Book Reviews *

Houben-Weyl. Organo-Fluorine Compounds. Workbook Edition E10b/1. Edited by Bernd Baasner (Leverkusen), Hermann Hagemann (Leverkusen), and John C. Tatlow (Birmingham). Georg Thieme Verlag: Stuttgart. 2000. xvi + 724 pp. $199.00. ISBN 3-13-119064-7.

This volume of the E10 series encompasses the synthesis of fluorinated compounds from organofluorine precursors. The methods of synthesis are organized according to whether or not they preserve the original carbon skeleton of the substrate.

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Houben-Weyl. Organo-Fluorine Compounds. Workbook Edition E10b/2. Edited by Bernd Baasner (Leverkusen), Hermann Hagemann (Leverkusen), and John C. Tatlow (Birmingham). Georg Thieme Verlag: Stuttgart. 2000. xiv + 886 pp. $199.00. ISBN 3-13-119164-3.

Volume E10b/2 continues where E10b/1 concluded by covering further methods of synthesis of fluorinated compounds. These include reactions involving oxidation, intramolecular dehydrohalogenation and dehalogenation, isomerization, and disproportionation. It also contains a review of general reactions and reactivity of organofluorine compounds.

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Handbook of Chemical Risk Assesment: Health Hazards to Humans, Plants, and Animals. Volume 1: Metals; Volume 2: Organics; Volume 3: Metalloids, Radiation, Cumulative Index to Chemicals, and Species. By Ronald Eisler (Patuxent Wildlife Research Center). Lewis Publishers: Boca Raton, FL. 2000. $250 (set). ISBN 1-56670-506-1 (set).

This three-volume set provides comprehensive coverage of 1500 chemicals that contaminate the environment and details their real and potential impact on plants and animals. The chemicals selected were recommended by environmental specialists of the U.S. Fish and Wildlife Service and other resource managers. Each chapter focuses on one contaminant, such as lead, and includes information about its source and use; physical, chemical, and metabolic properties; concentration in field collections; and lethal and sublethal effects. Recommendations for regulating each contaminant are also given.

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CRC Handbook of Laboratory Safety, 5th Edition. Edited by A. Keith Furr (formerly at Virginia Polytechnic Institute and State University). CRC Press: Boca Raton, FL. 2000. xxviii + 774 pp. $149.99. ISBN 0-8493-2523-4

This edition of the *CRC Handbook of Laboratory Safety* provides information on standards for setting up a laboratory that meets the latest safety requirements from OSHA, the Centers for Disease Control, and the Nuclear Regulatory Commission. Some of its new features include Internet references, changes in the Clean Air Act regarding the incineration of hospital, medical, and infectious waste, and new information on respiratory protection guidelines.

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Clean Synthesis Using Porous Inorganic Solid Catalysts and Supported Reagents. By James H. Clark and Christopher N. Rhodes (University of York). Royal Society of Chemistry: Cambridge. 2000. x + 107 pp. £55. ISBN 0-85404-526-0

According to the authors, the aims of this monograph are to (1) use important and varied examples of porous inorganic solid-catalyzed organic reactions to illustrate the scope and potential of the subject and (2) provide important fundamental information on heterogeneous catalysis and the preparation and use of solid catalysts in liquid-phase organic reactions (for inexperienced organic chemists) to exploit these exciting new process ideas. Unfortunately, the authors fall short in accomplishing these goals.

One aspect that deters researchers in organic synthesis and reactions from using heterogeneous catalysis is the notion that it is more of an art than a science. The perception is that there are few predictive trends, and results can be often either irreproducible or very sensitive to operating parameters. Those familiar with the field of heterogeneous catalysis realize that the apparent catalytic properties of a heterogeneous solid depend strongly on the detailed environment of the solid surface and active sites that are functions of the preparation and pretreatment conditions of a sample and on the test conditions that affect the heat and mass transfer effects. This monograph has not provided the necessary description of the fundamental chemical or physical principles for newcomers to use the information with confidence. Phrases such as “the mesopores of the support creating high reaction fields which are highly activating” and alumina available in “acidic, basic, and neutral forms” that appear without explanation provide little clarification. Moreover, out-dated information, such as that about the acidic strength of zeolites and clay and the effect of modification of zeolites, adds to the confusion. Finally, the examples were not particularly enlightening. Reactions of special interest for organic synthesis, such as asymmetric hydrogenation, selective hydroxylation, selective oxidation of complex molecules, aldol condensation, ketene formation, anti-Markovnikov activation, etc., are not well represented.

