

## Book Reviews \*

**Dendritic Molecules: Concepts, Syntheses, Perspectives.** By George R. Newkome and Charles N. Moorefield (University of South Florida) and Fritz Vögtle (Universität Bonn). VCH: Weinheim. 1996. vi + 261 pp. DM198. ISBN 3-527-29325-6.

This work expedites tremendously the efforts of anyone setting out for investigations of the synthesis, applications, determination of characteristics, or conceptual consideration of dendrimers or hyperbranched polymers of any type. In addition to the excellent compilation of references detailing the prior efforts in the field, and the organization of Chapter 11 (appendices) concerned primarily with reviews of the topic, the work provides in a concise manner discussions of concept, theory, practice, and directions of research in dendrimers and hyperbranched polymers.

Chapter 1 (written by Professor Wayne L. Mattice of The University of Akron) is a brief introduction to the prediction of polymer geometry. While terse, it provides in a useful manner fundamentals and appropriate references for the nonpolymer scientist wishing to understand characteristics of dendrimers and related species in relationship to their geometric parameters.

A short, but sufficient, treatment (Chapter 2) is given to the history and general concept of dendritic architecture, followed by a discussion (Chapter 3) of alternative nomenclature systems for dendritic molecules. The authors are certainly correct to note that IUPAC and *Chemical Abstracts* nomenclature is unwieldy for these types of molecules; it should also be pointed out that these current methods of nomenclature do not make evident the fundamental dendritic nature of the molecules. The alternative system described is quite useful in both these regards, and has applications for other species which are technically not dendritic.

Synthetic methodologies are separated into considerations of divergent, convergent, and one-step (hyperbranched) approaches. The authors provide concise descriptions of not only the synthetic procedures, but also the rationalizations for the approaches. (In many instances these descriptions are clearer than those in the original literature reports.) The review of the synthetic (and other) literature is complete into 1996. The presentation of structures for the dendritic molecules is excellent; large structures emphasizing the dendritic nature of the species and the modes of their construction are given. The only drawback in the structural presentation is an inevitable one for print medium; in numerous instances the reader must shuffle forward and back a number of pages between the text and the appropriate figures and schemes. This is an instance where CD ROM presentation of the material could be far superior.

Separate treatments (Chapters 7 and 8) are given for chiral and metal-containing dendritic molecules. Similarly, Utilitarian Aspects are presented in Chapter 10 apart from treatments of syntheses and physical characterizations. The form of Chapter 10 involves no discussion, but rather simply a listing of references relating to each of a collection of applications (chromatography, electronics, those owing to physical properties, catalysis, biochemical/pharmaceutical, and organic synthesis).

Chapter 9 (Dendritic Networks) is devoted to a discussion of macromolecular assemblies. A particular value of this section is the fact that it points to new design, synthetic, and application schemes. Those wishing to begin efforts in dendritic molecule research would do well to consult this chapter to see what is coming.

For a review of the literature, as well as a critical consideration of the directions being taken by investigations of dendritic molecules, this work is well worth the investment. The only drawback comes in realizing that while the coverage of the literature is complete into 1996, the burst of new efforts will make it necessary to update the treatment in no more than three years.

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**The HPLC Solvent Guide.** By Paul C. Sadek (Analytical Consulting Laboratories). Wiley: New York. 1996. xii + 346 pp. \$54.95. ISBN 0-471-11855-9.

Somewhat surprisingly, in view of the maturity of the field of HPLC and since much research has focused on the role of the mobile phase, no monograph has previously been devoted to the subject. With the publication of *The HPLC Solvent Guide*, this has changed. Dr. Sadek has provided the practitioner with useful solvent data—including safety data—and a compendium of separations achieved with specific solvents. Uniquely, the book is organized into solvent categories; thus, in addition to an introductory chapter (which should be required reading for anyone performing HPLC)—Physical and Chemical Solvent Properties, the chapters are named Alcohols, Alkanes and Alkyl Aromatics, etc. Each of these seven chapters commences with a brief discussion of the chemical nature of the solvent class under consideration, its manufacture, and common impurities. Chromatographic applications are then described, grouped into application categories, such as General analytes, Environmentally important analytes, Industrial and polymer analytes, etc. These are further resolved into groupings such as Surfactant and additive analytes, Polymeric analytes, and Other industrial analytes. Each category concludes with a brief summary of the general applicability of the solvent class in that specific field.

