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BOOK REVIEWS

Supramolecular Catalysis. Edited by Piet W. N. M. van Leeuwen (Institute of Chemical Research of Catalonia, Tarragona, Spain). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. xvi + 304 pp. $200.00. ISBN 978-3-527-32191-9.

This monograph provides a very timely update on the renaissance occurring in the field of supramolecular catalysis. As mentioned by the editor in the Preface, early efforts in the 1970s to apply supramolecular concepts to catalysis focused primarily on replicating how natural enzymes catalyze reactions. The complexity of most of these biomimetic catalysts hampered further application to problems in synthetic chemistry. The goal of developing a selective and efficient catalyst, whether for a synthetic application or as an enzyme mimic, requires the selective recognition of a particular transition state. This book presents a broad spectrum of supramolecular strategies to achieve this goal, ranging from approaches based on molecular recognition and self-assembly to organometallic chemistry.

The book comprises 10 chapters written by participants of the *2008 Conference on Supramolecular Approaches to Catalysis* in Barcelona. Consequently, it is not intended to be a thorough review of the area but rather represents a concise discussion of the most recent advances in supramolecular catalysis. Although each chapter generally reviews the author's contribution to the field, the chapters flow together smoothly and logically.

The opening chapter provides a brief fundamental introduction to supramolecular catalysis that nicely categorizes the multitude of strategies currently being pursued in the supramolecular community. Noncovalent molecular assembly emerges as a prevalent theme throughout most of the subsequent chapters. Chapters 2 and 9 offer descriptions of several efforts to exploit hydrogen-bonding interactions and/or metal coordination to rapidly assemble, preorganize, and screen transition metal catalysts for selectivity. The approach presented in these chapters focuses on the rapid development of selective catalysts and therefore would be of particular interest to researchers involved in asymmetric catalysis. In Chapters 3 and 4, the authors discuss how molecular grids (Chapter 3) or macrocycles (Chapter 4), created via metal-mediated self-assembly, function as catalysts. These two chapters primarily emphasize the synthesis and structure of several beautifully intricate metallic supramolecular complexes, rather than catalysis. With the exception of Chapter 5, which is a description of the impact of crown compounds on acyl transfer reactions, the remaining chapters (6−10) explore how host/guest interactions within supramolecular cavities and receptors influence the rate and selectivity of a chemical process.

Overall, this book would provide an excellent entry to the literature of supramolecular catalysis. It is not intended as a stand-alone text, nor is it a comprehensive review of the area. There are just over 500 well-chosen, relevant citations in the book. Readers with some background in modern physical organic chemistry with an interest in catalysis will find this book interesting and informative. It would be useful as a supplementary text in a graduate seminar course, provided that students had some prior exposure to fundamental concepts in catalysis and physical organic chemistry. The topics are well chosen and timely, and the chapters are succinctly written.

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International Tables for Crystallography, Volume B: Reciprocal Space, 3rd ed. Edited by Uri Shmueli (Tel Aviv University, Israel). Springer: Dordrecht. 2008. xiv + 686 pp. $359.00. ISBN 978-1-4020-8205-4.

The purpose for the creation of Volume B, to paraphrase the editor, was to cover important topics in crystallography relating to the concepts of reciprocal lattice and reciprocal space. The book comprises five main parts: (1) General Relationships and Techniques; (2) Reciprocal Space in Crystal-Structure Determination; (3) Dual Bases in Crystallographic Computing; (4) Diffuse Scattering and Related Topics; and (5) Dynamical Theory and Its Applications. The third edition includes many new chapters and sections as well as revisions and updates to existing chapters; e.g., there are three new sections in Chapter 2.5 on convergent-beam electron diffraction, three-dimensional reconstruction, and single-particle reconstruction. An author index and a subject index complete the book.

