by Mass Spectrometry. By Robert K. Boyd (National Research Council, Ottawa, Canada), Cecilia Basic (Basic Mass Spec, Winnipeg, Canada), and Robert A. Bethem (Alta Analytical Laboratory, El Dorado Hills, CA, USA). John Wiley & Sons, Ltd.: Chichester. 2008. xxiv + 724 pp. $130. ISBN 978-0-470-05771-1.

The role of mass spectrometry (MS) in quantitative analysis is vital and growing. The sensitivity and specificity of modern mass spectrometers have allowed for the identification and quantitation of analytes at ultratrace levels in tremendously complex matrices. However, actually accomplishing these analyses in the laboratory are typically not discussed in most analytical chemistry texts at the undergraduate or graduate level. As the authors state, the typical approach is "learning by doing"—a daunting task faced by countless new analysts in government and industrial laboratories. This book attempts to bridge the gap between the basic concepts of analytical chemistry and the intricacies of utilizing MS in quantitative analyses.

The main objective of this book is to discuss the real-world process of quantitating trace levels of small molecules in complex matrices using MS. The authors seek to emphasize the fundamental concepts behind quantitative analysis and provide several examples of the use of mass spectrometry in real samples. The book is ambitious in its scope, covering topics from the very basic (Chapter 1 covers measurement, dimensions, and units) to the very complex (in Chapter 11, the authors discuss food contaminants, anthropogenic pollutants in water, bioanalytical applications, and quantitative proteomics). Along the way, the authors also provide detailed treatments of quantitative analysis (Chapter 2), chromatography (Chapters 3 and 4), MS interfaces and ion sources (Chapter 5), mass analyzers (Chapter 6), MS detectors (Chapter 7), statistics (Chapter 8), and method development and validation (Chapters 9 and 10). The lengthy treatment of chromatography in Chapter 3 seems excessive, and it is easy to question if it is truly necessary. However, the authors do cover some important and recent chromatographic advances, such as ultrasmall particles and monolithic columns. The discussion of practical tools for separation (Chapter 4) seems more useful and appropriate. Here the authors cover a host of techniques that are areas of current interest such as the use of molecularly imprinted polymers, turbulent flow chromatography, and single drop microextraction. The most useful chapters are Chapter 9, "Method Development and Fitness for Purpose"; Chapter 10, "Method Validation and Sample Analysis in a Controlled Laboratory Environment"; and Chapter 11 "Examples from the Literature". This material cuts to the heart of the issue, addresses how to develop a successful analytical method, and provides several examples of how other investigators have done the same.

Each chapter includes a useful "Summary of Key Concepts". Several profiles of famous scientists who were instrumental in the development of key analytical techniques are also included in the book. However, one criticism is that some of the illustrations are rather crude in their resolution and style. The authors are not without a sense of humor, though, and interjections and anecdotes keep the tone of this work above that of an undergraduate text, but not as dry as standard treatises from experts on the subject matter. The references are wide ranging and cover historically important developments up to late summer 2007, when the manuscript was completed. Given the coverage of past developments, issues of dated references are moot for most of the book. The challenge for the authors was to present relevant and current examples (Chapter 11). Although some of the data presented are rather dated (1991−1995), the majority of the applications were taken from recent publications (2001−2006) and are quite demonstrative.

Overall, this book could easily find use as a textbook for graduate-level analytical chemists, as an excellent training material for industrial/governmental analysts, or as a comprehensive reference on the topic for researchers.

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JA806615Z

10.1021/ja806615z

Ionic Liquids in Synthesis: Second, Completely Revised and Enlarged Edition, Volumes 1 and 2. Edited by Peter Wasserscheid (Friedrich-Alexander-Univerisität, Erlangen, Germany) and Tom Welton (Imperial College of Science, London, U.K.). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2008. xxvi + 722 pp. $360.00. ISBN 978-3-527-31239-9.