This organization requires a reader interested in a specific class of analytes to refer to sections in nearly every chapter. Fortunately, the four-page General Index is supplemented by a forty-page Analyte Index. However, one must find the index entry for a specific compound rather than use a more general term (e.g., “ethylparaben” as opposed to “parabens”). Thus, while experienced workers in a particular field will likely not be hampered by the book’s organization, it is a bit more difficult to find information for classes of compounds with which you are generally less familiar. This reviewer is not convinced that this novel organization is superior to the alternative approach of grouping strictly by applications area regardless of solvent system.

The coverage of specific separations is quite brief, but provides a complete description of the mobile phase and, if applicable, the gradient used. Exact specification of the column and of any sample pretreatment is typically omitted. Only two figures contain chromatograms, although the inclusion of each chromatogram discussed would likely have doubled or tripled the length since there are 1123 references cited. Most of the references are from the mid-1990s; those prior to 1980 involve solvent physical properties, etc., rather than separations. The separations presented are typically complex, real samples. Indeed, in the preface, Dr. Sadek remarks, “...in general, separations in which only two or three compounds are resolved are not cited here; rather, more complex mixtures...are presented from which selected analyte sets of importance to the analyst can be generated”.

This is clearly not an introductory book on chromatography, nor is it a “how-to” book. While the book includes references to extensive studies of solute retention such as would be useful to those studying the retention process, it is more likely to be useful to an industrial chemist who needs to perform HPLC on a variety of samples in that it provides a reference guide to solving an extensive array of specific problems. As such, it has significant value in the chromatographic library.

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**Mesomolecules: From Molecules to Materials Search Series, Volume 1.** Edited by G. David Mendenhall (Michigan Technical University), Arthur Greenberg (University of North Carolina at Charlotte), and Joel F. Liebman (University of Maryland Baltimore County). Chapman & Hall: New York, 1995. xi + 199 pp. \$59.95. ISBN: 0-412-03811-0.

As stated in the series preface, this book is the first in a series aimed at presenting “the most significant research areas in organic chemistry from the perspective of the interplay and inseparability of structure, energetics, and reactivity”. This volume is modeled as a text for a one-semester graduate course in chemistry. The research field between

the chemistry of small molecules and materials science, or supramolecular chemistry, is the topic of the volume. This important and intensely investigated research area has already been the subject of numerous books. Nevertheless, the tutorial aspirations of this short and varied text set it apart and make for enjoyable reading.

The book is divided into six chapters and an appendix. The introductory chapter (Mendenhall) provides a discussion of the properties of molecules and materials and the crossover point between molecular and bulk behavior as a function of molecular size and temperature. This chapter also gives a concise review of various strategies for the design of materials from molecular components. Chapters 2–5 each concern specific molecular motifs or intermolecular interactions that form an organizing principle for a class of macromolecules. Chapter 2 is a review of recent advances in dendrimer (arborol) chemistry by G. R. Newkome and C. N. Moorefield. The authors survey a large number of branched macromolecules; particular attention is directed toward the synthetic techniques and useful building blocks for constructing the compounds. (The book's appendix presents a shorthand, fractal notation that is useful for describing dendritic compounds.) Chapter 3 (G. Denti, S. Campagna, and V. Balzani) describes cascade polymers composed of polynuclear ruthenium and osmium complexes linked by bridging bipyridine ligands. A discussion of the physical properties of these systems (optical spectroscopy, electrochemistry, luminescence, and electron and energy transfer) makes up the bulk of the chapter. Chapter 4 (J. D. Wuest) concerns the synthesis and self-assembly of molecular units containing hydrogen-bonding 2-pyridone units. Although the chapter is fairly limited in scope, it serves as an excellent introduction to the unique challenges of constructing porous materials using intermolecular interactions. Chapter 5 (J. Michel) describes progress toward developing the components of a molecular Tinkertoy construction set and the use of these components in Langmuir–Blodgett films and modified electrodes. While Chapters 2–5 offer a “bottom-up” perspective to designing materials with specific properties, Chapter 6 (J. A. Jaszczak) discusses recent fullerene chemistry in the context of the properties and structures of various forms of naturally-occurring graphite. The discovery of many new macromolecular carbon allotropes highlights the instability of planar graphite in systems of reduced size.

