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Book Reviews

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BOOK REVIEWS

M. E. Vol'pin (Ed.), *Chemistry Reviews, Volume 6, Soviet Scientific Reviews, Section B*, Harwood Academic Publishers, New York 1984, 442 p., \$170.00, ISBN 3-7186-0139-7.

Soviet Scientific Reviews are English translations of reviews written by Russian scientists as accounts of their recent work. Each volume of the chemistry reviews is now devoted to one branch of chemistry; the subject of the present Volume 6 is organophosphorus chemistry, which has a long tradition in the Soviet Union since the pioneering work of A. E. Arbuzov in the beginning of this century. The volume contains eight reviews, each written by leading Russian experts:

- B. A. Arbuzov, N. A. Polezhaeva, and R. P. Arshinova: Investigations of Cyclic Phosphorus Derivatives
- T. A. Mastryukova and M. I. Kabachnik: Reactions of Phosphorus Monothio, Monoseleno, and Selenothio Acids with Aliphatic Diazo Compounds
- A. V. Kirsanov, N. G. Feshchenko, and Zh. K. Gorbatenko: Organic Derivatives of Phosphorus Iodides
- A. N. Pudovik and I. V. Konovalova: Reactions of α,β -Unsaturated Derivatives of Trivalent Phosphorus Isocyanates and Substituted Methylenamides with Electrophilic Compounds
- L. N. Markovskii, V. D. Romanenko, and A. V. Ruban: Synthesis and Investigation of the Properties of Two-Coordinate Phosphorus Compounds
- Yu. G. Gololobov and P. P. Onys'ko: Anionic σ -Complexes in the Nucleophilic Phosphorylation of Aromatic Compounds
- D. G. Knorre and V. F. Zarytova: Phosphorylation Reactions with the Use of Condensing Agents in Oligonucleotide Chemistry, Intermediate Compounds and Intermediate Reactions
- E. E. Nifant'ev and M. P. Koroteev: Cyclic Phosphites and Cycloamido Phosphites of Carbohydrates

The selection of topics is well made and the reader will get a good impression of the "state of the art" of organophosphorus chemistry in the Soviet Union. For the sulfur chemist there is the excellent review by Mastryukova and Kabachnik on the alkylation of ambident thio/seleno phosphorus acid anions, and diverse phosphorus-sulfur compounds tend to crop up in most of the reviews.

The book is well produced and contains few errors, and the references are reasonably up to date with many from 1982, although only a few from 1983. It contains little which is new to the reasonably well read phosphorus chemist, but may fulfill a need for a quick entry to Russian work for a newcomer in the field. The high price, however, makes it a dubious investment for other than the largest libraries.

Otto Dahl
Department of General and
Organic Chemistry
University of Copenhagen
The H. C. Ørsted Institute
DK-2100 Copenhagen
Denmark

Studies in Inorganic Chemistry. Volume 5. *Sulfur, Its Significance for Chemistry, for the Geo-, Bio- and Cosmosphere and Technology*. Edited by A. Müller and B. Krebs. Elsevier, Amsterdam-Oxford-New York-Tokyo 1984, XIV + 511 pp. US\$ 111.50 (USA and Canada), Dfl. 290.00 (Rest of the world).

Sulfur is an element which is widespread in the bio- and geosphere, its chemistry therefore is of great interest for a large number of chemists working in different parts of organic, inorganic and physical chemistry. As elemental sulfur and sulfur compounds are more and more used in industry sulfur has become an element of interest in technology. Therefore, it was an excellent idea to organize a symposium on "sulfur, its significance for chemistry, for the geo-, bio-, and cosmosphere and technology" at the *Zentrum für Interdisziplinäre Forschung* at the University of Bielefeld in West Germany. The present book consists of the 21 lectures given at this symposium, it covers the following interesting features:

1. Elemental Sulfur and Related Homocyclic Compounds and Ions.
2. Sulfur in the Earth's Crust, its Origin and Natural Cycle.
3. Sulfur in History: The Role of Sulfur in "Black Powder".
4. Sulfur in Artwork: Lapis Lazuli and Ultramarine Pigments.
5. New Developments in the Field of Organic Sulfur Chemistry.
6. Organometallic Sulfur Compounds.
7. Thiolates—Intriguing and Versatile Ligands for Transition Metals.
8. Metal Complexes of Sulfur and Sulfur-Nitrogen Compounds and their Catalytic Properties.
9. Sulfido-Complexes of Molybdenum and Tungsten: Synthetic Aspects.
10. Interaction between Metal Centers Through Sulfur-Containing Ligands.
11. Spectroscopic Aspects of Sulfur Chemistry: Electronic and Resonance Raman Spectroscopy of Sulfur-Containing Complexes, Ions and Radicals.
12. Sulfuric Acid—an Important Basic Product in Chemistry. Problems and Recent Developments in Production.

13. Chemical Problems of Flue-Gas Desulfurisation.
14. Metal Sulfides in Photovoltaic, Photoelectrochemical and Solar Biological Energy Conversion.
15. Inorganic Chemistry Related to Rubber Vulcanisation.
16. Biodegradation of Sulfur Minerals and its Application for Metal Recovery.
17. Microorganisms and the Sulfur Cycle.
18. Phototrophic Bacteria and Their Sulfur Metabolism.
19. Cytochromes and Iron Sulfur Proteins in Sulfur Metabolism of Phototrophic Sulfur Bacteria.
20. Sulfide and other Sulfur-Containing Ligands in Metalloproteins and Enzymes.
21. Genetic Diseases of Sulfur Metabolism in Humans.

The authors of the different chapters are all outstanding chemists in their field. All reviews give a list of up-to-date references. This book covers such a wide spectrum of sulfur chemistry that it will be impossible for one reviewer to evaluate all these diverse aspects of sulfur and its compounds. However, being a sulfur chemist specialized in organic sulfur compounds the reviewer finds this book very fascinating from a general point of view. It gives the reader the chance to have a look into many different parts of sulfur chemistry.

It gives lecturers in chemistry a possibility to seek inspiration for topics they can use in their general lectures to show the importance of sulfur and the widespread use of sulfur compounds in modern chemistry. All these applications show that sulfur is a unique and specially fascinating element.

Specialists in a specific topic will probably not find this book equally interesting but it is also beyond the scope of it to be a specialist report. The book is typographically well-produced with a general index with approximately 1200 entries. Unfortunately, the price of this book as of many reviews of this type is prohibitive for personal purchase. However, for every chemistry library acquisition ought to be a matter of course.

Carl Th. Pedersen
Department of Chemistry
Odense University
DK-5230 Odense M
Denmark

F. Bernardi, T. G. Csizmadia, and A. Mangini (Eds.), *Organic Sulfur Chemistry, Theoretical and Experimental Advances; Studies in Organic Chemistry 19*, Elsevier, Amsterdam, 1985, 740 p., US \$146.25/Dfl. 395.00, ISBN 0-444-42453-9.

This book (with a somewhat unimaginative title which it shares with extant books) contains valuable and timely reviews by leaders in their fields and will no doubt serve as a standard work of reference for many years to come. It contains the following

chapters:

- 1) S. Oae: Historical Development of Sulfur Bonding: A View of an Experimental Sulfur Chemist (sic!).
- 2) I. Hargittai: Geometrical Variation in Free Organic Sulfur Molecules (sic!).
- 3) S. Wolfe: Sulfur-Containing Carbanions and Related Species.
- 4) A. Kucsman and I. Kapovits: Non-Bonded Sulfur-Oxygen Interaction in Organic Sulfur Compounds.
- 5) G. Capozzi and G. Modena: Reactive Sulfonium Salts.
- 6) A. Fava: Sulfonium Ylides.
- 7) M. Cinquini, F. Cozzi, and F. Montanari: Stereochemistry of Optically Active Sulfoxides.
- 8) R. A. Hayes and J. C. Martin: Sulfurane Chemistry.
- 9) L. Lunazzi and G. F. Pedulli: Structure and Reactivity of Sulfur Containing Organic Free Radicals: Recent Advances.
- 10) G. Modena, C. Paradisi, and G. Scorrano: Solvation Effects on Basicity and Nucleophilicity.
- 11) I. W. J. Still: Photochemistry of Organic Sulfur Compounds.
- 12) J. Balint, R. Bogнар, and M. Rakosi: Chemistry of Sulfur Containing Flavonoids.

