

**x"Polysaccharide Materials: Performance by Design.**

Edited by Kevin J. Edgar (Virginia Tech, Blackburg, VA, USA), Thomas Heinze (Center Excellence for Polysaccharide Science, Jena, Germany), and Charles M. Buchanan (Eastman Chemical Company, Kingsport, TN, USA). American Chemical Society: Washington, DC (distributed by Oxford University Press). 2009. x + 292 pp. \$150. ISBN 978-0-8412-6986-6.

The book was developed from a symposium entitled "Synthesis and Structure/Property Relationships of Polysaccharides", which was the Anselme Payen Award symposium of the ACS Cellulose and Renewable Materials Division, held in Chicago, IL in March 2007. It covers, to paraphrase the Preface, the role of polysaccharides in drug delivery, the synthesis of polysaccharide derivatives of controlled microstructure, the use of polysaccharides and their derivatives in advanced materials, the use of complex polysaccharides as chemical feedstocks, and the analytical chemistry of polysaccharides. The book consists of 15 chapters, not including an introductory chapter by one of the editors, as well as author and subject indices.

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**Introduction to Modern Liquid Chromatography, 3rd ed.**

By Lloyd R. Snyder (LC Resources, Inc., Orinda, CA), Joseph J. Kirkland (Advanced Materials Technology, Wilmington, DE), and John W. Dolan (LC Resources, Inc., Amity, OR). John Wiley & Sons, Inc.: Hoboken, NJ. 2009. xlii + 912 pp. \$125. ISBN 978-0-470-16754-0.

Thirty years after publication of the second edition of this book in 1979, the completely updated third edition has appeared. This is one of the most anticipated books in analytical chemistry. Modern liquid chromatography is now the third most used analytical technique, after analytical balances and pH meters, yet most people "using" the technique understand far too few of the fundamentals and consequences of their actions. This book is recommended in the strongest possible terms for anyone doing anything more than simply running an already developed and validated method.

Various chapters thoroughly cover basic concepts of chromatography, instrumentation—including modern detection methods such as mass spectrometry and light scattering—method development, column technology and the chemical modes of separation, gradient elution processes, quantitative analysis, method validation, and selected applications. All of the material is up to date; references are meticulously added at appropriate points and include several citations from 2009.

The authors are the foremost authorities in the field. Snyder and Kirkland are two of the "Fathers" of modern liquid chromatography and are responsible, directly or indirectly, for the development of many of the methods and column technolo-

gies in use today. Dolan is a highly acclaimed chromatographer who is perhaps best known for his long-running column on troubleshooting that appears in *LC-GC*. The combination of these authors has made for a truly comprehensive book that covers the fundamentals and practical operation of liquid chromatographic systems equally well.

It is difficult in these times to ever call a scientific book a "bargain", but this truly is. The wealth of information contained in these almost 1000 pages is invaluable. The book is comprehensive, eminently readable and approachable, and highly useful for both the skilled chromatographer and those new to the technique. Everyone using a liquid chromatographic instrument would benefit from owning a copy.

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**Solid State Electrochemistry I: Fundamentals, Materials and their Applications.**

Edited by Vladislav V. Kharton (University of Aveiro, Portugal). WILEY-VCH Verlag GmbH & Co. KGaA: Weinheim. 2009. xxii + 506 pp. \$210. ISBN 978-3-527-32318.

This book explores the fundamental aspects of solid-state materials, including an introduction to their common classes. The thermodynamics and kinetics of ionic transport in solid-state materials and the applications for each class of them are discussed, and an evaluation of their current trends and limitations and the methodologies for improving the targeted properties is provided. The book is broad in scope, providing numerous systems for the reader to explore and expand upon using the supplied references, which are sufficient for the introduction of each topic. The authors have done a very good job of providing citations that focus on current research in the areas of solid-state electrochemistry. This work should be particularly helpful for those working on the periphery of solid-state chemistry and who may want to expand the scope of their research.