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Advances in Polymer Science. Volume 152. Viscoelasticity, Atomistic Models, Statistical Chemistry. Contributions by J. Baschnagel et al. Springer-Verlag: Berlin. 2000. x + 216 pp. $125.00. ISBN 3-540-66735-0.

This volume is comprised of the following three chapters: (1) Prediction of Viscoelastic Properties and Shear Stability of Polymers in Solution, by G. Gregorescu and W.-M. Kulicke; (2) Bridging the Gap between Atomistic and Coarse-Grained Models of Polymers: Status and Perspectives, by J. Baschnagel, K. Binder, P. Doruker, A. A. Gusev, O. Hahn, K. Kremer, W. L. Mattice, F. Müller-Plathe, M. Murat, W. Paul, S. Santos, U. W. Suter, and V. Tries; and (3) Principles of the Quantitative Description of the Chemical Structure of Synthetic Polymers, by S. I. Kuchanov.

The chapter on models for the equilibrium and dynamic properties of melt polymers, which is the longest of the three, presents strategies for predicting certain observable properties of polymeric melts by using calculations on models that incorporate a range of atomistic detail. The general perspective may be exemplified by the following excerpt: “A brute force approach, consisting of a simulation of fully atomistic models of a sufficiently large system over time scales for which thermal equilibration could be reached at practically important temperatures, is totally impossible. Useful progress requires a different approach.” Accordingly, the authors discuss models over a range of atomistic detail and strategies for mapping the results of one type of model onto those of another, from atomistic models to coarse-grained ones and vice versa, with numerous examples from the work of the authors and others. The models and methods are described in sufficient detail to illustrate their relative merits and standing in the hierarchy of atomistic detail (or lack thereof) and to stimulate the reader to explore the original literature on the models treated. These include the rotational-isomeric-state model at one extreme and various lattice models and Monte Carlo simulations at the other. A number of examples of treatments on specific polymers are included for the range of models considered. This chapter is highly recommended, both for those who seek an introduction to the subject and for those familiar with aspects of the subject but who wish to expand their repertoire.

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[*] Unsigned book reviews are by the Book Review Editor.

The first chapter presents a discussion of some empirical expressions for representing the viscosity η of moderately concentrated polymer solutions, as well as a discussion of the dependence of the nonlinear viscosity $\eta(\gamma)$ on the shear rate $\dot{\gamma}$, and issues of the flow stability at large $\dot{\gamma}$. The empirical expression for η comprises linear, quadratic, and nonintegral power-law terms in the product $c[\eta]$ of the polymer concentration, c, and intrinsic viscosity, $[\eta]$, with the power law term designed to give the observed dependence of the viscosity on molecular weight M. The authors give expressions for a number of polymer/solvent pairs, but unfortunately fail to include clear and easily noted citations to the source or the range of c and M for the data. Though $c[\eta]$ is sometimes employed for empirical purposes over a suitable range of c and M, the representation in terms of $c[\eta]$ suffers from a lack of contact with physical principles, except at low concentration, and is inherently limited in revealing the underlying physics. For example, the progressive screening of intramolecular excluded volume and hydrodynamic interactions and the onset of intermolecular chain entanglement interactions, along with the change in local friction effects, will usually invalidate the scaling of η with $c[\eta]$ with increasing c and molecular weight. The authors discuss the time constant τ used to represent $\eta(\dot{\gamma})/\eta$ as a function of $\tau\dot{\gamma}$, presenting τ in terms of $c[\eta]$. Since it is found for most materials that $\tau = J_s\eta$ over a wide range of $\tau\dot{\gamma}$, with J_s being the steady-state (linear) recoverable compliance, this is equivalent to a representation of J_s in terms of $c[\eta]$. This has some of the same limitations that were mentioned above for the analogous treatment. The authors include some discussion of other nonlinear viscoelastic effects and flow stability in the final sections.

The final chapter is devoted to discussion of a mathematical formalism for the statistical representation of the microstructure of a polymer chain or set of chains. Examples include the distribution of chain length along with the sequence distribution of any distinguishing features of the repeat units comprising the polymer chains, such as the head-to-head, etc., sequence, the sequence of the chemical structure of the repeat units in a copolymer sample, the sequence of syndiotactic and isotactic repeat unit placements, or other similar attributes. Much of the formalism presented derives from work of the author (with nearly half of the references citing his work). In part, the present contribution builds on material presented by the author and co-workers in a chapter in *Advances in Chemical Physics*, Vol. 72 (Wiley: New York, 1988). Similar statistical treatments have been published by others, especially in connection with discussions of comonomer and stereo structure sequences. The author applies the formalism to discussions of several examples, including free-radical and anionic copolymerizations, step polymerizations, and branched polymers. In view of the increasing sophistication of experimental methods to reveal sequence distributions of repeat units and the complexity of many polymers found in successful applications, the formalism presented by the author may find use by workers interested in characterizing these materials.

