

the proposed ring, but the choice of which isomer is not easily made. We believe the compound is 3,3,6,6-tetrafluoro-2,5-bis-(trifluoromethyl)-1,4,2,5-dioxadiazine, but the 1,4,2,6- and 1,2,4,5-dioxadiazines cannot be ruled out.¹³

The above reactions clearly show the remarkable properties of PFAPO. Considerable new synthetic work is indicated by these

(13) Examples of saturated 1,4,2,5- and 1,4,2,6-dioxadiazines are apparently unknown. Several 1,2,4,5-dioxadiazines have been prepared and their conformational equilibria have been examined: Katritzky, A. R.; Baker, V. S.; Brito-Palma, F. M. S.; Sullivan, J. M.; Finzel, R. B. *J. Chem. Soc. Perkin* 2 1979, 1133.

results, and the obvious mechanistic questions raised by these examples are of interest.

Acknowledgment. The support of this research by the U.S. Army Research Office (Grant No. DAAG29-80-C-0102) is gratefully acknowledged. J. V. Paukstelis is also acknowledged for helpful assistance with the NMR.

Registry No. PFAPO, 60247-20-3; PFAPO dimer, 82135-34-0; $\text{CF}_2=\text{CFCl}$, 79-38-9; $(\text{CH}_3)_3\text{SiCN}$, 7677-24-9; 4-chloro-3-(trifluoromethyl)perfluoro-1,3-oxazolidine, 82135-35-1; acetone, 67-64-1; 5,5-difluoro-2,2-dimethyl-4-(trifluoromethyl)-1,3,4-dioxazolidine, 82135-36-2; 1-(trifluoromethyl)-3-(trimethylsilyl)carbodiimide, 82135-37-3.

Book Reviews*

Organic Syntheses. Volume 60. Edited by O. L. Chapman. John Wiley & Sons, New York. 1981. xii + 140 + 32 pp. \$22.50.

There are 27 checked procedures in this volume, mostly emphasizing new or improved methods of some generality rather than specific important products. A resurgence of interest in organic electrochemistry is demonstrated with three electrochemical preparations. The usefulness of silicon compounds in synthesis is illustrated by four examples. Carbene chemistry, once largely of interest to physical organic chemists, is finding its place in synthesis, as shown by the introduction of a formyl group on styrene by means of dichloromethylene to prepare atropaldehyde, and the preparation of a cyclopropene from a carbene generated by thermolysis of a diazine. These are merely examples of the good things to be found in this volume.

This venerable aid to the organic chemist has now reached its sixtieth anniversary, unheralded by jubilee celebrations, but nevertheless widely and deeply appreciated. The Editor alerts future submitters of methods that this occasion is marked by the adoption of a new style guide. The variety and timeliness of the preparations included in this volume demonstrate the health and vigor of this institution, with which most of us have been familiar from the beginning of our careers.

Chemistry and Physics of Carbon. Volumes 15, 16, and 17. Edited by P. L. Walker, Jr., and P. A. Throver. Marcel Dekker, Inc., New York. 1979, 1980, and 1981, respectively. Volume 15: 320 pp. \$36.50. Volume 16: 336 pp. \$42.50. Volume 17: 320 pp. \$45.00.

Lest anyone might be misled, it should be stated that the title of this series is not meant to include organic chemistry; the volumes are concerned with the element. Each contains a group of contributed reviews. In volume 15, these are Pyrocarbon Coating of Nuclear Fuel Particles, by Guilleray, Lefevre, and Price; Acetylen Black: Manufacture, Properties, and Applications, by Schwab; and The Formation of Graphitizable Carbons via Mesophase: Chemical and Kinetic Considerations, by Marsh and Walker. Volume 16 contains two reviews: The Catalyzed Gasification Reactions of Carbon, by McKee; and The Electron Transport Properties of Graphite, Carbons, and Related Materials, by Spain. In Volume 17 are to be found reviews on Electron Spin Resonance and the Mechanism of Carbonization, by Lewis and Singer; Physical Properties of Noncrystalline Carbons, by Delhaës and Carmona; The Effect of Substitutional Boron on Irradiation Damage in Graphite, by Brocklehurst, Kelly, and Gilchrist, and Highly Oriented Pyrolytic Graphite and its Intercalation Compounds, by Moore.

The orientation of the contributions is toward materials science and industrial concerns, although there is much fundamental chemistry to be found. Each volume is provided with a subject index and a complete author index, as well as the tables of contents of all prior volumes. The text is reproduced from typescripts which have apparently been retyped on the publisher's premises to provide a uniform appearance.

Energy Storage and Transportation. Edited by G. Beghi. D. Reidel Publishing Co., Dordrecht, Holland, and Boston, Mass. 1980. x + 497 pp. \$39.50.

A course of lectures held at Ispra, Italy, in 1979, sponsored by The Joint Research Centre of the Commission of European Communities, provided the content of this book. There are 17 lectures plus an introduction and a subject index. Some of the topics are directly related to applied chemistry, such as: Hydrogen as Chemical Storage, by G. De

Beni; Perspectives for Hydrogen Hydride Technology, by H. Buchner; Advanced Secondary Batteries, by M. Dell; Phase Change Heat Storage, by F. Fittipaldi; Coal Gasification and Liquefaction, by H. G. Rörtgen and U. Lenz; and Solar Energy Conversion and Storage by Semiconductor Liquid Junction Cells, by W. Gissler.

