Additions and Corrections

Solvent Isotope Effects in H_2O-D_2O Mixtures (Proton Inventories) on Serine-Protease-Catalyzed Hydrolysis Reactions. Influence of Oxyanion Hole Interactions and Medium Effects [*J. Am. Chem. Soc.* **1996**, *118*, 8802−8807]. T. K. CHANG, Y. CHIANG, H.-X. GUO, A. J. KRESGE,* L. MATHEW, M. F. POWELL, AND J. A. WELLS

Page 8804, Equation 4: The quantity in parentheses under the square-root sign should be squared, and this equation should therefore read as follows:

$$A = \epsilon_p b + (\epsilon_c - \epsilon_p)\left\{\frac{(a + b + 1/K) - \sqrt{(a + b + 1/K)^2 - 4ab}}{2}\right\} \quad (4)$$

JA975402U

Book Reviews

Combinatorial Peptide and Nonpeptide Libraries. A Handbook. Edited by Gunther Jung (Institute Fur Organische Chemie Eberhard-Karls-Universitat Tubingen). VCH: Weinheim. 1996. xxvii + 544 pp. ISBN 3-527-29380-9.

With the explosion of combinatorial chemistry on the scientific scene, we have recently seen an onslaught of review articles on this subject, the outgrowth of which has now led to one of the first books on the subject.

The book edited by Jung is comprised of eighteen chapters, seven of which Jung has been either an author or co-author. While the book title implies discussions on peptide and nonpeptide libraries, the brunt of the book, fourteen chapters, is based on peptide or peptidomimetic libraries. The most notable contribution from the book is the bringing together of some of the earliest pioneers of combinatorics. Chapters of note here include (A) Mario Geysen describing his antibody-defined epitope mapping−using his mimotope approach, (B) Arpad Furka detailing his revolutionary portioning-mixing method, (C) Frank's insights into his SPOT technique, (D) Houghten's teabag method as applied to positional scanning peptide libraries, and (E) Lam's one-bead−one-compound concept. These chapters provide not only excellent background for beginners but also a historical prospective on the subject.

Sandwiched between the numerous accounts of peptide libraries are a few sections dealing with polymer-supported organic synthesis and a chapter written by Ellman on benzodiazepine libraries. Clearly, the field of combinatorial chemistry or what now might be more adeptly termed high-throughput organic synthesis, has moved in this direction. Additional chapters on this subject would have heightened pharmaceutical interest. Particular emphasis was given to special analytical tools for the analysis of libraries with an excellent chapter on mass spectral analysis of peptide libraries. Virtually every chapter describes a particular screening assay that can be considered a signature for the various strategies used to create the libraries. One particularly nice touch is the chapter on supports for solid phase chemistry. This is particularly valuable to the novice as it provides the properties, linkers, suppliers, and price ranges for each.

The book, while indepth on each particular area of special interest, at times tends to contain excess overlap and repetition. In addition, missing are any accounts of solution phase, high-throughput, and automation of organic synthesis. Nevertheless, the basic principles of planning, preparing, and analyzing combinatorial libraries are well documented. In summary, the book contains a wealth of information for the avid combinatorial chemist and should be a welcome addition to the shelf of most libraries.

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JA9657768

S0002-7863(96)05776-9

Advances in Polymer Science 126: Biopolymers Liquid Crystalline Polymers Phase Emulsion. Edited by Akihiro Abe (Tokyo Institute of Polytechnics). Springer: New York. 1996. 226 pp. $149.00. ISBN 3-540-60484-7.

This most recent volume of *Advances in Polymer Science* continues the series' tradition of presenting numerous articles in polymer science and engineering that are invaluable to polymer chemists, physicists, and engineers alike. Although it is not based on a number of articles of unified nature, it contains four independent contributions with chapter lengths from 32 to 77 pages and with number of references ranging from 81 to 191: Contemporary Topics in Polymeric Materials for Biomedical Applications, Polymerization and Domain Formation in Lipid Assemblies, Concentrated Solutions of Liquid-Crystalline Polymers, and High Internal Phase Emulsions (HIPEs)-Structure, Properties and Use in Polymer Preparation. Each contribution is written by an expert or experts in the respective field, and provides a comprehensive and up-to-date review of the topic in question.