The strength of this volume is that it provides varying outlooks on the synthesis and properties of macromolecular systems. Generally, chapters progress from synthetic aspects to physical properties of materials. The subject matter does not entirely bridge the gap between the chemist's and the materials scientist's perspectives. An additional chapter (between Chapter 5 and Chapter 6) would have been helpful in this regard. However, *Mesomolecules* serves as a useful introduction to the topic of supramolecular chemistry at the graduate student level.

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**DNA: The Double-Helix-Perspective and Prospective at Forty Years.** Edited by Donald A. Chambers (University of Illinois). *Annals of the New York Academy of Sciences*. New York Academy of Sciences: New York. 1995. 472 pp. \$95.00. ISBN 0-89766-905-3.

This book celebrates the 40th anniversary of the publication of the original papers describing DNA as a double helix, with papers by many of the major participants in this biological revolution as well as by current leaders in molecular biology. The book includes reminiscences of the early history of molecular biology that led to the discovery of DNA's structure and forecasts concerning where those discoveries are likely to take us in the 21st century.

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**Gmelin Handbook of Inorganic and Organometallic Chemistry, 8th ed. Supplement Volume C2, Dinuclear Compounds with Hydrogen. Polyphosphanes Including Organyl-Substituted Derivatives.** Edited by Hans Schafer. Springer: Berlin. 1995. xx + 349 pp. ISBN 3-540-93714-5.

The present volume describes the binary species which are formed between phosphorus and hydrogen and contain two or more phosphorus atoms. This volume continues the description of the P–H compounds which started in 1993 on Phosphorus Supplement Volume C1 which covered the monophosphorus compounds. The first chapter deals with diphosphorus compounds. The following chapters cover polyphosphanes which contain three or more phosphorus atoms. A formula index at the end of the volume allows easy access to all known isomers for a particular empirical formula. The final chapter is on physical constants and conversion factors.

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**Synthetic Polymers: Technology, properties, applications.** By Dorel Feldman (Concordia University) and Alla Barbalata (Université de Moncton). Chapman & Hall: Florence. 1996. xv + 370 pp. ISBN 0-412-71040-4.

This is a useful text for individuals interested in a well-researched summary on processing and properties of polymers. The authors claim their audience is undergraduate and graduate students in a broad range of disciplines, as well as individuals practicing these disciplines. This is accurate as long as individuals are willing to seek information beyond this text. The references are carefully incorporated within the chapters and cited in order at the end of the chapters so that individuals can easily expand the information within the chapters. The references are current with approximately half from 1990 or later. Additionally, the references represent a variety of sources from secondary sources, encyclopedias, and texts to primary research articles.

The text is presented in two parts, chain growth polymers and step growth polymers. Within the chain growth polymers part, polyolefins, vinyl polymers, and diene polymers are presented in three separate chapters. The step growth polymer part includes chapters on polyesters, polyamides and polyimides, silicone polymers, polyurethanes, epoxy polymers, phenolics, and aminoplasts. Specialty polymers are not specifically included.

Within a given chapter, there is a discussion of the technologies used to manufacture a particular polymer with direct reference to the influence of various approaches (catalyst, phases, temperature, etc.) on structure. The discussion continues with the influence of structure on properties. This sets the stage for the final discussion on applications. Throughout these discussions, the material is very well referenced.

There were a few errors noted, some significant and some trivial. For example, the cross-linked phenolic structure on page 340 has a methylene substituent meta to the hydroxy, and the noting of the value of the specific modulus of extended chain polyethylene fibers (page 21) is confusing. Periodically there are grammatical errors. Also, because it is a summary text, occasionally topics are presented so cursorily that they are unclear. However, these problems are overshadowed by the general readability and utility of the text.

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