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BOOK REVIEWS

Block Copolymers in Solution: Fundamentals and Applications. By Ian W. Hamley (University of Reading, UK). John Wiley & Sons, Ltd.: Chichester. 2005. xii + 288 pp. $180.00. ISBN 0-470-01557-8.

An enormous amount of information is available on the solution state of block copolymers (BCPs), and this book is certainly vital to scientists and engineers working with these materials. The book is logically arranged into chapters on dilute neutral BCPs, concentrated solutions, polyelectrolyte BCPs, adsorption, and applications.

The chapter on dilute solutions has extensive discussions of experimental methods for studying formation of micelles and determining critical micelle concentration, thermodynamics, micelle sizes and types (including wormlike micelles), vesicles, and the effects of adding small-molecule surfactants. The factors driving formation of micelles and controlling their aggregation number are clearly explained for nonexperts.

The chapter on concentrated solutions that follows includes a synopsis of phase diagrams, with many specific examples, and discussions of gelation, rheology, order−disorder, and order−order transitions, as well as scattering studies of ordering kinetics, domain spacings, and the primary results from self-consistent field theory. While the last topic lacks many of the details of this theory, important references are provided. A superb discussion of flow alignment is included, and the main results for lamellar, hexagonal, and cubic phases are presented.

Polyelectrolyte BCPs are discussed in the next chapter, which includes coverage of micelle formation, effects of charge density and salt, scattering measures of chain conformations, and simple scaling models for categorizing these results. Brief mention is made of polyion complexation, the effects of small-molecule surfactants, polyampholyte BCPs, and the gelation that occurs at high concentrations. The chapter ends with an interesting discussion of peptide-containing BCPs, which can form α-helices and β-sheets, and how these structures can be utilized to form hydrogels.

The following chapter on adsorption includes Langmuir−Blodgett isotherms and neutron reflectivity data on BCPs at the air−water interface. AFM, surface plasmon resonance, and neutron reflectivity studies of BCPs adsorbed on solid surfaces, including a discussion of adsorption of micelles, are also presented. Brief mention is made of results from the sophisticated "surface forces apparatus", adsorption models, and the results of simulations.

The concluding chapter on applications is extremely thought-provoking. After a presentation of some obvious uses of BCPs as conventional surfactants in the solubilization, emulsification, and stabilization of foams, this chapter contains highly interesting discussions of drug delivery, biodegradable BCPs, thermo-responsive materials, nanoreactors, templating, and membranes.

Overall, this book nicely summarizes the field, touching on all the important aspects. Owing to its broad scope, the book leaves out many details regarding both models and experiments, referring the reader instead to the relevant literature. However, the referencing throughout the book is very thorough and up-to-date. The weakest part of the book is the index. For example, pentablock copolymers, lyotropic lamellar phases, and applications such as fuel cell membranes and hollow microspheres are all nicely discussed in the book, but these topics are not listed in either the index or the table of contents.

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Resorcinol: Chemistry, Technology and Applications. By Raj B. Durairaj (Indspec Chemical Corporation, Pittsburgh). Springer: Berlin, Heidelberg, New York. 2005. xxvi + 748 pp. $329.00. ISBN 3-540-25142-1.

The aim of the author in writing this book was "to outline the advantages of resorcinol chemistry and technology in various applications". There are 10 chapters that cover a range of topics, from the structure and physical properties of resorcinol to manufacturing processes to various applications of resorcinol chemistry. A subject index completes the book.

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The Science and Technology of Rubber, 3rd Edition. Edited by James E. Mark (The University of Cincinnati), Burak Erman (Koc University, Istanbul), and Frederick R. Eirich (Polytechnic University, Brooklyn). Elsevier Academic Press: San Diego, CA. 2005. xviii + 744 pp. $125.00. ISBN 0-12-464786-3.

Like its predecessors, this edition of *The Science and Technology of Rubber* provides a broad overview of elastomers and materials of rubberlike elasticity and covers a range of areas from elastomer synthesis to vulcanization to tire engineering. The 14 chapters that appeared in the second edition have been revised and expanded in this one to include new developments in the field, and a new chapter on the recycling of rubbers has been added. An extensive index completes the book.