The book, which has been produced by direct reproduction of typed manuscripts, contains an adequate subject index, but no author index. The quality of the artwork is excellent a little bit of unevenness notwithstanding. The literature appears to be covered through 1983 with a few 1984 references here and there. More vigilant editors might have weeded out weak spots such as non-standard journal abbreviations, patent citations without Chemical Abstracts references, and some authors' kamikaze approach towards the English grammar. Queer sentences like "Earlier, pentacoordinate sulfur compounds were considered to assume $3sp^3d$ hybridization, although three-center-four-electron bond, namely, hypervalent bond, consisted with a p-orbital, was suggested by Rundle and others for such a compound as SF_4 as shown below" (p. 43) and "We now know that this mechanism is not correct, but, as discussed later, it is not necessarily ruled out that sulfonium ylides play no role in squalene biosynthesis" (p. 135) should not have escaped the attention of the editors. However, it must be admitted that most of these oddities do make sense after careful and slow rereading.

Chapter 1 contains, *inter alia*, a candid presentation of the monumental contributions of the author's school to organosulfur chemistry including the ups and downs of the long-standing controversy concerning the involvement of sulfur d-orbitals in bonding. It contains 338 references.

Chapter 2 gives an encyclopedic overview of the structures of organic sulfur compounds determined in the gas phase. This is an extremely useful and timely corollary of the more usual compilations of X-ray structure data. Extensive tables and figures as well as 204 references are presented.

In Chapter 3 a most detailed analysis of sulfur-containing carbanions as theoretical challenge and synthetic tool, complete with 180 references, is executed with authority and enthusiasm.

Chapter 4, with 300+ references and plenty of physical data in concise, no-nonsense tabulation treats an interesting and intriguing subject which would defy the neophyte's attempt at a Chemical Abstracts literature search, be it manual or computer-assisted.

Chapter 5 is a welcome update on the corresponding volumes of the Patai series with another 116 references. The emphasis is on reaction mechanisms.

With Chapter 6 a long-needed and comprehensive rather than eclectic critique of sulfur ylide chemistry becomes available. The chapter is well documented with 145 references.

Chapter 7 reflects the considerable interest in optically active sulfoxides *per se* and as a means for transferring chirality to carbon displayed by chemists in recent years, attested by 128 references.

Chapter 8 is, of course, co-authored by "Mr. Sulfurane" himself and benefits immensely from his enthusiasm and superb grasp of the subject. No less than 300+ papers can be quoted on this somewhat esoteric subject.

Chapter 9 does for sulfur-containing radicals what Chapter 3 does for carbanions and draws, of course, heavily on a wealth of ESR data. No doubt much of this seminal, mostly theoretical and mechanistic, work (203 references) will, in due course, be translated into elegant and efficient synthetic schemes.

A rather slim Chapter 10 (59 references) addresses itself to important and intriguing questions aptly treated with the formidable instruments of modern physical organic chemistry. The important synthetic implications are obvious.

Chapter 11 is a treasure trove of mechanistic and preparative lore and must be required reading for all sulfur chemists, especially those who only practice photochemistry occasionally. This chapter weighs in with a hefty 310 references.

Finally, as befits a chapter written by this book's only authors from an industrial laboratory, Chapter 12 deals with an applied (or rather potentially applied) subject essentially treating the nuts and bolts of thioflavonoid synthesis. An amazing 316 references document the subject matter.

It is obvious that this book contains a unique compilation of useful and thought-provoking information on the state of the art and no sulfur chemist should be without access to it. It sets a standard of what is valid sulfur chemistry today. The editors and authors have rendered the sulfur community a generous and splendid service which will be remembered gratefully for years to come. We cheerfully succumb to the power and charm of this sulfur mafia.

Alexander Senning
Kemisk Institut
Aarhus Universitet
DK-8000 Århus C
Denmark