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Stereoselective Polymerization with Single-Site Catalysts. Edited by Lisa S. Baugh (ExxonMobil, Annandale, NJ) and Jo Ann M. Canich (ExxonMobil, Baytown, TX). CRC Press/Taylor & Francis Group: Boca Raton, FL. 2007. Xx + 678 pp. $249.95. ISBN 1-57444-579-0.

Single-site catalysts (SSC), a term coined to differentiate single-site homogeneous discrete catalysts from typical multisite heterogeneous catalysts, attract ever-increasing attention, thanks to phenomenal scientific and commercial successes in the production of stereoregular and revolutionary polyolefin materials using discrete molecular catalysts, such as metallocenes or related organometallic compounds. (It is worthwhile to note that one should not take the term SSC literally to refer to a catalyst with only one active site or center, because metallocene-type catalysts have more than one site and can even involve more than one center, as in the case of polynuclear catalysts. The term SSC more precisely defines the catalyst with one type of catalytically active species.) This book covers both fundamental aspects as well as recent advances in stereoselective polymerization using SSC. The scope of the book is formidable; it comprises 25 review chapters, grouped into five parts according to monomer class.

The first part consists of seven chapters concentrating on catalysts for polymerization of propylene and mechanisms of

Unsigned book reviews are by the Book Review Editor.

stereocontrol and covering basic types of polypropylenes varying in tacticities (stereomicrostructures). The second part contains five chapters on the role of tacticity as a factor in the design of polypropylenes for tailored materials. The third part includes four chapters dealing with stereoselective polymerization of higher α-olefins, styrene, and cyclic olefins, and the fourth has five chapters on the stereoselective polymerization of dienes and acetylenes. The final part comprises four chapters addressing stereoregular polymers derived from stereoselective polymerization of functional, nonolefinic monomers, including olefins/CO, methacrylates, expoxides, and lactides.

Most of the 25 review chapters are well written by experts who provide authoritative overviews of each area and extensive references to the primary literature. The introductory material and references (with titles) included in each chapter will be especially valuable to nonexpert readers. The quality and style of the contributions vary notably from chapter to chapter, which is not surprising in a book involving this many chapters and authors. Most of the chapters offer balanced coverage and do not display noticeable bias toward the authors' own research. The text is reasonably up-to-date, with extensive references up to 2005. Because the polymerization of olefins by SSC has been much more extensively investigated in the past than the polymerization of other monomers, the current status of the former remains largely the same since the inception of the book. In comparison, the research in the latter area has just begun to burgeon, and several significant advances have already been made in this area since 2005; thus, it is clear that an update for the latter area will be soon needed. There are some inconsistent abbreviations and chemical structures, as well as the occasional poor-quality figure and even incorrect scheme. Moreover, in my opinion this book would have been more complete if a chapter on asymmetric polymerization for the synthesis of optically active stereoregular polymers were included.

Overall, the editors fulfill their primary objective of creating a reference volume valuable to both experts in the field and beginners or students wishing to learn the fundamentals of stereoselective SSC and polymerization systems. One might question the potential impact of the book on the polyolefin community as there are already so many comprehensive reviews on this subject out there. However, this book is an excellent collection of reviews on the stereoselective polymerization with SSC as a whole, not just on the polymerization of olefins. I highly recommend it for both institutional libraries and individual researchers interested in this field.

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Drug−DNA Interactions: Structures and Spectra. By Kazuo Nakamoto (Marquette University, Milwaukee, WI, USA), Masamichi Tsuboi (University of Tokyo, Japan), and Gary D. Strahan. John Wiley & Sons, Inc: Hoboken, NJ. 2008. xvi + 370 pp. $125.00. ISBN 978-0-471-78626-9.

The primary aim of this book is to provide an overview of drug−DNA interactions from a structural and spectroscopic perspective. The authors admit that the presentation may be "unbalanced" by that perspective, and it is, since there is virtually no mention of the thermodynamics or kinetics of drug−DNA interactions, both of which are crucial for a full understanding of the topic. A better, more balanced introduction to drug−DNA interactions can be found in Chapter 12 of *Nucleic Acids: Structures, Properties and Functions* by Bloomfield, Crothers, and Tinoco, Jr. Nonetheless, this book does have some introductory material that would be useful to novices.

