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BOOK REVIEWS

Organolithiums in Enantioselective Synthesis. Topics in Organometallic Chemistry, Volume 5. Edited by David M. Hodgson (University of Oxford). Springer-Verlag: Berlin, Heidelberg, New York. 2003. x + 320 pp. $229.00. ISBN 3-540-00104-2.

This book is a valuable addition to the *Topics in Organometallic Chemistry* series that has successfully culled a vast topic into engaging and focused chapters through skillful editorship. With minimal redundancy, the short text provides comprehensive coverage of stereoselective deprotonations using alkyllithiums in the presence of sparteine; the presentation balances uninspiring examples with those in which the effectiveness of the asymmetric depronation strategy is unsurpassed. Interspersed throughout are complementary methods for the creation and utilization of organolithiums in myriad reactions that contribute meaningfully to the usefulness of the text. Clear chapter headings and subject/author indexes make finding information easy, and the volume will be a useful addition to library reference collections.

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Chemical Applications of Synchrotron Radiation. Part I: Dynamics and VUV Spectroscopy and Part II: X-ray Applications. Edited by Tsun-Kong Sham (University of Western Ontario). World Scientific: Singapore, River Edge, London. 2002. 1304 pp. $198 (Set). ISBN 981-02-4480-0 (Set).

The stated goal of this two-volume set is to describe recent advances in chemical applications of synchrotron radiation. In the past few decades, synchrotron radiation has become a widely used and increasingly effective probe of the electronic and physical properties of materials. Important applications exist not only in chemistry, but also in condensed matter physics, materials science, earth and environmental science, and biological sciences. The appearance of this set is perhaps especially timely now that several third-generation radiation sources around the world have begun routine operation, considerably expanding the capabilities and power of synchrotron science.

Individual articles in this collection were contributed by internationally recognized experts in each area. Topics are organized primarily by the materials examined rather than by the techniques used. For example, whereas Chapters 4 and 5 both cover low-energy inner-shell spectroscopy, one applies it to photoionization dynamics and the other to molecular studies. This arrangement of topics means that all synchrotron applications in a particular area of chemistry are in one place, and chapters can be read relatively independently of each other. It does, however, entail some repetition of relevant techniques, and certain characteristics of synchrotron radiation reappear several times: for example, one reads rather too often that a synchrotron source is better than a lab-based one.

The quality of the contributions varies, of course. Many are excellent, wherein the authors describe experimental techniques, including their potential power and their limitations, provide examples of results obtained on specific materials, and discuss future prospects. Examples of particularly thorough presentations are those on dynamics of photoionization, spectroscopy of polymers, and powder diffraction. Others are less comprehensive, however, and do not include recent citations or the latest advances. Some contributions seem over-long for the topic or rather narrow, consisting mostly of detailed reviews of the authors' own work. The index, which is essential for unifying a comprehensive survey like this, is poor. One must know, for example, that EXAFS and XAFS, and NEXAFS and XANES, are the same − different authors use different terms and these are not cross-referenced. Awkward English is unfortunately common. Although this does not usually prevent comprehension, better editing would have been desirable. Some techniques are used in rather different ways in different articles, which could confuse those new to the field. For example, the use of spectral features of XANES to study local electronic and physical structure is described in a chapter on soft X-ray spectroscopy, whereas in another chapter, application of XANES amplitudes to determine film thickness and composition is described.

As the editor points out, this collection does not encompass biochemical applications, including chemical crystallography and macromolecular crystallography. This is a serious limitation, as the latter in particular has become increasingly significant: a large fraction of beam time at US synchrotrons is now devoted to structural biology. Perhaps including these topics would have necessitated a much larger edition. Also, some topics seem inadequately covered, including photoemission, magnetic circular dichroism, single crystal diffraction, high pressure work based on the diamond anvil cell, and EXAFS (extended X-ray absorption fine structure), probably the most widely used synchrotron technique. Although EXAFS is mentioned piecemeal in a number of articles, the only full treatment is a theoretical paper. Microbeam analysis is mentioned in several articles, but coverage of the latest advances in resolution at third-generation sources is inadequate.

A considerable range of important topics is covered, however. Part 1 deals with low-energy radiation, including infrared, ultraviolet, and vacuum ultraviolet. The interactions of such radiation with molecules in the gas phase are discussed in the first several chapters, where it is shown how important insights into the dynamics of molecules can be obtained. Imaging using IR and UV is also discussed, including such topics as chemical state imaging and spectromicroscopy. There is a chapter devoted to the study of organic materials, another to photodissociation, and yet another to dispersive photofluorescence. Part I concludes with spectroscopic studies of chemically modified surfaces and electronic and magnetic materials, primarily semiconductors and magnetic monolayers.

