

Book Review

Polymer Synthesis. Advances in Polymer Science, 171 With contributions by Toshikazu Takata (Tokyo Institute of Technology), Nobuhiro Kihara, Yoshio Furusho (Osaka Prefecture University), Michinori Sugimoto (Kyoto University), Yoshihiko Ito (Doshisha University), Kohtaro Osakada, and Daisuke Takeuchi (Tokyo Institute of Technology). Springer-Verlag: Berlin, Heidelberg, New York. 2004. x + 214 pp. \$199.00. ISBN 3-540-21711-8.

David E. Bergbreiter

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Surface and Interfacial Tension: Measurement, Theory, and Applications. Surfactant Science Series, Volume 119. Edited by Stanley Hartland (ETH Swiss Federal Institute of Technology, Zürich). Marcel Dekker, Inc.: New York, Basel. 2004. x + 620 pp. \$175.00. ISBN 0-8247-5034-9.

This volume covers interfacial phenomena, ranging from foaming and bubbling to wetting and capillary penetration, and the role played by surface and interfacial tension in governing them. Theoretical interpretation and careful experimentation are presented in detail to illustrate the mechanisms involved in interfacial phenomena and the effects of surfactants on them.

The beginning chapter on foams is a description of the drainage, coalescence, and collapse in standing foams by appropriate theoretical models. The next chapter covers the stability of foam films in aqueous systems in terms of surface tension. Various methods to characterize foam stability, foam lifetime, and bubble size distribution are summarized, and mechanisms of foam stabilization and antifoaming are discussed. A chapter on liquid drops at surfaces follows, presenting a good discussion on how the shape of droplets on a solid substrate is determined by surface and interfacial tension, with special attention given to the effects of gravitational field, line tension, and surface micelles/vesicles on droplets on surfaces.

The effects of capillary forces on fluid flow are covered in two chapters. The first is a discussion of the role of surface tension in solution–air systems and interfacial tension in solution–oil systems in controlling solution flow in both hydrophobic and hydrophilic quartz capillaries, as can be seen by monitoring the movement of the menisci of surfactant solutions in capillaries. The other chapter covers capillary-driven flow in the manufacture of composites. In addition to a description of the nature of capillary-driven fluid flow through generally porous media, successive flow models are considered as a means to describe the physics of capillary effects in liquid composite modeling (LCM) processes.

There are two chapters devoted to measurements of contact angles. One is a general discussion of the methods of measurement for contact angles and surface tensions based on the change of surface/interfacial dynamics or geometrical quantities. The other focuses on contact angles of solutions on fibers. A series of direct and indirect approaches for measuring the contact angle on fibers and fibrous assemblies are presented, and fiber–surfactant interactions and wetting of fibers are discussed.

Bubble motion, nucleation, and detachment are the topics of two chapters as well. In one of them, several approaches and methods for numerically simulating the flow around a bubble, which in turn describes bubble motion in liquids, are discussed. The companion chapter mainly focuses on bubble nucleation, including a brief discussion on detachment. Both homogeneous nucleation in bulk solution and nucleation processes at hetero surfaces are discussed. The last chapter presents a detailed theory for describing curved interfaces by considering curvature effects in terms of surface and interfacial tensions.

This book provides a good and adequate, although not necessarily complete, survey of the literature on interfacial phenomena and should be useful to researchers working in the area of interfacial chemistry and surfactants.

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Polymer Synthesis. Advances in Polymer Science, 171. With contributions by Toshikazu Takata (Tokyo Institute of Technology), Nobuhiro Kihara, Yoshio Furusho (Osaka Prefecture University), Michinori Suginome (Kyoto University), Yoshihiko Ito (Doshisha University), Kohtaro Osakada, and Daisuke Takeuchi (Tokyo Institute of Technology). Springer-Verlag: Berlin, Heidelberg, New York. 2004. x + 214 pp. \$199.00. ISBN 3-540-21711-8.

Advances in Polymer Science is a venerable series of reviews of topics relating to the synthesis, characterization, and use of polymers and polymeric materials. This volume focuses on synthetic issues. It is a collection of three reasonably up-to-date reviews dealing with polyrotaxanes and polycatenanes, polyisocyanides, and coordination polymerization of dienes and methylenecycloalkanes. Although it is perhaps unlikely that an individual would have a simultaneous interest in all three of these somewhat disparate synthetic topics, this volume of the series, like its predecessors, clearly belongs in the collection of any group that has an interest in the preparation and use of organic macromolecules.