The first chapter provides a nice introduction to the structures of nucleic acids and to common spectroscopic methods. The remaining chapters each cover particular classes of DNA-interacting compounds: intercalators, groove binders, drugs that bind covalently or that induce strand breaks, and metal-containing drugs. The discussion of compounds within these classes is by no means comprehensive, and the specific compounds selected for discussion seem somewhat arbitrary and are perhaps based on work done in the authors' own laboratories.

The book is not entirely current. Although there are scattered references to work published in 2006, the majority of them are to publications much earlier than that. Much current research in the field is focused on the characterization and discovery of structural-selective compounds, particularly on compounds that can recognize functionally important G-quadruplex structures. However, this topic is largely ignored in this book, an omission that must be considered a serious flaw. Overall, although this book does provide some very useful introductory material, it does not cover the area of drug−DNA interactions in a sufficiently comprehensive manner to provide a completely useful entry into the field.

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Bioorganic and Medicinal Chemistry of Fluorine. By Jean-Pierre Bégué and Danièle Bonnet-Delpon (Faculty of Pharmacy—Paris South University, France). Translated from French by Julien Legros (Paris South University). John Wiley & Sons, Inc.: Hoboken, NJ. 2008. xvii+365 pp. $99.95. ISBN 978-0-470-27830-7.

It is well established that the chemical reactivity of fluorinated organic compounds is distinctly different from other halide-containing analogues. When a fluorine atom is substituted for a hydrogen atom or another organic functionality in an organic molecule, it induces only minimal steric alterations but profound electronic changes in the resulting compound. This is due mainly to fluorine's small size, high electronegativity, and strong bond with carbon atoms. Consequently, such substitutions can effectively modify the physicochemical properties of the molecule and provide a tool for the discovery of compounds of biological significance. The importance of fluorine-atom substitution has not been ignored by authors and publishers, as demonstrated by the stream of monographs during the past 20 years extolling the unique stereoelectronic properties of this atom, advances in the synthesis of organofluorine compounds, and their novel material and biological properties. On average, the medicinal applications of organofluorine compounds have received less coverage, and it is in this regard that Bégué and Bonnet-Delpon's book serves to fill a void in the secondary literature. In terms of content, this book adds only incrementally new material compared to their 2005 French edition, although, of course, the mere fact that it is available in an updated English version adds luster.

The book has eight chapters, the first three of which cover the physicochemical properties of organofluorine compounds, provide a shortened overview of synthetic methodologies, and review the effects of fluorine-atom substitution on biological properties. Chapters 4−6 offer descriptions of three important classes of fluorinated naturally occurring compounds, namely, natural products, α-amino acids and peptides, and carbohydrates. In Chapter 7, the authors discuss the inhibition of enzymes by fluorinated compounds, whereas in Chapter 8, they give an overview of fluorinated drugs clinically used as pharmaceuticals, or in an advanced stage of development.

As the title implies, the majority of the coverage centers on the biological aspects of organofluorine chemistry, with only one-quarter of its pages devoted to the first three chapters on stereoelectronic properties and preparation. Chapter 2, which addresses synthetic methods, has the most references, and these include work from the major players in the field. Chapters 1 and 3 contain information that can be obtained from other, more comprehensive, sources.