The first contribution by Tsuruta includes the discussion of polymeric materials for biomedical applications, which is undoubtedly an interesting topic. The hydrophilicity and hydrophobicity are the most fundamental properties of polymers whenever they are used in biomedical devices. Protein-adsorption behavior on several polymers of different hydrophilicity is discussed by comparing available data with two models for the protein-adsorption process, since this process is the first event when any of the body fluids encounters a synthetic polymer. The polymers used for such biomedical applications include water soluble polymers, their conjugates, and microdomain-structured polymers. The notable example among microdomain-structured polymers is an A−B−A block copolymer such as HEMA−St−HEMA, which has an excellent blood compatibility both *in vitro* and *ex vivo* studies. The author concludes with the review of several biohybridized and biomimicking materials. Particularly, a multimolecular micelle system composed of a PEO−poly(Asp) block copolymers as a vehicle for anticancer drugs is an interesting one. The second contribution by Armitage *et al*. reviews the polymerization of various lipid assemblies in order to create new materials. On their polymerization, lipid assemblies can either "lock in" preexisting lipid domains or create lipid

domains from random mixtures depending on the nature of polymerizable lipids. These polymerized lipids provide new approaches to the delivery of reagents as well as the transduction of light energy. The third contribution by Sato and Teramoto presents theoretically and experimentally the static and dynamic solution properties of liquid crystalline stiff-chain polymers (lyotropic)—an interesting class of polymers. Their static solution properties such as osmotic pressure and osmotic compressibility, phase behavior involving liquid crystalline phases, and orientational order parameters are discussed on the basis of scaled particle theory, their dynamic solution properties such as translational and rotational diffusion coefficients and zero-shear viscosity on the basis fuzzy cylinder model theory, and their rheological property on the basis the so-called Doi's theory. In the major cases, the agreement between theory and experiment is satisfactory, which enables one to predict the solution properties from basic molecular parameters. The fourth contribution by Cameron and Sherrington attempts successfully to present the structure, properties, and stability of high internal phase emulsions having a dispersed phase volume fraction greater than 0.74, which is the value for the close-packing of uniform spheres. They can be prepared easily from two immiscible liquids, one of which is usually, but not necessarily, water or an aqueous solution. This contribution also includes a number of interesting applications for HIPEs ranging from supports for catalytic species, inert matrices for the immobilization of enzymes and microorganisms, and materials for the intact capture of microparticles of cosmic dust.

Throughout the volume the utmost care in presentation for each of these contributions is apparent. In the appropriate chapter, lists of symbols and appendices are included, and comprehensive author and subject indices are appended for Vols. 101−126. I recommend this volume without any reservation whatsoever to both individuals and libraries.

Pradip K. Bhowmik, *University of Detroit—Mercy*

JA965723Q

S0002-7863(96)05723-X

Symmetry: A Basis for Synthesis Design. By Tse-Lok Ho (National Chiao Tung University, Taiwan). Wiley: New York. 1995. xv + 561 pp. $69.95. ISBN 0-471-57376-0.

The efficient synthesis of a complex target structure requires careful planning and design. Elegant solutions to synthetic problems have emerged when a strategy capitalizes on various elements of symmetry. This book reviews the role of symmetry in the development of various synthetic strategies and tactics. The material covered encompasses far more than the use of symmetry as a means of controlling stereochemistry. Indeed, most of the book is dedicated to the systematic review of symmetrical difunctional synthons such as diacid derivatives, 1,3-diketones, and symmetrically substituted benzene rings and heterocycles. As has been the pattern of the author in previous textbooks, the literature coverage is enormous (ca. 1800 references); most of the references date between 1970 and 1995. This book will be most beneficial to readers equipped with a strong knowledge of organic synthesis.

The first chapter introduces, through example, various stereochemical terms such as desymmetrization, enantiodivergence, psuedosymmetry, and local symmetry. Chapter 2 describes syntheses of various symmetrical unnatural (e.g., cubane, dodecahedrane, and fenestrane) and natural products. Chapters 3−5 outline difunctional synthons of two or more carbon atoms. Many useful summaries of the proven synthetic utility of various symmetrical building blocks are described within these chapters. Among the synthons described are desymmetrized derivatives of 2-methyl-1,3-propanediol and glycerol. The use of synthons such as tartaric acid and glyceraldehyde derivatives is also described within these chapters. Chapters 7 and 8 describe the use of various carbocyclic synthons. Chapter 7 is the largest and focuses on the use of six-membered ring synthons. An entire section of this chapter is devoted to the Wieland−Mieschler ketone and its derivatives. The final chapter, Chapter 9, describes the use of symmetrical heterocycles as building blocks. An index of natural products as well as journal references is included at the end of the text.

