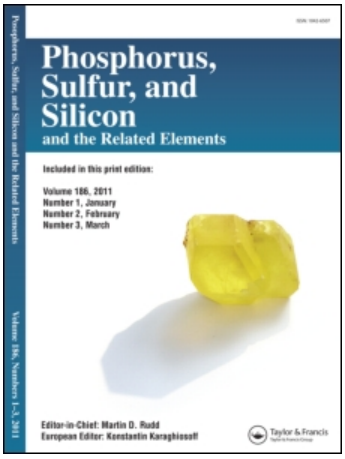

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Book Reviews

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Book Reviews

NEW USES OF SULFUR—II, by Douglas J. Bourne (Advances in Chemistry Series—165). American Chemical Society, Washington, D.C. 20036, 1978. 282 pp. ($30.00)

Research on the employment of elemental sulfur as an engineering material, in contrast to its uses as an important chemical feedstock, has expanded significantly in the last decade. This interest has been spurred by the growing stockpiles of sulfur generated from desulfurization of sour crude oils and natural gas, and by the prospect of even larger supplies becoming available from coal-fired power plant flue gas desulfurization.

This book contains the proceedings of the 1977 "Symposium on Sulfur Utilization: A Progress Report" held at the 173rd Meeting of the American Chemical Society. It contains fourteen papers, of which three deal with the chemistry of elemental sulfur, in both the modified (plasticized) and unmodified states, while the remainder review research efforts and field trials of sulfur as an engineering material.

This is a book which can be recommended not only to chemists and chemical engineers, but more importantly to civil engineers, particularly those concerned with highway construction. Five of the papers deal with the use of elemental sulfur as an extender of asphalt in bituminous mixtures used for highway pavement construction. The topics discussed include laboratory characterization of sulfur-extended asphalt (SEA) binders alone and in mixtures with aggregates, construction and evaluation of highway pavements utilizing these SEA binders, and predictions based on computer modelling of the long-term performance of such pavements. These papers give a very up-to-date picture of the status of SEA binders, including the variety of processes which have been developed to produce them.

Also of interest to civil engineers are papers on sulfur concrete, chemically modified sulfur used in protective coatings for earthen and portland cement concrete structures, and uses for foamed sulfur. The last two papers in the volume deal with sulfur treated bamboo rod to replace reinforcing steel, and the production and properties of wood-sulfur composites.

Overall, the technical content of this volume is of high caliber. It will appeal to a very wide audience and should definitely be read in its entirety by anyone seeking information on innovative, practical approaches to the use of sulfur in engineering. The book is attractively printed and bound, and careful reading uncovered only four minor, obvious typographical errors. The only negative comment is that at $30.00 the price of this volume is almost double the first volume in the series published in 1975, although there is a modest increase in the length (282 versus 236 pages). The subject index is adequate, and while there is no author index, each paper is extensively referenced. In summary, for any researcher interested in the engineering uses of sulfur, this book would represent $30.00 well spent.

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PHOSPHORUS, AN OUTLINE OF ITS CHEMISTRY, BIOCHEMISTRY, AND TECHNOLOGY, by D. E. C. Corbridge (University of Leeds, U.K.). Elsevier Scientific Publishing Co., Amsterdam, Jan. 1978. 464 pp. (U.S. $49.60, Dfl. 146.00)

The author, a recognized authority on the structural chemistry and infrared spectroscopy of phosphorus compounds, has performed a monumental task. He has endeavored to outline in a single volume the organic, inorganic, biochemical physical, technical and environmental aspects of this important element. A substantial portion of the book consists of chemical equations and structural formulae, which makes for easy reading. Mechanistic aspects are dealt with sparingly and not in the depth represented by, for example, the monograph by Kirby and Warren. As one might expect from the author's background, structural and bonding aspects are discussed with greater thoroughness.

The book is divided into ten major chapters. Particularly useful is the inclusion of the nomenclature at the beginning of the chapters on organic phosphorus compounds. Very useful and well-written chapters are those dealing with condensed inorganic phosphates, phosphazenes, stereo-

chemistry of phosphorus, and pseudorotation. The discussion of phosphorus biochemistry comprises about a tenth of the book and could serve as a reasonably compact introduction to this complex subject.

The chemistry and structural information appear in general to be accurate. Such errors as were noted are mainly typographical, which unfortunately are numerous. Examples of such errors are: Equations 147 and 148 on page 173—Cl_2 is shown as a by-product when it is intended to be HCl; + and − signs are missing in equation 171 on page 175; double bonds are used in equation 216F when they are intended to be triple bonds; P is missing in $(PhO)_5P$ in equation 238 on page 189. These are only a few examples cited from just a few pages of the book.

The weaker aspect of the volume is its coverage of the technological and applied aspects of phosphorus chemistry. For example, an erroneous explanation is given for the plasticizing function of tricresyl phosphate. In connection with organic phosphate synthesis, the important commercial manufacture of triethyl phosphate from P_4O_{10} and diethyl ether is not mentioned. The long-time commercial availability of phenylphosphonous dichloride is not stated—needless preparative labor could be the result of this sort of omission. Some commercially-important inorganic phosphorus compounds, such as chlorinated trisodium phosphate, are not mentioned. The statement is made (p. 69) that "phosphorus trichloride is said to react rapidly with pure oxygen, even at low temperature, but it appears that various trace impurities can inhibit this reaction," without indicating nevertheless that this is the commercial route to $POCl_3$.

Part of a chapter is devoted to phosphorus polymers, but none of those depicted is actually commercial, whereas the important use of phosphorus-containing diols built into the structure of rigid urethane foams as a flame retardant is not alluded to. The vinyl phosphonate and phosphorus oligomer chemistry developed commercially in connection with flame retardancy is also not described.

However, the author should be complimented for having made a sincere attempt to integrate industrial phosphorus chemistry into this volume. It is refreshing to find several pages devoted to the synthesis, structure and chemistry of phosphorus pentoxide, the major industrial phosphorus intermediate, which is scarcely mentioned in the excessively academic phosphorus monograph of Emsley and Hall.

As a reference source, this book will be found somewhat frustrating because the individual items discussed are not accompanied by references. The reader seeking further details on a given statement in Corbridge will be obliged to hunt through the "Further Reading" lists at the end of each chapter. The references in these lists are mostly to books and reviews.

The book is quite readable throughout and could be useful as a supplemental assignment for advanced undergraduates, as an introductory text for graduate students or research workers entering phosphorus chemistry for the first time, or as a refresher for the experienced worker in this increasingly-active field.

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