The core of the book begins with Chapter 4 where the discussion is centered on derivatives of natural products that have been selectively fluorinated, mostly on the aliphatic moieties, contrary to fluorinated drugs where fluorine atoms are borne by aromatic rings. Among the classes of natural products analogues presented, steroids, vitamins and pigments, alkaloids, and macrolides are given the most coverage in this chapter. A similar format is employed in the next two chapters where the authors analyze fluorinated aliphatic, aromatic, functional, and α-fluoroalkyl amino acids in Chapter 5 and mono- and difluorinated analogues of sugars, fluoromethyl derivatives, and perfluoroalkylated sugars in Chapter 6. In the succeeding chapter, the authors consider only cases in which the presence of a fluorine atom as a substituent plays a determinant role in the inhibition of enzymes and which are of importance in drug discovery, such as mimicry and destabilization effects. Chapter 8 marks a departure from previous books on organofluorine compounds, as the authors provide a comprehensive list of fluorinated drugs covering areas as diverse as cancer, infectious diseases, CNS, cardiovascular, inflammatory, immunity, gastrointestinal, endocrine, and metabolic disorders. An appendix with INN and trademark names ends this chapter.

The book is clearly written and has been adequately translated for the most part, although there are several instances where errors in format or translation are apparent, such as in the naming of figures, the use of confusing or erroneous terms, like saccharidic, fludrocortisol, or the use of French words, like retiré, Tripéridol, Diprosténe, etc. The index at the end of the chapter is too short and has a very narrow coverage, focusing mostly on names of compounds. Nonetheless, the over 1000 literature references found in this book, some of them as recent as 2007, its compact size, and abundance of helpful schemes, figures, tables, and structures make it a convenient aid for the practicing scientist.

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Protein Folding, Misfolding and Aggregation: Classical Themes and Novel Approaches. Edited by Victor Muñoz (University of Maryland, College Park, USA and Center for Biological Investigations, Madrid, Spain). Royal Society of Chemistry: Cambridge. 2008. xvi + 272 pp. $189.00. ISBN 978-0-85404-257-9.

This book is a compilation of chapters written by experts exploring theoretical and experimental approaches to protein folding. Those interested in a fairly comprehensive and current look at protein folding from a biophysical perspective will find much useful information here. Some knowledge of protein chemistry, structure, and folding is assumed—the book is not suitable for a neophyte.

The book opens with two chapters on the structure and kinetics of formation of α-helices as the simplest important protein structural feature. These chapters include an excellent discussion of the inadequacies of the simple two-state coil-helix model and an intriguing description of the complexities underlying the apparently simple nucleation−elongation mechanism of helix formation. There are also very useful comprehensive tables summarizing data on helix propensities and interaction energies collected from numerous diverse sources. Both chapters could have been improved by the addition of some carefully chosen illustrations depicting the structural and kinetic features described in the text.

Chapter 3 is a delightful primer on the energy landscapes associated with protein folding. Current thinking on funnels, the evolution of protein sequences, the entropy "crisis", the principle of minimal frustration, and related topics are covered in a highly readable and entertaining fashion. This chapter supplies the core organizing principle for the entire book.

The next four chapters are descriptions of modern experimental approaches from a conceptual point of view; specific details on methodologies and instrumentation are not covered, although useful references are provided. Chapter 4 is rather narrow in scope, providing a brief but useful description of hydrogen−deuterium exchange and summarizing specific studies that nicely illustrate the types of information that can be gleaned. The following chapter on differential scanning calorimetry contains a thoughtful discussion of the thermodynamics of temperature-dependent protein folding/unfolding equilibria but has very little coverage of experimental methods. Chapter 6 covers several approaches to fast (submillisecond) protein folding, rather than focusing on a single experimental technique. Included here is a brief but clear conceptual description of the dynamics of loop formation, collapse, and secondary structure formation, a very helpful figure illustrating the timescales accessible by various instruments, and a comparison of the advantages and disadvantages of each technique. The final chapter in this group is on single-molecule fluorescence spectroscopy and is particularly strong, with ample illustrations, clear discussion of data analysis including pitfalls to avoid, plentiful references to examples from the literature, and a perspective on the particular contributions that experiments in single-molecule fluorescence can make to the field of protein folding.