A strong point within the organization of the chapters is the ability of practitioners of organic synthesis to have rapid access to an extensive summary of previous uses of many different synthons such as tartaric acid or 1,4-pentadien-3-one. On the other hand, the organization leads to a less than satisfactory description of the use of symmetry as a means of asymmetric synthesis, such as the desymmetrization of meso or C_2 symmetric compounds. Another shortcoming of the organization is that a number of syntheses are repeated throughout the book.

The synthetic schemes are well illustrated but only occasionally include reagents and reaction conditions. In some instances a description of a synthesis is not accompanied by a scheme. Another minor problem is the consistent misuse of the term meso; for instance, 2-methyl-1,3-propanediol is a prochiral but not meso compound. These features will detract from the books utility in first- or second-year graduate courses. However, this book would be a useful addition to the personal library of more advanced workers in the area of organic synthesis.

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JA955343P

S0002-7863(95)05343-1

Archaeological Chemistry. By A. Mark Pollard and Carl Heron (University of Bradford). Royal Society of Chemistry: Cambridge. 1996. xvi + 376 pp. $39.00. ISBN 0-85404-523-6.

The last ten years have seen an explosion in the development and in the applications of new and/or existing analytical techniques. *Archaeological Chemistry* brings these new applications and developments to the attention of those practicing archaeological chemistry. The book is an indispensable reference book that covers most of the details of analytical archaeological chemistry, and it can be used as a guide for instrumental analytical techniques used in modern analytical laboratories.

Archaeological Chemistry consists of ten chapters and five appendices. The first chapter traces the history of archaeological chemistry throughout the years and points out several milestones. The chapter also describes the status and scope of archaeological chemistry.

Chapter 2 is the heart of the book where the focus is on various analytical methods. The chapter covers in detail the fundamentals of electromagnetic radiation and subsequently electronic transitions. These topics are the foundations for the various spectroscopic techniques that are discussed later in the chapter. Atomic absorption spectrometry (AAS), inductively coupled plasma atomic emission spectrometry (ICP-AES), inductively coupled plasma mass spectrometry (ICP-MS), energy dispersive X-ray fluorescence (EDXRF), wavelength dispersive X-ray fluorescence (WDXRF), scanning electron microscopy (SEM), proton-induced X-ray emission (PIXE), neutron activation analysis (NAA), thermal ionization mass spectrometry (TIMS), gas chromatography (GC), and high-performance liquid chromatography (HPLC) are described in detail. Although the authors are not experts in these fields, they did a worthy job describing the techniques without complicating them. However, the authors relied on using copyrighted figures from other books to describe the various techniques. From this, it was evidenced that the techniques discussed are not the authors' strong points. For example, several copied figures were incorrect such as in Figure 2.4 the spray chamber is labeled the nebulizer and in Figure 2.15 the resolving slits are mislabeled. When the authors used their drawings, several key components were left out. Despite these minor problems, this is an excellent chapter and I would recommend using it as a reference of analytical techniques.

Chapter 3 provides a short description of the characterization of Eastern Mediterranean obsidian and provides the chemical composition of obsidian. Chapter 4 describes in detail the crystal structure and elemental composition of clay and minerals. The chapter also describes how trace element analyses can help in the provenance of ceramics. The data were analyzed and interpreted using various chemometric techniques such as cluster analysis and dendrograms to show provenance. The topic of Chapter 5 is the chemistry and corrosion of archaeological glass and is reinforced with figures, tables, and detailed chemical equations showing how glass corrodes.

Chapter 6 goes into detail on the chemical analyses of metal and alloy artifacts. The chapter begins with an interesting historical presentation on the development of copper and brass in artifacts. The chapter describes how brass is made and the elemental composition of different kinds of brass. The chapter is interesting because it describes a procedure for authenticating scientific brass instruments. A table of trace elements in the scientific brass instruments of the Astronomical Compendium, Perpetual Calendar, Scaphe, and Equinoctial Dial is presented. Elemental compositions of scientific instruments in the Barberini Collection are also presented. These tables are quite useful

because they provide the collector elemental data that can assit in the authentication of these brass instruments.

