Book Reviews

Organoselenium Chemistry. Edited by Dennis Liotta (Emory University). John Wiley and Sons: New York. 1987. ix + 422 pp. $65.00. ISBN 0-471-88867-2.

The editor and authors of this book are to be congratulated on producing, within a relatively slim volume, a comprehensive account of the major aspects of selenium chemistry that are important in the domain of organic synthesis. The book contains a very large amount of information but the text is easy to read. There are nine chapters, each prepared by one or more individuals who have made significant contributions to the subject of their review. There is a subject index and each chapter has a table of contents and is judiciously divided into a number of subsections. There is no difficulty in locating a specific topic. The literature coverage generally extends into the early 1980's with some references as recent as 1986. The editor has seen to it that wasteful repetition is avoided. The longest chapter (125 pages by T. G. Back) covers the reactions of electrophilic selenium reagents. Here are found numerous ways of introducing selenium functionality into an organic structure as well as much chemistry of the resulting organoselenium species. One specialized aspect of electrophilic selenium reagents is their use to effect cyclizations and this particular application is reviewed by Nicolaou, Petasis, and Claremon. All the major reaction types are covered with a very representative choice of examples from the authors' own work and from the results of other laboratories. There follows a comprehensive review by S. V. Ley on the use of seleninic anhydrides and acids. The subject of nucleophilic selenium species—their generation and reaction with organic electrophiles—is dealt with by Monahan, Brown, Waykole, and Liotta. Again the treatment shows clearly what can be achieved with the reagents under discussion. H. J. Reich has contributed a chapter on selenium-stabilized carbanions. This survey is a combination of important physical organic chemistry and synthetic applications. A second chapter by Reich treats [2,3]-sigmatropic rearrangements of organoselenium compounds and is again from the same two complementary perspectives. Back has also written two chapters for this book. His second contribution is on the radical reactions of selenium compounds. The subject of selenocarbonyl species, with emphasis on those of properly characterized structure, is dealt with by F. S. Guziec, Jr. The book ends with an up-to-date review (F. Wudl) on organic metals based on selenium.

The properties of organic selenium compounds have proven to be very useful and the practising organic chemist requires some knowledge of the subject and some ready means of access to the details. The present book is a valuable contribution in this regard.

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Structure and Bonding. Volume 66. Electronegativity. Edited by K. D. Sen (University of Hyderabad) and C. K. Jorgensen. Springer Verlag: Berlin, Heidelberg, New York, London, Paris, and Tokyo. 1987. 198 pp. ISBN 0-387-17740-X.

The series *Structure and Bonding* has provided the chemist with a distinguished series of small volumes, each devoted to a restricted range of subject matter, which have proven themselves extremely useful to both the teacher and researcher in various areas of chemistry. The present volume, devoted exclusively to the title subject, is no exception.

The seven chapters which make up the 66th volume in this series span a wide range of approaches to the fundamental underlying concepts by which the evaluation of the electronegativity of atoms, molecular fragments, and molecules can be approached. It is interesting to note that with but a single exception, each chapter uses as its starting point a reference to Pauling's 1932 paper in this *Journal*, or the various restatements in subsequent editions of *The Nature of the Chemical Bond*. Moreover, the intuitive nature of the electronegativity concept, and its value as a descriptor of chemical behavior, is stressed by virtually all of the contributors.

The volume starts with a review of the estimation of atomic and group electronegativities, using several of the scales now in vogue, and this treatment is particularly useful in providing both an overview of and a comparison between the numerical electronegativity values for selected atoms calculated on the basis of various assumptions underlying these scales. The following two chapters deal with the density functional formalism applied to the calculation of absolute electronegativities of atoms and diatomic molecules. The relationship between electronegativity and hardness in the context of the Kohn-Sham theory and its relevance to chemical reactivity is examined next, followed by a consideration of the electronegativity of atoms and molecules using the Slater transition state and operator concept as a starting point. The final two chapters deal with the importance of electronegativity equalization as suggested by Sanderson, and the relationship between orbital electronegativity and charge distribution in molecules as a function of the valency state of the constituent elements and their hybridization.

The electronegativity concept, by its very nature, readily lends itself to expression in terms of numerical values that permit a meaningful quantitative (or, at the least, a semiquantitative) comparison between related chemical species. It is one of the strengths of the present volume that several of the authors have summarized the results of their calculations in the form of extensive and well-organized tables. These alone would make the present volume a useful, and frequently consulted, reference addition to the bookshelf. But in a broader context, this volume, dealing with such a frequently used didactic idea in the discussion of chemical behavior, which is used from the freshman chemistry level up to the consideration of advanced topics in chemistry, is destined to become a useful resource to chemists working in diverse fields. In this context, it can be expected to find a secure place in most chemical libraries, both personal and institutional.

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Conduction in Non-Crystalline Materials. By Sir Nevill Mott (Cavendish Laboratory, University of Cambridge). Clarendon Press, Oxford University Press: Oxford. 1987. viii + 128 pp. $32.50. ISBN 0-19-851981-8.

For a book of some 100 pages it is remarkable in content. The book covers virtually all the important modern theories about conduction in amorphous materials. At the expense of rigor, the author utilizes his vast physical intuition and perspective and moves rapidly from one major idea to the next. Key references are given so that the reader can supplement what is actually presented. For those of us working in the field of amorphous materials, this book is an important summary of recent theoretical developments, authored by the man centrally responsible for much of the theoretical development and the understanding of the theoretical work of others. Nevill Mott has the unique ability to present difficult theory in understandable physical perspective. For a novice this short book would serve the useful purpose of revealing the important topic areas to be understood with a short list (perhaps too short) of references from which to commence the study of a specific area of importance to the reader.

The outstanding chapters are Chapters 3, 4, 6, and 7. Chapter 3 covers a portion of the work for which Mott and Anderson shared two-thirds of the 1977 Nobel prize in Physics, viz., localization, and hopping mechanisms. This chapter is must reading for anyone working in the electronics properties of non-crystalline materials. In Chapter 4 the Mott transition is covered very lucidly. Chapter 6 is a nice if not too terse treatment of the essentials of polarons which are the distortions caused by electrons, which are prevalent in many materials. Chapter 7 treats amorphous semiconductors and points to the differences between crystalline semiconductors where the impurity states are well known and the amorphous materials where the states are far less well known. Clear pictures of the energy bands, the mobility edge ideas, and solar cells are provided. Lucid explanations are particularly characteristic of the material covered in these four chapters of typically difficult concepts. Chapter 10, although quite brief, is remarkable in its treatment of inversion layers and the quantum Hall effect which was the subject of a recent Nobel Prize. Only Chapter 9 seemed weak and could easily have been eliminated. This chapter attempts to cover both electrical properties, the intended purpose of the book, and film formation of amorphous SiO_2, a vast topic in itself and clearly outside the purpose of the book. Consequently, only scant references to very selected material is presented, especially relative to the film preparation section.

In summary, this is an excellent little book. It will likely be tough reading for someone unfamiliar with the material, but still well worth the trouble to read with the use of supplemental texts and references. It seems that Chemists are becoming more and more interested in the electronic applications of Chemistry and thus these kind of brief but understandable treatments from a renowned scholar are appropriate reading.

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