Book Reviews

High-Performance Thermosets: Chemistry, Properties, Applications. By Shiow-Ching Lin (Ausimont USA) and Eli M. Pearce (Polytechnic University). Hanser: Munich, Vienna, New York. 1993. 317 pp. $98.50. ISBN 1-56990-155-4.

This book is a comprehensive review of the literature on the many different chemistries giving thermoset resins that have been reported in recent years. The book is presented from the viewpoint of synthetic chemists and gives essential detail of a multitude of synthetic pathways to reactive resins. The format divides thermosets by polymerization chemistry and includes chapters on the majority of major systems studied, including bismaleimides, cyanates, benzocyclobutenes, acetylenes, and high-performance epoxies to mention some of the sections. The data is drawn from the recent literature, patents, and commercial literature mostly from the 1980s and early 1990s. The structure and coverage make the book difficult to read as the listing of chemistries attempted and a very brief review of the resultant polymer properties rapidly become overwhelming due mainly to the enormous range of materials.

It is, however, a tremendous resource for active researchers in the field. Consequently, the book is of primary use to researchers in the field who need a review, especially if trying to decide possible approaches not yet tried. The most tantalizing aspect of the book, is the possibility of deducing worthwhile structure−property relationships from the data included. A small problem with the presentation derives from the mixed literature sources of the data quoted: much of the description is in terms of "improved" properties, typical of commercial data sheets rather than dispassionate numerical data. Throughout the book, much information is included on modification of the polymer chemistry to improve toughness of the final polymer, reflecting the major problem of thermosets derived from their inherent brittle nature. In terms of the title, the book is intended to cover chemistry, properties, and applications. Chemistry is covered in great detail. The properties are often limited to glass transition data and pyrolysis data, and more complex information including fracture toughness data is, usually, not available. Applications are only briefly alluded to. In summary, this text is an excellent and comprehensive review of advanced thermoset synthesis with some supporting property data.

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JA9451168

Chemical Pretreatment of Nuclear Waste for Disposal. Edited by Wallace W. Schulz and E. Philip Horwitz (Argonne National Laboratory). Plenum: New York. 1994. viii + 212 pp. $75.00. ISBN 0-306-44898-X.

Chemical pretreatment of nuclear wastes refers to the sequence of separation processes used to partition such wastes into a small volume of high-level waste for deep geologic disposal and a larger volume of low-level waste for disposal in a near-surface facility. The driving force for development of chemical pretreatment processes for nuclear wastes is the economic advantage of waste minimization as reflected in lower costs for near-surface disposal compared with the relatively high cost of disposing of wastes in a deep geologic repository.

The 12 articles in this book are based on papers presented at a symposium on Chemical Pretreatment of Nuclear Waste for Disposal held in August 1992 in Washington, DC, in conjunction with the Fall 1992 National Meeting of the American Chemical Society. These articles emphasize chemical aspects of separation processes which are under development to pretreat the large volume of nuclear wastes stored at the U.S. Department of Energy sites at Hanford, Washington, and Svannah River, South Carolina. Thus seven of the 12 papers in this book include authors from these sites. All but one of the other papers describe work relating to chemical pretreatment of nuclear waste underway at other U.S. national laboratories (Argonne, Brookhaven, and Oak Ridge). Thus the research and development work discussed in the book is restricted to work carried out in the U.S. and does not include any related work from Western Europe or other parts of the world which is probably a natural result for a book based on a symposium of this type at an American Chemical Society meeting.

This book presents a useful summary of many of the important issues arising in the processes for chemical pretreatment of nuclear wastes under consideration at U.S. sites and is recommended to scientists and engineers interested in nuclear waste treatment and disposal. A negative aspect of the book is the long delay between the 1992 date of the symposium where the papers were presented and the 1994 publication date of the book.

R. Bruce King, *University of Georgia*

JA955198F

An Introduction to Cosmochemistry. Edited by C. R. Cowley (University of Michigan). Cambridge University Press: Cambridge, Great Britain. 1995. xii + 489 pp. $29.95. ISBN 0-521-45920-6.