Chapter 7 changes directions from inorganic elemental analyses to organic chemical analyses of resinous substances. This chapter is written with authority because one author, Carl Heron, is an expert on the topic. The chapter begins with a discussion of the definition and uses of resins. Numerous chemical structures of organic compounds in resins are shown throughout the chapter. Chapter 8 continues the theme of organic compound analyses with emphasis on organic compounds found in "First Americans". The chapter begins with a brief discussion of the use of accelerator mass spectrometry (AMS) for ^{14}C dating. Detailed analyses of bone collagen with figures and reactions are also presented. The stereochemistry of amino acids and racemization are described in detail. Interesting techniques such as amino acid racemization dating of Californian Paleoindians are also described. The chapter ends with an interesting but brief discussion of using amino acid racemization to determine age at death.

Lead isotope geochemistry and the trade in metals are discussed in detail in Chapter 9. A discussion of natural radioactivity is followed by a discussion of the different decay modes that show the origins of the four stable isotopes of Pb. This section should have been moved to Appendix 2, Isotopes. Useful to archaeologists is a discussion of the Holmes−Houtermans model for the isotopic composition of common lead-ore deposits. It is interesting how the authors show that the age of deposits can be determined from this model. It is described that when ores of Zn and Cu are mined, they will also contain traces of Pb. Then, by measuring the isotope ratios of this trace Pb, provenance of artifacts made of Cu and Zn can be determined.

Chapter 10, Summary-Whiter Archaeological Chemistry, concludes the book. It puts all the chapters in perspective and ties all the information presented in the previous chapters together. To assist the reader in various concepts presented in the book, five Appendices: The Structure of the Atom, and the Electromagnetic Spectrum; Isotopes; Fundamental Constants; Atomic Number and Approximate Weights; and Periodic Table of the Elements are included.

Overall, *Archaeological Chemistry* is well written and organized. Not only the topics covered are informative and very useful to the archeological chemist but the book could also be used by anyone involved in instrumental analysis. The authors chose a good cross section of references that covered both journal articles and books. Most of all, the references were current and pointed to actual examples of the techniques discussed in the book so that the reader could obtain a better feel for the technique.

The only shortcoming of the book is the omission of a chapter on chemometrics. Chemometrics is a very important tool for the archaeologists, and it should have been included because the authors used numerous graphs and discussed topics such as cluster analysis and discriminant analysis for data interpretation. Without a chapter on chemometrics, the data collected using the various instrumental methods might lead to the wrong conclusion about the provenance of an artifact.

Archaeological Chemistry will make a fine collection to your library of reference books on instrumental analytical techniques. Perhaps reading the book will assit in solving an unsolved mystery in archaeology.

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JA9656457

S0002-7863(96)05645-4

The Physics of Polymers: Concepts for Understanding their Structures and Behavior. By Gert R. Strobl (Alber-Ludwigs University). Springer: New York. 1996. xi + 439 pp. $39.95. ISBN 3-540-60768-4.

The author is professor of experimental physics at the University of Freiburg/Breisgau and obtained his Ph.D. and habilitation at the University of Mainz. He thus personifies the traditions of the two foremost polymer physics schools in Germany. The scope of the book is dictated by the needs of graduate students. Polymer physics is first and foremost the science of phenomena due to the characteristic general properties of macromolecules: their enormous length, their strong segmental anisotropy, and their mobility. Following this guideline and in order to reduce the volume of the text, the author has deliberately excluded the treatment of optical and electrical properties, which—as he indicates in the foreword—in any case employs many concepts which are well known from the physics of semiconductors and low molar mass molecules.

The chemical architecture of macromolecules and some essential definitions (for exemple, molecular weight distribution) are succinctly presented in Chapter 1. A rigorous treatment is given of rotational isomeric states and molecular coil dimensions. Unlike in certain other textbooks the coil structure is also described in terms of quantities determining their scattering behavior, such as pair distribution functions and Debye structure factors. The meaning of different model representations and scaling laws is critically discussed.