The first portion of the book serves as an introduction to the topic and highlights the role of defect structure in solid-state materials. Long- and short-term defect structures in crystal lattices are differentiated, and the role of temperature in the emergent ionic conductivity is particularly emphasized. The introductory topics are well connected and provide the reader with referrals to subsequent chapters and figures that can be used to strengthen and expand the subject matter. The book then effectively shifts to more applied, current solid-state topics such as nanoionics, intercalation/deintercalation thermodynamics, and kinetics as well as the electrochemistry of micro- and nanoparticles affixed to electrode surfaces. Experimental methods are examined, and materials characterization and evaluation of important parameters such as defect structure and ionic transport in the materials are highlighted. In addition, computational methods are evaluated for numerous systems with a fairly extensive discussion of the agreement between theoretical

and experimental results. The limitations of computational methods are also provided, giving a balanced representation of the current state of the art. Proton/cation as well as multivalent cation and oxygen conduction in solids are subjects of additional chapters and provide a more complete picture of current materials and their applications. Transport in more novel polymer electrolytes is explored, and alternative synthetic methods that influence the inclusion of acid functional groups, the membrane stability, and operation temperatures are related to the overall proton conductivity for PEM materials. Finally, the concluding chapters examine high temperature fuel cells and sensing applications for various solid electrolytes and materials.

In summary, the book succeeds in providing the reader with a concise introduction to a broad and diverse research area. The discussion and references can be used to expand any topic of interest with the advantages and disadvantages of synthetic methods, materials, and approaches for many solid-state electrochemical systems.

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**Esterification: Methods, Reactions, and Applications: Completely Revised and Enlarged 2nd ed.** By Junzo Otera (Okayama University of Science, Japan) and Joji Nishikido (The Noguchi Institute, Tokyo, Japan). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. xii + 374 pp. \$200. ISBN 978-3-527-32289-3.

This second edition of *Esterification* continues the same format as the first, published in 2003, with the content arranged in two sections: Methodology and Synthetic Applications. The new edition includes approximately 500 new references—nearly half of which are associated with green technologies—as well as a new chapter entitled “New Technologies”. The chapter on industrial uses has also been expanded. The book concludes with an epilogue, an extensive reference section, and a subject index.

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**Dictionary of Mass Spectrometry.** By A. I. Mallet (University of Greenwich, U.K.) and S. Down (Consultant, Nottingham, U.K.). John Wiley & Sons, Ltd.: Chichester. 2010. viii + 174 pp. \$50.00. ISBN 978-0-470-02761-5.

This slim and attractively produced volume contains explanations for more than 800 new and commonly used technical terms and acronyms in the field of mass spectrometry, which are accompanied by over 400 illustrations, diagrams, and photographs. It is aimed at both newcomers and experienced practitioners in the field and is extensively cross-referenced, where appropriate. It opens with a list of acronyms and concludes with a list of suggested reading.

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**Stilbenes: Applications in Chemistry, Life Sciences and Materials Science.** By Gertz Likhtenshtein (Ben-Gurion University, Beer-Sheva, Israel). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2010. xii + 348 pp. \$195. ISBN 978-3-527-32388-3.

The isomeric stilbenes have played a key role in the development of modern molecular photochemistry and photo-physics. As the prototypical examples of *cis*–*trans* photoisomerization and pericyclic photocyclization, they have been favorite targets for new experimental techniques and theoretical advances. As long as the theory of electronically excited states remains a scientific frontier, they can be expected to continue to provide fertile ground for the interplay of experiment and theory. Well studied and well understood, the stilbene moiety has been incorporated into every conceivable molecular environment and has been evaluated in myriads of applications. A book that aims to bring in one place a representative cross-section of that vast stilbene-woven tapestry is an ambitious and timely undertaking. While this book has a pretty cover of many colors, the admonition not to judge a book by its cover applies, unfortunately.

The first chapter is a summary of reactions that lend themselves to the synthesis of stilbenes and a description of methods used in their analysis. Although useful synthetic methods are identified, a quick reference check immediately puts the reader on guard. The very first reference (26) to a synthesis, purportedly to an aldol-type condensation of 2,4-dinitrotoluene with an aromatic aldehyde, is clearly incorrect because it refers instead to the synthesis of *p,p'*-disubstituted stilbenes using the Wittig reaction. In the next section, the author mentions the stereospecific synthesis of a *cis*-stilbene using the Siegrist reaction, but the reference given applies to the use of that reaction in the synthesis of all-*trans* polymeric 1,4-phenylenevinyls. Likewise, there are figures that do not match their captions or attendant references and omissions of important material relevant to the topic; for example, under Pd-catalyzed reactions, the use of Lindlar Pd is omitted. The reference that is supposed to describe a Ru–Pd heterodinuclear photocatalyst for the reduction of toluene to *cis*-stilbene without the use of H<sub>2</sub> covers a different Pd-based catalytic reduction instead. The classic stereospecific reduction of diarylacetylenes to *trans*-stilbenes by alkali metals in ammonia is not included, whereas a recent report of stereoselective reductions of toluenes is provided under reactions of stilbenes in the next chapter (see Figure 2.7). Also unmentioned is the photochemical conversion of the *trans* isomers to the *cis* isomers, an important synthetic application of photochemistry. This part of the chapter ends with recent syntheses of several supramolecular systems incorporating stilbene moieties. As with the rest of the book, most of what is presented can be taken directly from the abstracts of the cited references. Included in this chapter are recent (2006–2008) analytical procedures used primarily in the analyses of naturally occurring stilbenes. Historically, Zechmeister's separation of the stilbene isomers by liquid chromatography was an early success of this method, but readers seeking advice on how to separate isomeric stilbenes will not find it here.