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The Transition State: A Theoretical Approach. Edited by Takayuki Fueno (Osaka University and Aichi Institute of Technology). Kodansha: Tokyo and Gordon Breach Publishers: Amsterdam. 1999. xvi + 328 pp. $120.00. ISBN 90-5699-216-3

The transition state (TS) plays a basic role in our understanding of chemical reactions. This book, a collection of 15 review articles by Japanese experts on various aspects of transition state theory (TST), is a useful addition to the literature. I would not hesitate to recommend that it be added to any chemistry library.

Many such collections of review articles do not really serve as good general references. The varying quality of the different contributions, coupled with a natural propensity for each author to highlight his or her own narrow research area, does not lead to a very coherent picture. However, this collection is a little different. Several of the chapters include or represent relatively broad overviews, and there is an interesting blend of theoretical, applied theoretical, and even experimental research topics. I would say that this book lies somewhere between a good advanced level chemical kinetics textbook [e.g., Steinfeld, J. I.; Francisco, J. S.; Hase, W. L. *Chemical Kinetics and Dynamics*; Prentice Hall: Englewood Cliffs, NJ, 1998] and a more thorough, research-oriented review of TST [e.g., Truhlar, D. G.; Garrett, B. C.; Klippenstein, S. J. *J. Phys. Chem.* **1996**, *100*, 12771−12800]. As such, it provides a bridge between basic chemical reaction theory and state-of-the-art research.

Readers will find reasonable introductions to many areas of TST, including gas-phase bimolecular and unimolecular reactions, the use of electronic structure theory to find TS structures, reactions in solution, and TS spectroscopy, as well as some mathematical and quantum dynamics aspects. The book also contains some more chemically oriented chapters on organometallic reactions and compounds containing heavier main group elements.

A deficiency in the book is that, aside from the chapter on reactions in solution, relatively little attention is paid to the TST of condensed phases.

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Chromatographic Science Series. Volume 83. Micellar Liquid Chromatography. By Alain Berthod (Universite Claude Bernard, Lyon 1) and Celia Garcia-Alvarez-Coque (University of Valencia). Marcel Dekker: New York and Basel. 2000. 632 pp. $195. ISBN 0-8247-9993-3.

Micellar liquid chromatography is a form of reversed-phase liquid chromatography employing an aqueous-organic mobile phase to which is added a surfactant at a concentration sufficient for micelle formation. Separations result from the distribution of solutes between the surfactant-coated stationary phase, a micellar pseudophase, and the aqueous-organic portion of the mobile phase. Micellar liquid chromatography has been practiced for about 20 years but has not proven to be a popular separation technique and has few general applications of note. Its use is minor compared to micellar electrokinetic chromatography (MEKC), which also employs a micellar pseudophase for separations.

This book provides the first comprehensive account of the development of micellar liquid chromatography, although most of the material is available in recent review articles. The authors are enthusiastic about the technique but do not hide its deficiencies: namely, lower efficiency sometimes accompanied by poor peak shapes, limited elution strength, and the need for careful system maintenance when compared to conventional reversed-phase chromatography. The primary variables used to optimize a separation are surfactant and organic modifier concentration and pH. Included with the book is a CD-ROM containing a version of the software MICHROM, which can be used for the iterative optimization of these variables using empirical and fundamental models introduced in the text. The software is easy to use and seems to function correctly. The general layout of the book is fine except for the figures, which have probably been scanned into the text, and are of variable quality and in many different styles.

The market for this book is likely limited since it deals with a specialized separation technique that has failed to reach mass popularity. Indeed, one of the shortest chapters in the book discusses the applications of this technique. Not only are these few in number but most could be better accomplished by other methods. The direct analysis of physiological fluids, the separation of weak acids and bases with similar acid dissociation constants in water, and enhanced limits of detection for fluorescent compounds are indicated as strengths of the technique, but still these are not widely employed in practice. Most studies have been performed for curiosity, providing a reasonable physical basis for the separation mechanism and to determine the physical properties of micelles. The book may, therefore, be of some interest to academics, but my own feeling is that micellar liquid chromatography is still a technique in search of a reason for its existence and is not a generally useful tool in the separation sciences. Its status could be comprehensively summarized in less space as part of a broader work on secondary chemical equilibria in reversed-phase chromatography without loss of any essential information. This would have been preferable in my opinion.

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