Book Review

Book Review of Intelligent Materials

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BOOK REVIEWS

Chemistry and Physics of Carbon, Volume 30. Edited by Ljubisa R. Radovic (The Pennsylvania State University, University Park, PA). CRC Press/Taylor & Francis Group: Boca Raton, FL. 2008. xvi + 244 pp. $199.95. ISBN 1-4200-4298-X.

This book covers a wide range of topics on the chemistry, physics, and applications of carbon and carbon materials. Like previous volumes, the subjects discussed here reveal the multidisciplinary nature of carbon research, as can be seen in the titles of its chapters: (1) "Carbon Activation by Alkaline Hydroxides: Preparation and Reactions, Porosity and Performance: by Linares-Solano et al.; "Template Approaches to Preparing Porous Carbon" by Zhao and co-workers; "Characterization of Carbon Surface Chemistry" by Burg and Cagniant; and "Sorption of Heavy Oils into Carbon Materials" by Inagaki and co-workers. In addition to a standard Table of Contents, there is also a list of the contents of the previous 29 volumes as well as a subject index.

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Iminosugars: From Synthesis to Therapeutic Applications. Edited by Philippe Compain and Olivier R. Martin (CNRS, University of Orleans, France): Chichester, 2007. xiv + 468 pp. $170.00. ISBN 978-0-470-03391-3.

Iminosugars are one of the most fascinating classes of molecules, inspiring synthetic, mechanistic, and medicinal chemists for more than 40 years. Also called azasugars, iminosugars are cyclic sugars in which the ring oxygen atom is replaced by a nitrogen atom. These polyhydroxylated alkaloids have been found to be potent inhibitors of glycosidases, enzymes which cleave glycosidic bonds. The iminosugar with a protonated nitrogen atom is believed to be a transition-state mimic of the developing pyranosyl or furanosyl cationic intermediate formed during the enzyme-catalyzed anomeric bond cleavage, where the relative inhibitory activity of each iminosugar depends upon its stereochemical match to the carbohydrate substrate.

There has been a dramatic increase in the synthesis, study, and therapeutic use of iminosugars since the work of the early 1960s. The history of this development along with recent advancements is reviewed in this book. To accomplish this daunting task, the editors, Compain and Martin, assembled a team of approximately 30 experts in the field to help them write it.

The first 13 chapters are a collection of focused reviews covering the synthesis of various iminosugars such as five-, six- and seven-membered mono- and bicyclic iminosugars, 1-*N*-iminosugars, and *C*-linked disaccharides; their mechanism of action, as in the inhibition of glycosidases and glycosyltransferases; and finally their therapeutic uses as antiviral and antitumor agents and for lysosomal storage disorders, for example. It is worth noting that each chapter is a significant review of an aspect of the chemistry/biology of iminosugars and not an account of one group's effort. Each of these chapters is comprehensive and well referenced, with several 2007 citations—not an easy thing to do for a book published in 2007.

Although the first 13 chapters by themselves would stand alone as an excellent 326-page book, what really makes this book stand out is the 14th chapter. These last 130 pages of the book are composed of a detailed and well-referenced table of iminosugar compounds organized by structural class and therapeutic indications. The table lists both synthetic and natural materials and includes biological activity data, e.g., K_i, IC_{50}, and GI_{50}. Although I was personally pleased to see how the text showed the strong role that synthesis plays in each of these studies, it is the final chapter that makes this book a must buy for anyone interested in carbohydrate and/or medicinal chemistry.

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Intelligent Materials. Edited by Mohsen Shahinpoor (University of Maine, Orono) and Hans-Jörg Schneider (Universität des Saarlandes. Saarbrücken). Royal Society of Chemistry: Cambridge. 2008. xxii + 532 pp. $229.00. ISBN 978-0-85404-335-4.

As defined by the editors of this wide-ranging volume, intelligent materials are those "that are multifunctional due to their unique molecular structure and respond to external stimuli by a characteristic behavior." Given such a broad definition, the range of topics is enormous. Few, if any, readers will be knowledgeable of all the subjects covered in this 22-chapter book, so the publication of this volume offers opportunities for experts (or beginners) in some fields to expand their areas of expertise under the guidance of leading authorities. The pair of editors combine the knowledge of a mechanical engineer engaged in research involving artificial muscles and smart/intelligent materials, and an organic chemist with a background in molecular recognition/host−guest chemistry. As an excellent example of the adage that two heads are better than one, the resulting editorial tandem undoubtedly benefits the reader in both the choice of topics and the selection of individual contributors. This reviewer is far from conversant with all the topics in the book, but in the areas I know, the editors have done an outstanding job in selecting senior authors who are leaders in their field.

With a book of over 500 pages, it would be impossible to do it justice by attempting to write a critical review in the limited space available. Even to list all the chapter titles in their entirety seems excessive. Perhaps a list of the major topics will best provide an idea of the range of material covered in the book. In approximate order of appearance, those topics include the following: chemically and photochemically powered and transition-metal-based molecular machines; chemomechanical polymers; ionic polymer−metal nanocomposites; sensing and elec-

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trochemically controllable artificial muscles; unimolecular electronic devices; piezoelectric ceramics; ferroelectric relaxor polymers; magnetic polymer gels and metal hydrides as intelligent artificial muscles; shape-memory polymers and alloys; magnetorheological materials; dielectric elastomer activators; photomechanical azobenzene polymers; chitosan-based hydrogels; polymer−protein complexation and an ATP-driven gel machine; composite sensing, activating, and self-repairing materials. The final two chapters contain brief overviews of liquid crystal elastomers, magnetic shape-memory materials, fullerenes, carbon nanotubes, nonionic smart polymers, electrorheological fluids, and biogenic and bioinspired materials, e.g., DNA-based devices, biochips, and drug-delivery systems.

The book includes both a detailed Table of Contents and an 11-page Subject Index. Most chapters have more than 50 references, with coverage generally through 2005 and the occasional citation from 2006.

In their Introduction, the editors state that one of their objectives is to provide a volume that attempts to bridge the gap between the top-down approach to intelligent materials of engineers and physicists and the bottom-up strategy of chemists. The authors have made an admirable contribution toward bridging that gap.

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