This two-volume set is excellent for any reader with an interest in ionic liquids. It is a comprehensive series that highlights the various aspects of ionic liquids that have made them a versatile solvent and auxiliary in various chemical applications. Volume 1 covers the synthesis and physical differences exhibited by various ionic liquids as well as their use as solvents in organic reactions; Volume 2 focuses on the role ionic liquids play in catalysis, inorganic synthesis, and biocatalysis and the use of ionic liquids in industrial applications. Combined, these two volumes provide a current and in-depth account of the field.

The first volume has five chapters and starts with a clear and broad introduction to ionic liquids followed by chapters on the synthesis and purification of ionic liquids, their physiochemical properties, their molecular structure and dynamics, and the use of ionic liquids in organic synthesis. Each chapter should increase the reader's understanding of the use of ionic liquids. Readers unfamiliar with the emerging importance of ionic liquids in chemistry are given this information in the introductory chapter, whereas the remaining chapters are very comprehensive with updated references that should allow the reader to apply ionic liquids for their desired needs.

The second volume provides the reader with a good understanding of the role ionic liquids play in biocatalytic reactions and in industrial applications in the fields of catalysis, inorganic synthesis, and polymer synthesis. As in Volume 1, each chapter is comprehensive and thorough. In addition, the editor has

written a very good overview of the outlook and future of ionic liquids in the various fields that spans both volumes.

In summary, these volumes provide an excellent, in-depth view of ionic liquids and their role in the field of chemistry. Given the increasing use and emergence of ionic liquids as alternative solvents, these volumes provide a resource for readers learning how ionic liquids are utilized in their particular research area. Furthermore, the Table of Contents and the Index are organized in such a way that it is very easy to pinpoint specific target areas for the use of ionic liquids. In my opinion, this set does a very good job of covering the diversity of ionic liquids. Both volumes are comprehensive enough to be of interest to a variety of readers.

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JA805338Y

10.1021/ja805338y

Chemistry of Zeolites and Related Porous Materials: Synthesis and Structure. By Ruren Xu, Wenqin Pang, Jihong Yu (all at Jilin University, China), Qisheng Huo (Pacific Northwest National Laboratory, USA), and Jiesheng Chen (Jilin University). John Wiley & Sons (Asia) Pte Ltd: Singapore. 2007. xiv + 280 pp. $235.00. ISBN 978-0-470-82233-3.

Zeolites are crystalline microporous materials with uniform pore sizes that have been widely used in the petrochemical industry, ion-exchange for water purification, and gas separations. Hierarchical ordered porous phases—mesoporous, macroporous, and metal organic frameworks—represent an emerging class of porous materials that are promising for diverse functional applications. The scope of this book attempts to cover the fundamentals of materials chemistry of these porous materials.

The first two chapters provide relevant information on generalities and structural aspects of zeolites. It is an important starting point for individuals who have not been widely exposed to this research field. The next chapters focus mainly on synthetic approaches of microporous materials and mechanistic aspects of the formation of zeolites. The use of these porous materials as hosts for diverse chemical guests is also discussed.

In Chapter 8, the synthesis, mechanistic routes, and structural characterization of silica-based mesoporous materials are described; however, the authors only briefly mention a few examples of nonsilicate compositions, even though there are several relevant reviews available in the literature on nonsilica based mesostructured phases. In my opinion, this topic should be a state-of-the-art consideration, since mesostructured transition metal oxides, in particular, could find a broad range of functional applications due to their unique catalytic, separation, electrical, optical, and magnetic properties. Macroporous-templated materials is another topic that is barely touched on in this book, although it is one that deserves a better in-depth analysis. Literature citations are also not a strong point, with less than 9% of all the references being from 2004 to 2007.

In summary, this book mainly covers concepts on structure, chemistry, and applications of zeolites. Other hierarchical ordered porous materials are only briefly introduced. It does, however, represent a useful and comprehensive reference guide for those interested in the field.

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JA806745B

10.1021/ja806745b