A central part of the book is devoted to liquid equilibrium states of polymer solutions and mixtures and block copolymers (Chapter 3). This has quite practical implications such as the determination of molar masses and dimensions from observable quantities such as osmotic pressure or scattering intensities (of photons, neutrons, or X-rays). The discussion of the significance of the *screening length parameter* and the treatment of compatibility and phase separation behavior are particularly noteworthy.

Chapter 4 is titled Metastable partially crystalline states. This title correctly insinuates that crystalline structures in polymer materials are rarely perfect and stable: they nucleate and grow with time, depend on conformation, chain defects, and mutual interactions. The kinetics of lamellar growth is extensively treated often using the author's own results from optical observations, Raman scattering, and dilatometry. The discussion of the growth mechanisms is well supported by appropriate modeling (Figures 4.15, 4.33, and 4.19, the latter showing the existence of extended chains and once- and twice-folded chains in 6000 MW PEO oligomer crystals). Chapter 4 gives essential information on the structure of polymer materials. However—and in the opinion of this reviewer, unfortunately—two aspects have been neglected which represent the extreme ends of the scale of order: a discussion of the amorphous state on one hand and of monocrystals as obtained from dilute solution precipitation or by solid state polymerization on the other.

Logically, after having discussed the structure of polymers, Strobl turns to look at their small-scale deformation behavior: viscoelasticity and dielectric response. The first part of this chapter (5.1 and 5.2) is devoted to a classical treatment of complex viscoelastic variables. Section 5.3 deserves particular attention since it establishes a correlation between major relaxation processes and individual structural characteristics (local and cooperative processes, chain diffusion, specific processes in the crystalline state).

An area of rather intense developments in the last 15 years has been the study of polymer dynamics. On the basis of the fluctuation−dissipation theorem, Strobl discusses in this chapter the Rouse model, entanglement effects and the—most influential—reptation model.

One of the most striking manifestations of polymer physics is rubber elasticity, since it depends on all the characteristics mentioned at the beginning of this review (*chain length, chain mobility, and segmental anisotropy* are all necessary to make entropy an important variable). This unique phenomenon is discussed together with non-Newtonian melt flow under Non-linear mechanical behavior in Chapter 7. The equally highly nonlinear yield processes and fracture are briefly discussed in Chapter 8.

A useful Appendix on Scattering Experiments, a well chosen and up-to-date bibliography (with some 120 titles), and a Subject Index terminate this well and carefully written book.

Deliberately the author avoids cataloguing the numerous known structure−property relationships which although useful and interesting would have made this text unreadable (proper reference to the relevant Handbooks is made). Instead Strobl focuses on the *concepts of polymer physics* which he clearly elaborates, giving some preference to the results from scattering methods. The book constitutes an elegant and physically thorough text which can be highly recommended to graduate students and to researchers in polymer science at all levels. The price of the book is very reasonable while printing and graphic execution are absolutely excellent.

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JA965718M

S0002-7863(96)05718-6

Advances in Chemical Physics, Vol. 94. Polymeric Systems. Edited by I. Prigogine (University of Brussels and University of Texas−Austin) and Stuart A. Rice (The University of Chicago). Wiley: New York. 1996. ix + 742 pp. $130.00. ISBN 0-471-14324-3.

In this 94th volume of *Advances in Chemical Physics*, prominent reviews are presented on six distinct polymeric systems that continue to generate tremendous interest among polymer scientists. Separate chapters have been devoted to each polymeric system, and each chapter provides clear and thorough derivations of the various theoretical frameworks required for understanding the physical properties of each system. The authors have set out to establish a correspondence between the theories they develop and the experiments these theories relate to. The book is thus pleasant to read, even for the more experimentally inclined, without detracting from the thorough theoretical development. Since this volume compiles reviews on six different topics, it provides an enriching transdiscipline sampling of the theories and perspectives specific to each area treated. Each chapter is supplied with numerous and up-to-date references.

In Chapter I, the dynamical and conformational theories for charged chains in dilute and semidilute solutions, or in gels and brushes, are presented. Emphasis is set on long-range electrostatic interactions and the role of small counterions. The electrostatic rigidity exhibited by charged chains is also treated by considering length scales over which the chain structure is either flexible or rodlike. In their conclusions, the authors also suggest some experimental and theoretical studies aimed at deepening the understanding of polyelectrolyte solutions.