The three chapters are written in three quite different styles. The first one on polyrotaxanes and polycatenanes is a comprehensive review of polymers that are assembled through non-covalent interactions. While the writing in it is not the best, the chapter is very thorough, even detailing the various classes of interlocked polymers that have yet to be prepared. References extend to 2003, although coverage of that year does not appear to be complete. Synthetic approaches are adequately and critically summarized; however, the discussion of why these materials are of interest could have been addressed more clearly. Although the authors hint that these materials might become interesting parts of nanomachinery, it is more likely that a reader will have to be content with the challenges of preparing these novel molecular assemblies.

The second chapter deals with transition-metal-catalyzed synthesis of polyisocyanides. It is a very well-written chapter. Like the chapter on interlocked polymers, it contains a few references from 2003. Most of the references are somewhat older, however. The chapter includes some mechanistic details of the polymerization of polyisocyanides as well as a good discussion of asymmetric polymerization of these helical rigid rod polymers.

The third and final chapter is the least focused, as might be surmised from its title “Coordination Polymerization of Dienes,

Allenes and Methylenecycloalkanes". I found it to be diffuse because of the variety of substrates described. 1,3-Butadiene and 1,5-hexadiene, for example, really have little in common other than the fact that metals and metallocene catalysts affect both polymerizations. The most interesting part of the chapter is the section dealing with polymerization and copolymerization of methylenecycloalkanes because these monomers are structurally isomeric with conjugated dienes and because of the interesting types of polymeric structures (e.g., structures with pendant =CH_2 groups) that these novel monomers produce.

Although the book was supplied in hard copy, I also briefly examined an electronic version of the book available through our library. The electronic version could be saved as a PDF file, which was searchable using Adobe Acrobat. I found such access useful as it allowed me to find a citation and associated footnote more easily. According to the book's front matter, such electronic versions are available for all customers who have standing orders to the *Advances in Polymer Science* series.

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Vapour and Trace Detection of Explosives for Anti-Terrorism Purposes. Edited by Michael Krausa (Fraunhofer Institut für Chemische Technologie, Pfingsttal, Germany) and Aleksey Alekseyvitch Reznov (SMC Technological Center MIET, Moscow, Russia). Kluwer Academic Publishers: Dordrecht, The Netherlands. 2004. x + 152 pp. \$94.00. ISBN 1-4020-2714-1.

This book was developed from a NATO Advanced Research Workshop of the same title held in Moscow, Russia, in March 2003, where different strategies for vapor and trace detection were discussed. This workshop was the first of a three-part series on the detection of explosives. The second dealt with methods for bulk detection, and the third focused on electronic noses. A sampling of the chapters in this volume includes the following: "Analysis of Explosive Vapor Emission to Guide the Development of Vapor Detectors", "Remote Explosive Scent Tracing", and "Detection of Traces of Explosives by Means of Sniffing Dogs". There is no index.

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Encyclopedia of Analytical Science, 2nd ed., Volumes 1–10. Edited by Paul J. Worsfold (University of Plymouth), Alan Townshend (University of Hull), and Colin E. Poole (Wayne State University). Elsevier: Amsterdam. 2004. 5000 pp. \$4570.00. ISBN 0-12-764100-9.

The second edition of this very useful reference consists of more than 600 articles in an A to Z format covering all aspects of the science and practice of analysis, from the fundamental to the applied. All of the articles were written by leading international authorities and cover a wide range of applications

of chemical analysis in areas such as medicine, environmental science, and food science, to name a few. Articles are cross-referenced, and there is a detailed index. An online version is scheduled to be made available in the Spring of 2005.

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Charged Particle and Photon Interactions with Matter. Chemical, Physicochemical, and Biological Consequences with Applications. Edited by A. Mozumder (University of Notre Dame, Notre Dame, Indiana) and Y. Hatano (Tokyo Institute of Technology, Tokyo, Japan). Marcel Dekker, Inc.: New York, Basel. 2004. xii + 870 pp. \$235.00. ISBN 0-8247-4623-6.

This book contains 27 chapters that cover a range of topics from the most fundamental, such as a chapter on ionization and secondary electron production, to the very specific, such as a chapter on food irradiation. It was compiled, in the words of the editors, "to present a coherent account of high-energy charged particle and photon interaction with matter, in vivo and in vitro, that will be of use to both students and practicing scientists and engineers". This is a formidable task because of the diversity of topics, but one that is largely successful nevertheless.