The book ranks as one of the most ambitious of its ilk in quite some time. In 16 chapters Cowley attempts to summarize the current canon in the nebulous (pun intended) field of cosmochemistry, encompassing elements of geology, traditional nuclear, and physical chemistry and a wide swatch of astronomy. Cowley is an astronomer by trade, so it is not surprising that astronomy claims the lion's share of the text, but it is still a fine scholarly piece of work.

In fact, the major criticism of this work is that it is too scholarly. Rather than limiting himself to a summary of what is known and accepted, the usual task of an introduction to any field, Cowley presents cosmochemistry as a living entity, waddling fearlessly into controversies which will rage on for the next decade or more. At the same time, important introductory material is glossed over, including discussion of the pertinent elements of basic nuclear chemistry and astronomy. For example, the classic Hertzsprung−Russell diagram, used as a keystone in most introductory astronomy classes, is used fairly extensively but its axes and main features are never explained. The chart of the nuclides, a vital tool in the discussion on such topics as heat sources in the early solar system and the "burning" processes in stellar interiors, is likewise used but never explained at a basic level. Some chapters, such as the one on atomic and molecular spectra, are written in such detail and at such a high level that I suspect only very advanced students will derive much understanding from them. All in all, this book may prove frustrating for students when it is used as the major textbook for a cosmochemistry class, especially if the students do not already have solid backgrounds in physical chemistry and astronomy.

In spite of these shortcomings, however, this book stands out from other introductory texts in capturing the feel of its subject. The text often exudes the excitement of discovery and the thrill of scientific argument. With the exception of some chapters and asides, the text is written in a very personal flowing style which is a pleasure to read and which captures the human side of a living scientific discipline. References are very much up-to-date and very extensive for an introductory book. This book is not without faults, but in the hands of a well-rounded instructor or as a supplementary text, it is a fine presentation of modern cosmochemistry.

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JA9551594

Understanding Polymer Morphology. Edited by Arthur E. Woodward (City University of New York, New York). Hanser-Gardner: Cincinnati, OH. 1995. ix + 130 pp. $19.95. ISBN 1-56990-141-4.

This slim volume, designed as a "mini-tutorial" for professionals and students new to polymers, should perhaps be retitled "An Introduction to Polymer Morphology". Professor Woodward provides a brief introductory chapter covering the chemical microstructure of synthetic polymers, the liquid and crystalline states, and microscopies (optical, electron, and atomic force). The next two chapters address the crystalline state of structurally regular, flexible chain polymers. This reader was disappointed that the importance of crystallization kinetics in determining lamellar morphology was overlooked. Liquid crystallinity is covered in one short chapter, and while pertinent subjects are mentioned, space limitations make discussions of items such as director

fields, disclinations, and inversion walls very difficult to comprehend. The chapter on block copolymers and blends is longer, with an unexpected emphasis on triblock copolymers. The final two chapters cover some effects of processing on morphology and deformation/fracture morphologies, respectively.

With excellent micrographs and descriptions of many systems, the coverage is broad but qualitative, and the one equation in the book is not used. Experimental methods that commonly provide quantitative information on morphology (X-ray diffraction, light scattering, birefringence, calorimetry, and various spectroscopies) are virtually ignored. Many elements of polymer morphology are mentioned, but in this short book, most cannot be "understood" as presented. The use of references, current through 1993, will be important to readers. There are numerous typesetting errors that suggest careless production; most are benign, but two structural formulas on page 6 are switched and that for poly(dimethylsiloxane) on page 72 is incorrect. The author frequently uses nonstandard terminology, e.g. "microcrystalline" for partially crystalline, which may cause difficulty for those unfamiliar with the field. In summary, this book proves an inexpensive introduction to polymer morphology.

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JA955192Q

Membranes and Molecular Assemblies: The Synkinetic Approach. Edited by Jurgen-Hinrich Fuhrhop and Jurgen Koning (Freie Universitat Berlin, Germany). The Royal Society of Chemistry: Cambridge, U.K. 1994. xiii + 227 pp. £69.50. ISBN 0-85186-732-4.