Chapter II is a survey on star polymers (SP). After a short introduction on synthetic methods, the authors define the length scale relevant to the characterization of SP. Predictions of the scaling length scale behavior as well as the elastic relaxation of the branches are compared with the results of Monte Carlo (MC) and molecular dynamics (MD) simulations. They show essentially good agreement except in θ or poor solvents. From the experimental point of view, the small-angle neutron scattering technique is shown to be very powerful at characterizing the structure of SP, as well as neutron spin echo to monitor branch dynamics. The authors leave a feeling that the present understanding of the experimental and theoretical behavior of SP is robust and that reliable experimental tools are available for their characterization.

Tethered polymer layers make the subject of Chapter III. The conformational behavior of the chains and their thermodynamic and adsorption properties are reported using results obtained essentially with the single-chain mean field (SCMF) theory. Throughout the section, the SCMF results are compared to those obtained by the self-consistent field theory, MD or MC simulations, or analytical approaches. Discrepancies between methods are discussed. The authors stress that the combination of SCMF theory (for intermediate chain lengths) with analytical approaches (for very long chains) enables the characterization of polymer layers at all length scales which is an ideal feature for designing polymer layers with a desired behavior.

Living polymers for which the propagation reaction occurs at temperatures below a ceiling temperature are examined in Chapter IV. Using α-methylstyrene as a model compound, the validity of two theories is evaluated for their predictions of the polymerization transition. Experiments monitoring the temperature dependence of the extent of polymerization, the solution mass density, the intensity of small-angle neutron scattering, and the correlation length of living polymer molecules all show that the mean-field theory and the non-mean-field dilute $n \rightarrow 0$ magnet model describe the data qualitatively, the magnet model being slightly more accurate. A list of as yet unanswered questions in this area of research is proposed at the end of the section.

Chapter V constitutes a master review on transport and kinetics in electroactive polymers. Over 300 pages, Lyons presents a unified discussion on the different models that characterize the diffusion of charges within the electroactive polymer matrix coating an electrode. These models involve charge percolation and ion and solvent transport. Their quantitative accuracy is established via comparison with experiments recording the polymer-modified electrode profiles of current, charge, or mass versus voltage. The process of nucleation and growth of electronically conducting polymers on an electrode is examined. The applicability and importance of the complex impedance spectroscopy technique is demonstrated for the study of mixed-conduction behavior in electroactive polymers. Due to the utility of polymer-modified electrodes in electrocatalysis, the last three sections of Chapter V are devoted to describing the reaction kinetics of such systems and the theoretical approaches used in characterizing their properties. Chapter V exposes the sound theoretical foundations that characterize the coupling between transport and reaction kinetics taking place in polymer-modified electrodes. Well written, it is unfortunate that the high scientific value of this overview is impaired by numerous typographical errors.

The heavily theoretical Chapter VI discusses various approaches for describing polymer conformations and diffusional processes in disordered media. The authors consider how polymer adsorption onto the porous material affects the polymer dimensions and what effect the presence of impurities has on the order−disorder transition of a liquid crystalline polymer. The results of simulations aimed at monitoring the diffusional behavior of polymers in various porous environments are compared with the predictions of the reptation theory or the Rouse law.

Written by experts in their field, this book constitutes a worthwhile purchase for scientists willing to grasp the theoretical background required in the description of these complex polymeric systems.

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JA965682Y

S0002-7863(96)05682-X

Crystal Structures I: Patterns and Symmetry. By M. O'Keeffe (Arizona State University) and B. G. Hyde (The Australian National University). Mineralogical Society of America: Washington, DC. 1996. xvi + 453 pp. $36.00. ISBN 0-939950-40-5.

This book represents Volume I of a two-book series dealing with the crystal chemistry of minerals and inorganic materials. The publication of Volume II entitled *Crystal Structures II: Inorganic Materials* is anticipated for the near future. This first volume introduces the concepts of two- and three-dimensional symmetry and their application to the description of nonmolecular crystal structures in terms of lattice geometry, polyhedra, sphere packings, and nets. Approximately one-third of the book is used for an introduction to plane-group and space-group symmetry while two-thirds is devoted to the topics of polyhedra and sphere packings and three-dimensional nets.