Chapters 8 and 9 cover computational methods used in simulating protein folding and in designing proteins with tailored properties. The informative overview of various approaches to simulations is highly readable and demystifies for experimentalists many of the terms and jargon used by computational scientists. Especially appreciated is the clear call for the importance of validating simulation by comparison to experiment using a statistically defensible method and a recognition of the difficulty of doing so. The exciting possibilities and the

daunting challenges inherent in *de novo* protein design are discussed clearly and comprehensively.

The last two chapters address protein misfolding and aggregation. These chapters are limited in scope to amyloid aggregates, which are of vital interest because of their relationship to degenerative diseases. In Chapter 10, the authors provide a brief overview of the field; the chapter has a descriptive rather than mechanistic flavor, and the brief discussion of toxic mechanisms diverges from the biophysical focus of the book. The last chapter covers in detail exciting recent results from the author's laboratory in which he uses computational approaches, both simulations and bioinformatics, to probe questions of amyloid structure and formation. Both chapters are narrower in scope than the earlier chapters, focusing mainly on the authors' own work. Although amyloid is clearly of high topical interest, it is unfortunate that there was no coverage of problems arising from protein aggregation as related to industrial applications.

As a whole, the book is strongly focused on current conceptual and theoretical thinking of protein folding. It is not a source of "nuts and bolts" information; thus, it will appeal more to academic scientists involved in fundamental studies rather than to industrial scientists tackling practical problems. The sections on protein misfolding and aggregation are rather brief, and readers who are specifically interested in those fields might want to turn to other texts. The book is strongest in its coverage of material from 1995 to 2005. Except for papers published by the authors of the chapters, most of the references are from 2005 or earlier.

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Semiconductor Nanocrystal Quantum Dots: Synthesis, Assembly, Spectroscopy and Applications. Edited by Andrey L. Rogach(University of Munich, Germany). Springer: Wien, New York. 2008. xii + 372 pp. $179. ISBN 978-3-211-75235-7.

Quantum dots are now widely known; what chemist has not seen a photograph of the photoluminescence of size-tunable cadmium selenide nanocrystals by now? Surprisingly, it was only 20 years ago that researchers were struggling to synthesize samples of sufficient quality to show quantum confinement at all. Since that time, the field has evolved and is just beginning to mature. Still, there are plenty of opportunities for research on nanocrystals in fields including spectroscopy, materials chemistry, engineering, biology, and industry. For instance, nanocrystals have properties that may make them useful as luminescent markers, sensors, lasers, optical detectors, specialized photon sources, etc. This book provides insight into the diverse areas of basic nanocrystal research.

The editor aims to present an overview of the field of nanocrystalline quantum dots to an interdisciplinary scientific readership. Toward that objective, the chapters certainly cover a number of the important topics that will interest a wider audience. These subjects include synthesis, assembly, physics, and spectroscopy, as well as a chapter on applications in biomedicine. The chapters on synthesis and assembly make up over half the content, and overall these are excellent accounts, reflecting the expertise of the editor. The authors succeed in presenting accessible overviews, yet they manage to include key details and background in the manner of an advanced textbook. The remainder of the book maintains the high standard of the contributions, although a few of the chapters may fall short of the objective of satisfying a broad, nonspecialist audience. For example, it would have been helpful to overview general topics like photoluminescence, surface passivation and trap states, physical properties, and protocols for characterization. Nonetheless, a high standard of scholarship is evident throughout, and the various authors do a commendable job in conveying general perspectives and covering the most recent literature. For example, in the chapter on dynamics and energy transfer, the author manages to provide an overview of nanocrystal spectroscopy, ultrafast excited-state dynamics, Förster resonance energy transfer, and even multiple exciton generation–a very new area of substantial interest in the area of photovoltaics.

The field of nanocrystals has been maturing and developing rapidly. This book succeeds in providing a balanced snapshot of the current status of research and generally communicates well to a broad audience. Overall, its contents will prove of immense value to researchers wishing to acquaint themselves with the field of nanocrystalline quantum dots. Moreover, it will also serve as a useful reference for specialists in the field and will be a superb text for graduate researchers.

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