The second chapter concerns chemical reactions of stilbenes, and its value lies in the mention of recently reported examples. The use of undefined acronyms, here and throughout the book, is irritating and forces the interested reader to consult the original literature. Seminal contributions of more useful reactions in the older literature are not included. Regrettably, it is left for the

reader to determine the relevance of reviews of enantioselective epoxidation to epoxidation of stilbenes. Considered of sufficient value to be included here is the nonstereospecific stilbene epoxidation, which is presented in Figure 2.5. Whenever I came upon a curious assertion, I consulted the original literature, only to discover that the assertion was in error. For example, electron transfer is claimed from the 9-mesityl-10-methylacridinium ion to stilbene, whereas the cited paper postulates reverse electron flow from stilbene to the electronically excited ion. Carbolithiation of *trans-o*-aminostilbenes is described in a section titled "Carbolization". The incorrect title aside, it is not clear why those reactions were not described in the preceding section on "Vinyl Lithiation". Again, there are examples here and throughout the book of incomplete, incorrect, and sometimes baffling references as well as repetition of material.

Chapter 3, "Stilbene Photophysics", begins with a generalized state diagram. The expectation that a stilbene-specific state diagram would follow is not fulfilled. The author continues with a description of theoretical calculations on the lowest excited singlet states of the stilbenes. The choice of a single reference out of the plethora of publications in this still controversial area is arbitrary. There are numerous examples of material that is confusing, out of sequence, and out of context: for example, one figure shows *cis*-stilbene orbitals only—although the text claims that it shows orbitals for both isomers—the discussion of which is immediately followed by coverage of tetraphenylethylene (TPE) ground and singlet excited state energetics, inferred from an experimental study. Also, under the heading "Excited Triplet State", predictions are taken from two theoretical papers dealing with nonvertical triplet excitation transfer to *cis*-stilbene. The context of those studies is not mentioned until later nor is the fact that they appear to reach diametrically opposed conclusions. Many more examples of the lack of critical review on the part of the author can be found in the book.

Problems that plagued the first three chapters continue to haunt the fourth, entitled "Stilbene Photoisomerization". Here are just a few examples: (1) The author lumps together stilbene photoisomerization via direct- and triplet-sensitized excitation and does not mention the possibility, realized with certain substituents, of reaching the triplet state by intersystem crossing; (2) The author's list of "photochemical deactivation channels"

that "have been discussed" includes processes in substituted stilbenes whose structures are not given. Missing are intersystem crossing and adiabatic photoisomerization in  $S_1$ ; (3) The author makes no distinction between concepts that have withstood experimental tests and those that are mere hypothesis; (4) The section entitled "Through Double Bond Twisting (Saltiel Mechanism)" is misnamed. Excitation leads to reversal of double/single bond character so that rotation about the central bond in  $S_1$ , i.e., one bond twist, cannot be regarded as double bond twisting; and (5) In view of the large number of systematic meticulous studies of viscosity effects on the parent stilbenes and the significant critical tests of theoretical predictions that they have provided, proper coverage of that subject could require a chapter by itself. The author allocates to it a little more than a page in Section 4.4, entitled "Viscosity Effect". It begins with a reference to a contribution from the author's laboratory on 4,4'-disubstituted stilbenes that is replete with conceptual and experimental errors. I was surprised to see that paper thank this reviewer for valuable comments when I did not even know of its existence. Viscosity effects on intermolecular energy transfer are then jumbled together with viscosity effects on intramolecular torsional relaxation.

This book presents conclusions uncritically from arbitrarily, at best, selected papers. No attempt is made to integrate different contributions into a coherent whole or to resolve opposing views by considering their relationship to experimental findings. The sloppy editing is exemplified in the liberal use of "exited" for "excited" on several pages. Stilbenes have fascinated me and been a focus of my research. I expected this review to be a worthwhile and rewarding undertaking. It turned out to be a chore. After careful examination of more than one-third of this book and having found no redeeming features, with the reader's indulgence, I take my cue from that spelling error to exit this task.

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