In Chapters 1−3 (98 pages), the concepts of point-group and space-group symmetries are introduced at a level suitable for senior undergraduate students in a solid-state chemistry or crystallography course. The approach is essentially geometrical, and the reader is regularly referred to the *International Tables for Crystallography* for a more in-depth treatment. Chapter 3 also contains a useful section on how to use the space group tables in the *International Tables for Crystallography*, and detailed examples of application are presented using crystallographic data for common inorganic and mineral compounds. In Chapter 4 (32 pages), more examples are introduced as part of the description of geometrical properties of crystal lattices and unit-cell transformations, and useful advice is given for drawing crystal structures. Indeed, the importance of good structural drawings is emphasized throughout the book which contains dozens of them illustrating the various ways of representing crystal structures in projection.

Chapters 5, 6, and 7 (75, 80, and 90 pages, respectively) form the core of the book presenting detailed descriptions and discussions of the three-dimensional geometrical patterns in periodic crystal structures. More complex structures and mathematical descriptions of them are encountered, and as noted by the authors in their Note to the Reader, several careful readings of these chapters "with pencil and paper at hand" may be required in order to fully appreciate and understand the material presented. In particular, the serious reader will need to familiarize himself or herself with a variety of symbols and notations, such as those used for the nomenclature of nets. Chapter 5 deals with the geometrical description of polyhedra and tilings (two-dimensional nets). Chapter 6 describes familiar as well as some less familiar sphere packings in terms of their symmetries and the geometrical relationships between them. This chapter also introduces the novel descriptions of some crystal structures in terms of packings of one-dimensional rods or cylinders. Like all chapters in the book, chapter 6 ends with a series of useful exercises which, in most cases, require the reader to draw crystal structures. Chapter 7 deals with the more complex topic of 3-dimensional nets and their topologies, and the reader unfamiliar with the symbols and notations might find the first reading difficult. This chapter also contains a description of numerous crystal structures with, as expected, an emphasis on zeolite-like framework compounds.

Finally, the book ends with a series of appendices which can be used as brief introductions to more difficult mathematical subjects, such as higher dimensions or topological properties of polyhedra and nets.

Appendix 5 presents brief descriptions of some major structure types as well as structural data for about 90 important crystal structures discussed in the text. A short book list is also given including the well-known reference books on crystal chemistry and some books on mathematical crystallography and geometry. Some titles, dating back 25 years or more, may not be accessible to all, but other references to more recent specialized journal articles are also found throughout the text.

Overall, this book should be found very useful by students, instructors, and researchers alike in mineralogy, crystallography, solid-state chemistry, and materials science. Its very affordable price should not only make it available to most science libraries, but should also enable the interested readers to obtain their own copy and use it as a working book which, I believe, the authors intended it to be.

Jacques Barbier, *McMaster University*

JA965775F

S0002-7863(96)05775-7

Advances in Metal-Organic Chemistry, Vol. 5. Edited by Lanny S. Liebeskind (Emory University). JAI Press: Greenwich, CT. 1996. x + 267 pp. $97.50. ISBN 1-55938-789-0.

This is a volume in the continuing series dealing with organometallic chemistry applied to organic chemistry. This particular volume deals with the novel application of iron carbonyl reagents for the synthesis of seven-membered ring ketones as well as recent advances in three palladium-mediated processes: the Stille reaction, the Heck reaction, and catalytic asymmetric carbon−carbon bond-forming reactions.

Chapter 1, Recent Advances in the Stille Reaction, by V. Farina and G. P. Roth provides an excellent discussion of the palladium-catalyzed formation of carbon−carbon bonds via cross-coupling of organostannanes with organic halides, triflates, or sulfonates. Rather than a detailed listing of Stille couplings, a comprehensive overview of the mechanistic aspects and influence of ligands in the Stille reaction is provided, and emphasis is placed on synthetic methods which extend the scope of this reaction.

Chapter 2, Seven-Membered Ring Synthesis via Iron Mediated Carbonylative Ring Expansion and σ-Alkyl-π-Allyl Complexes, by P. Eilbracht and A. Hirshfelder discusses an intriguing, very useful reaction in which, in the presence of Lewis acids, iron carbonyl reagents insert carbon monoxide into a variety of cyclohexadienes. This reaction provides a unique method for the preparation of seven-membered ring ketones and bicyclo[3.2.1]oct-3-ene-2,8-diones.