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Annual Review of Physical Chemistry, Volume 56, 2005. Edited by Stephen R. Leone, Paul Alivisatos (University of California, Berkeley), and Ann E. McDermott (Columbia University). Annual Reviews: Palo Alto, CA. 2005. xiv + 640 pp. $82.00. ISBN 0-8243-1056-X.

Unsigned book reviews are by the Book Review Editor.

10.1021/ja059842u CCC: $33.50

This volume, like its predecessors, covers a broad array of topics in physical chemistry, from nonlinear optical and excited-state dynamics of organic dendrimers and branched chromophores to lipid rafts to Rydberg wave packets. There are 20 chapters, a sampling of which includes "Quantum Chaos Meets Coherent Control" by Gong and Brumer and "Heat Capacity in Proteins" by Prabhu and Sharp. The book concludes with a Subject Index, a Cumulative Index of Contributing Authors, Volumes 52−56, and a Cumulative Index of Chapter Titles, Volumes 52−56.

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Metal-Catalysed Reactions of Hydrocarbons. By Geoffrey C. Bond (Brunel University, Uxbridge, UK). Springer: New York. 2005. xxii + 666 pp. $129.00. ISBN 0-387-24141-8.

The hydrogenation of hydrocarbons and related reactions are critically important both industrially and as classic examples of processes that are catalyzed by metal surfaces. The wealth of information available relating to the organic chemistry, surface science, and catalytic aspects of this field appears in a bewildering array of papers, making it a particularly daunting subject for the uninitiated. It is therefore a real pleasure to see a current, readable book that is devoted to the metal-catalyzed reactions of hydrocarbons under reducing conditions.

This is a painstaking work in which the author seeks to explain the current understanding of this field from first principles. Although the generalities of many of these reactions are familiar to most researchers and advanced students, the comprehensive treatment given in this text will undoubtedly give its readers a deeper appreciation of the mechanisms that lie at the heart of many important industrial processes. The material is presented in a very clear and well-paced style that acts as a careful guide toward an understanding of the physical chemistry of these catalytic reactions. Throughout, the author critically assesses the primary literature and directs the reader to key papers.

The book begins with two chapters giving a detailed overview of the structure and properties of metals and metal particles. Descriptions of the chemisorption of hydrogen and hydrocarbons are the subjects of the following two chapters. The fifth chapter is an introduction to the nature and activity of catalysts. This lengthy introductory material (255 pages!) serves to bring nonphysical chemists up to speed with the important concepts developed in the core chapters of the book. After a discussion of the deuterium exchange reaction of alkanes, the hydrogenation of alkenes, dienes and polyenes, alkynes, aromatics, and alicyclic species are each treated in separate chapters. The final three chapters cover dehydrogenation reactions of alkanes and the reactions of alkanes with hydrogen.

This book will be a significant aid for those wishing to gain a working knowledge of catalysis on metal surfaces. Chapter 5, "Introduction to the Catalysis of Hydrocarbon Reactions", could stand alone as the basis of a short course on the fundamentals of catalysis. In addition, the later chapters on the hydrogenation of specific hydrocarbon systems could be used effectively as course material for advanced undergraduate or graduate students.

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Inorganic Polymeric Nanocomposites and Membranes. Advances in Polymer Science, 179. Springer: Berlin, Heidelberg, New York, 2005. x + 220 pp. $209.00. ISBN 3-540-253254.

There are four chapters in this unedited volume of *Advances in Polymer Science:* (1) "Polysilalkylene or Silarylene Siloxanes Said Hybrid Silicones" by Guida-Pietrasanta and Boutevin; (2) "Epoxy Layered Silicate Nanocomposites" by Becker and Simon; (3)"Proton-Exchanging Electrolyte Membranes Based on Aromatic Condensation Polymers" by Rusanov et al.; and (4) "Polymer-Clay Nanocomposites" by Usuki and Kato. Author and subject indexes complete the book.

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