The editors include articles by many of the foremost authorities in their fields. After an introductory chapter, the volume begins with a general background on particle matter interaction by Mozumder. This is followed by two chapters on the details of particle matter interaction, focusing first on the particle (by Toburen) and then on the matter (by Pimblott and Mozumder). At this point, the focus of the book turns to specific interactions. Chapter 5 contains a discussion by Kouchi and Hatano on photon interaction with molecules, and Chapter 6 addresses reactivity in the gas phase by Ukai and Hatano. The interaction of electrons is the subject of the next four chapters, led by a chapter on solvation of both electrons and anions by Jonah and followed by chapters on electrons in nonpolar liquids by Holroyd, electron interaction with atomic and molecular solids by Bass and Sanche, and electron-ion recombination by Wojcik, Tachiya, Tagawa, and Hatano. The book then focuses on different mediums, with chapters on radical ions in liquids by Shkrob and Sauer, radiation chemistry in water by Buxton, and photo- and radiation chemistry in alkanes by Wojnarovits. A chapter by LaVerne expands the discussion on radiation chemistry to heavy ions.

The emphasis of the volume then shifts to more applied topics, such as the uses, applications, and consequences of radiation/photon interactions. There are four chapters on biological topics: the first two cover the biological consequences of ionizing radiation and photons by Bernhard and Close, and Kobayashi, respectively, and the remaining two deal with track structures by Nikjoo and Uehara and microdosimetry by Zaider and Dicello. The book then segues into materials chemistry with chapters on polymers (Tagawa, Seki, and Kozawa), metal clusters and photographic systems (Belloni and Mostafavi), and the molecular design of functional organic materials (Ichikawa). A chapter on organic reaction mechanisms by Majima appears next. The final five chapters cover some technologies that exploit

features of radiation chemistry and include chapters on nuclear technology by Katsumura, electron beams for treating flue gases by Namba, ion beams in medical therapy by Wambersie, Gueulette, Jones, and Gahbauer, food irradiation by Farkas, and ion beams in engineering by Fukuda, Itoh, Ohshima, Saidoh, and Tanaka.

Some of the topics addressed in this volume have been reviewed extensively in the past and are included here to facilitate understanding of the fundamental processes, which is crucial to grasping the subsequent material. Some chapters, such as that on the interaction of low energy electrons with solids by Bass and Sanche, have not been comprehensively reviewed recently and are very topical, as our understanding of the basic interaction of particles and matter has developed dramatically in the past two decades.

The volume does an excellent job of giving a perspective on the focus of radiation and photon interaction in more complex systems in the past 10–20 years. In particular, nanowires and nanoclusters are discussed extensively within chapters on the uses of radiation and photons in polymers and metal clusters. All of the sections covering biologically related topics give a great deal of attention to radiation-induced DNA damage, another area that is receiving increasing attention. The two chapters on ion beams are fascinating surveys of the facilities, capabilities, and recent applications of this technique to a wide range of research.

Many authors include material through 2002, so the book may be considered reasonably current. I have some doubts that the more fundamental material presented here would be accessible to students, except to those at an advanced level. In addition, the price of this volume renders it out of the reach of

most students. It would, however, be a very valuable addition to libraries because of the breadth of its contents.

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Comprehensive Organic Functional Group Transformations II, Volumes 1–7. Edited by Alan R. Katritzky (University of Florida) and Richard J. K. Taylor (University of York). Elsevier: Amsterdam. 2004. 6400 pp. \$4,950.00. ISBN 0-08-044256-0.

The second edition of this very useful reference consists of 144 reviews written by leading scientists who evaluate and summarize methods for organic functional group transformations. In the words of the editors, this work “presents the vast subject of organic synthesis in terms of the introduction and interconversion of functional groups.” The individual volumes are titled as follows: (1) Carbon with No Attached Heteroatoms; (2) Carbon with One Heteroatom Attached by a Single Bond; (3) Carbon with One Heteroatom Attached by a Multiple Bond; (4) Carbon with Two Heteroatoms, Each Attached by a Single Bond; (5) Carbon with Two Attached Heteroatoms with at Least One Carbon-to-Heteroatom Multiple Link; (6) Carbon with Three or Four Attached Heteroatoms; and (7) Author Index and Cumulative Subject Index. This set covers the literature from the past nine years, since the publication of the 1995 edition. An online version of this reference will be made available sometime in Spring 2005.

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