Chapter 3, New Catalytic Asymmetric Carbon-Carbon Bond-Forming Reactions, by M. Shibasaki is concerned with the application of palladium catalysts that are modified with enantiometrically-pure ligands to the synthesis of carbon−carbon bonds with useful enantiocontrol. Two different types of reactions are emphasized, the asymmetric Heck reaction and asymmetric allylic alkylation. The catalytic asymmetric cyclization of a variety of prochiral iodides or triflates via a Heck reaction catalyzed by Pd(II) catalysts modified with chiral diphosphine ligands is reviewed. The second part of this chapter discusses a useful catalytic asymmetric synthesis of bioactive molecules via alkylation of π-allylpalladium complexes which bear suitable chiral diphosphine ligands. This chapter provides a good review of the author's efforts in this area, but researchers interested in chiral asymmetric synthesis would likely find a more complete and authorative review more useful.

The final chapter, Recent Improvements and Developments in Heck Type Reactions and Their Potential in Organic Synthesis, by T. Jefferey provides a detailed review of recent developments and improvements in the Heck reaction (the palladium-catalyzed acylation and vinylation of alkenes, dienes, etc.). This chapter will have exceptional utility to anyone interested in such reactions. Many different approaches for improving Heck-type reactions are reported, providing researchers with sufficient information to select appropriate reagents and reaction conditions for their particular system.

In summary, this reviewer found this book an excellent source of developments in organic synthesis using organometallic reagents. While chapters two and three are less useful because they are too narrowly focused on the author's own research efforts, the other two chapters are a much more successful compilation of advances in this field. This book appears to have had a long lead time between the preparation of the manuscripts and publication, and as a consequence, none of the references are more recent than 1992. One attractive feature of this book is the many experimental details provided for representative reactions that are likely to be very useful for practioners of the synthetic methods reported in this book.

Allen W. Apblett, *Tulane University*

JA965660B

S0002-7863(96)05660-0

Stereoselective Synthesis, Vol. E21f. Edited by Gunter Helmchen (Heidelberg), Reinhard W. Hoffman (Marburg), Johann Mulzer (Berlin), and Ernst Schaumann (Clausthal). G. Thieme: Stuttgart, Germany. 1996. x + 1230 pp. DM1930.00. ISBN 3-13-102794-0.

The last volume of this comprehensive series provides a nearly 250-page survey of chiral auxiliaries, solvents, reagents, and catalysts which are often used in stereoselective bond-forming reactions. Authored by R. Herrmann, this appendix is structured by functional group and/or common structures present in the compounds considered. Thus, for example, terpenes are classified together and provide presentation of boron derivatives, terpene-based ligands and chiral auxiliaries, including amino alcohols and their derivatives, and other structures that will be of interest to the synthetic chemist. As in previous volumes, sample procedures for the synthesis of specific compounds are provided so that the series can be used as a critical review and as a primer for laboratory work and/or evaluation. The major sections of this appendix are amines; alkaloids, amino alcohols, and amino acids; terpenes—their derivatives and analogs; alcohols, carbohydrates, hydroxy acids, and their derivatives; heterocycles; biaryls; organometallic compounds; phosphorous compounds; and sulfur compounds. Reference is made from this appendix to sections of prior volumes where applications are described in more elaborate detail. The presentation in this appendix is textual, with structures and reactions liberally provided, although tables of information supplement the text.

The remaining nearly 1000 pages of this volume is devoted to an author index (199 pages) and a compound index (780 pages) that provide the composite to the 6000 pages of the complete set for *Stereoselective Synthesis*. Unexpected from such a massive undertaking is the relative ease of use of the compound index. There are no full systematic names. Instead, formulas are used; simple formulas are referred to directly, using abbreviations, whereas more complicated molecules are divided into substructures. Major divisions are open-chain compounds and cyclic compounds. For cyclic compounds, classifications are by ring type, and tabulation provides the position, functionality, and bond formation used. There is a separate tabulation for steroids. For complex open-chain compounds, substituents of the asymmetric center are listed according to the Cahn−Ingold−Prelog rules in descending order. Preparative procedures are easily identified by giving the page number in boldface type. There is no subject index, the Table of Contents serving this function, in part. In any series of this magnitude, the only universally satisfying index is one that provides multiple access to subject, structure, reaction type, authors, etc., available through CD, but this is not yet possible with this series.

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JA965720D

S0002-7863(96)05720-4