Giving an appropriate name to a new scientific idea or approach is much more than a pedantic exercise in terminology. It defines the subject in a new light, clarifies existing concepts, and provides new research opportunities. Synkinesis is indeed an appropriate name, coined by Jurgen-Hinrich Fuhrhop and Jurgen Koning, for "the synthesis of non-covalent molecular assembly with a defined structure and/or function." The term kinesis (originating in the Greek kinēsis) implies that the motion of the synthetic components in the ensemble, the synkinon, occurs at a rate designed by chemists rather than at that preordained by mother nature. By controlling the rates of assembly (and also of disassembly), chemists can construct considerably more stable supramolecular assemblies than the biological membrane. They can also produce stereochemistries and functionalities in desired morphologies, thus creating a large variety of advanced materials. The monograph *Membranes and Molecular Assemblies: The Synkinetic Approach* represents the first collected and organized view of organic chemists on the subject. It is refreshingly novel and inspiring.

Following a lucid and charismatic description of the philosophy of the synkinetic approach (Chapter 1) and a summary of synthetic methodologies for synkinones (Chapter 2), there are systematic and up-to-date surveys of micelles and microemulsions (Chapter 3), monolayer and bilayer vesicle membranes (Chapter 4), micellar and vesicular fibers (Chapter 5), molecular recognition at monolayers and Langmuir–Blodgett- and self-assembled films and at nanopores generated therein (Chapter 6), and amphiphilic crystals and cocrystals (Chapter 7). Throughout these surveys the difference between "simple" self-organization and target-directed synkinesis is continuously delineated. Naturally, emphasis is placed on published work of the senior author and thus detailed descriptions of the utilizations of "synkinetic systems" are limited to biomimetic and energy converting systems. Only allusions are made to the huge potential of this approach to advanced materials synthesis.

The monograph is well produced. It contains numerous colored and esthetically pleasing computer graphics, which greatly facilitates the readability. Anyone wishing to know where the frontiers of modern chemistry are should read this monograph. It opens the door to vast vistas of fascinating science.

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JA955115V

Immunochemistry. Edited by Carel J. van Oss (SUNY Buffalo) and Marc H. V. van Regenmartel (Institut de Biologie Moleculaire et Cellulaire du CNRS) Marcel Dekker, Inc.: New York. 1994. xii + 1069 pp. $195.00. ISBN 0-8247-9123-1.

Oss and Regenmartel have organized an authoritative review volume that summarizes the state of modern immunochemistry. The chapters are well-written and are accessible to the nonexpert. Coverage is as up-to-date as can be expected of any field that is subject to rapid progress. The text will appeal to a broad spectrum of researchers from the medical, biological, and biochemical communities and will be of special value for chemists working at the interface with biology. Many of the chapters consider the molecular details of structure, mechanism, and bonding interactions that mediate the immunological response. It is satisfying to see this exciting field of modern research opening up to a molecular understanding through application of gene cloning and mutagenesis, X-ray crystallography, thermodynamic and kinetic analysis, and mechanistic chemistry. The text covers all of these topics and serves as an excellent primer for any newcomer to the field.

Chapters are adequately illustrated with b/w drawings and are very well-referenced. This reviewer found the subject index to be more than adequate. The text is divided into four major sections. The first 11 chapters (Section I) introduce immunoglobulin and receptor proteins. Section II contains 11 chapters that describe the stimulation of an immunogenic response by foreign molecules and the presentation of fragment peptides, saccharides, lipids, nucleic acids, and other pharmacological substances to the immune system. These antigens mediate the immune response through specific interactions with antibodies, and the topic of antigen–antibody interactions is exhaustively covered in 14 chapters in Section III. These chapters review fundamental structural and bonding aspects of antigen–antibody binding and overview the results obtained from in vivo and in vitro studies. Finally, Section IV contains four chapters that describe the regulation of the immune response and will be of particular interest to chemists.

The price of the text is most likely beyond the pocket of those with only a peripheral interest in the area. However, it provides an invaluable summary of the field and will certainly be a welcome addition to the bookshelf of any chemist or biochemist interested in the molecular aspects of modern cell biology and immunology.

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