Part 2, on soft and hard X-ray techniques, begins with two chapters on soft X-ray work spectroscopy: one offers a good survey that includes several valuable examples from high

temperature superconductivity, elemental analysis in environmental science, and coordination chemistry, and the other a description of surface studies. Subsequent chapters discuss X-ray excited optical luminescence and reflectivity, followed by chapters on small angle, inelastic, elastic (powder diffraction), and time- and space-resolved scattering. A chapter on the effects of radiation on liquids, primarily hydrocarbons, is followed by discussions of applications of microprobes in microanalysis, photoetching and deposition, and tribology. Finally, depth selectivity is described in a chapter on the comparative use of different detection techniques, including fluorescence, electron yield, and absorption.

In conclusion, the criticisms voiced here are not meant to detract from the merits of this collection, but merely to point out its limitations. Overall, this is an excellent survey of the many applications of synchrotron radiation in all areas of modern chemistry and related disciplines, and it is highly recommended, both to active researchers interested in expanding their use of synchrotron techniques as well as to graduate students and others entering the field.

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Crystal Design: Structure and Function. Perspectives in Supramolecular Chemistry, Volume 7. Edited by Gautam R. Desiraju (University of Hyderabad). John Wiley & Sons, Ltd.: Chichester. 2003. xii + 408 pp. $265.00. ISBN 0-470-84333-0.

This most recent volume of *Perspectives in Supramolecular Chemistry* turns its attention to the growing field of crystal design and engineering. With advances in this area progressing rapidly over the past decade, there has been an increasing need for comprehensive surveys and texts that can serve both as introductions for newcomers to the field and as reference materials for the established researcher. Crystal engineering has progressed to the point where dominant themes have appeared, and in his preface, Desiraju describes these as the dual quests for control of topology and property design. This text provides the reader with current descriptions of important aspects of crystal design and engineering in the context of these two goals.

Chapters 1−6 examine specific architectural issues in the supramolecular assembly of solid-state materials, and several among them stand out as knowledgeable, comprehensive reviews of important areas in the field. Brammer's chapter on using hydrogen bonding to assemble inorganic synthons into crystalline, networked arrays provides insight into principles of basic design and the use of these materials for advanced applications. In another chapter, Saladino and Hanessian offer a comprehensive description of the use of the amine−alcohol hydrogen bond in the self-assembly of solids. There are also contributions from Fujita and Zubieta on the construction of 2-D networks and hybrid materials, respectively. All of these chapters provide surveys on specific topics, but the information conveyed is useful for anyone who wishes to parametrize crystal design.

One exciting new area of growth in crystal engineering is the development of functional materials, and no new text would be complete without at least mentioning the construction of advanced materials that exhibit designed physical properties or chemical reactivities. The last part of this book contains three chapters on network solids that have clear practical applications: a discussion of the molecular building block approach to molecular magnets, a section on crystal polymorphism with references to solid−gas reactions, and a chapter on the use of solid-state networks for applications as gas sensors. In particular, the development of molecular magnets using network design is a growing area, and the chapter by Pilkington and Decurtins provides a good discussion of research using this approach. All three subjects represent frontiers in the applications of crystal design and engineering, but this text only begins to scratch the surface on the topic of developing advanced supramolecular materials. However, a full listing of the many applications of designed solid-state compounds, which range from gas absorption to catalysis and photonic uses, is clearly beyond the scope of this text. Hopefully, a new volume in the series will be dedicated to this exciting, rapidly growing area.

Overall, *Crystal Design: Structure and Function* is both a useful introduction for new investigators and a good reference text for the specialist. Most of the chapters are solid, comprehensive discussions of a particular area in network solid design or application. Some chapters are myopic reviews of specialized topics with limited references, but such sections are all too common in contributed volumes. For the majority of chapters, the referencing is complete and up-to-date and not limited to the author's own work. The figures, most of which are black and white, are well rendered and easy to understand. The color figures are excellent but limited to a central section of the book, and thus they are detached from their discussion in the text. If there is a weakness in this book, it is that it tries to deal with the issues of both design and function in the same volume. Although there are a number of valuable chapters on architectural issues in crystal design, only a fraction of the volume is dedicated to some of the many new applications in designed solids. I recommend the text as a useful addition to any chemistry library collection; however, considering the high cost of the book, individuals should factor in its usefulness prior to purchase.

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