The papers are all in English and are reproduced from typescripts with several different typefaces, and there are a few ugly corrections. The lack of running headings makes the book difficult to use. There are bibliographies at the end of each paper, but they are rather short. Nevertheless, this book gives a useful, comprehensive insight into recent research and development activity.

Nitrogenous Air Pollutants: Chemical and Biological Implications. Edited by D. Grosjean. Ann Arbor Science Publishers, Ann Arbor, Mich. 1979. x + 349 pp. \$33.00.

A symposium on the title subject, held at the 175th National Meeting of the A.C.S., generated the papers in this book of proceedings. The 20 contributed papers consist of book reports or original research and reviews. Those that are reviews are shorter than most of the primary papers and are therefore less useful than might be expected. Nevertheless, the wide variety of subjects covered provides a helpful introduction to the recent investigations. The variety of nitrogenous compounds found in polluted air is as interesting as it is disturbing, and includes not only oxides of nitrogen but amines, nitrosamines, peroxy nitrates, and nitroarenes.

The volume concludes with a 4-page subject index, a feature pleasant to find in a book of proceedings, but a list of contributors (there must be over 50) is unfortunately lacking.

Solubility Data Series. Volume 7. Oxygen and Ozone. Edited by R. Battino (Wright State University). Pergamon Press, New York and Oxford. xviii + 519 pp. 1981. \$100.00.

This volume continues the pattern of the series by presenting carefully sifted and evaluated data on solubilities in a form that is thorough, useful, and clear, to the extent that published information allows, guided by the motto quoted in the foreword: "If the knowledge is undigested or simply wrong, more is not better". The importance of the solubility of oxygen and ozone is exceptionally great, owing to the dependence of life processes on it. It is therefore appropriate that this volume indicates not only solubilities in water, numerous salt solutions, and organic solvents but also in various biological fluids, such as tissue, blood, vegetable oils, and wines. The editor notes with surprise the absence of information on the solubility of oxygen in deuterium oxide, but he expresses no surprise at "the paucity of high pressure solubility measurements for oxygen", and offers the hypothesis, perhaps resulting from an unhappy experience, that this paucity is "no doubt due to the probability of converting the dissolution vessel into a bomb calorimeter".

Encyclopedia of Chemical Technology. Third Edition. Volume 16. Edited by M. Grayson and D. Eckroth. John Wiley & Sons, New York. 1981. xxvi + 971 pp. \$145.00.

This newest volume in the major revision of the Kirk-Othmer Encyclopedia covers topics from Noise Pollution to Perfumes. Two topics—Nuclear Reactors and Olefin Fibers and Polymers—make up about one-fourth of the book. Oxygen, ozone, and oxalic acid are each given a section. Organometallics are divided into σ -bonded and π -bonded compounds in separate sections. Paint, paper patents, and perfumes are among the important topics in the P portion. Nonwoven textile fabrics

* Unsigned book reviews are by the Book Review Editor.

appear here, rather than under F or T. There is a section on Odor Modification, but, curiously, none on the general topic of odor; perhaps it is planned for a future volume, under "S". Nomenclature is given an interesting treatment that includes a nice balance between historical development and modern approved practice.

As with earlier volumes, the articles, contributed by experts drawn largely but by no means entirely from industry, are authoritative, long enough to be useful, and embellished with many figures and tables.

Advances in Heterocyclic Chemistry, Volume 29. Edited by A. R. Kartzitzky and R. J. Boulton. Academic Press, London and New York. 1981. ix + 405 pp. \$62.50.

Three of the six contributed chapters in this volume bring up to date subjects that have been reviewed in this series before. R. K. Smalley takes the subject of indoxazenes and anthranils from 1966 and carries it through 1979, digesting 283 references in the process. In doing the same thing for benzothiophenes, R. M. Scowston had a more onerous task, having to deal with about twice as many references. He notes a surprisingly large amount of activity in the field; much of it is characterized by increasing sophistication, but "it is sad that a good deal of highly fragmented, routine work is being published—often almost identically in different journals, and often without mention of similar work reported previously by others". Surely this situation is not confined to benzothiophene chemistry.

Bringing isoindoles up to the eighties may not have been so demanding, for R. Bonnett and S. A. North manage the task with only 136 references. They note that the parent compound was at last isolated in 1972, well after the last review. Y. Tamura and M. Ikeda contribute a chapter on heteroaromatic *N*-imides and *N*-aminoazonium salts, a subject of relatively recent development. The N-N ylide function confers a rich and useful repertoire of reactivity on heterocycles, the reporting of which generated 269 references in the decade reviewed. A review by A. Gasco and A. J. Boulton on furoxans (1,2,5-oxadiazole *N*-oxides) and benzofuroxanes is a welcome addition to the literature of these unusually enigmatic and intriguing ring systems, much of the uncertainty about which has been cleared up in recent years. Finally, a chapter on mononuclear heterocyclic rearrangements is contributed by M. Ruccia, N. Vivona, and D. Spinelli. By the title term, the authors mean interconversions of azole systems with one another, a phenomenon particularly well developed in oxadiazole chemistry. The volume concludes with a cumulative index of titles; the role of a subject index is relegated to the tables of contents of the individual chapters, and the result is not fully adequate.

Coal Gasifiers. By B. E. J. Hoffman. The Energon Co., Laramie, Wyoming. 1981. x + 721 pp. \$225.00.

Efficient conversion of coal to gaseous fuel has taken on new importance in recent years, with the result that new procedures with reduced energy consumption are being developed. This book is concerned with the engineering aspects of the problems, such as materials handling, heat transfer, rate effects, and product separation, waste disposal, and pollution control, and their relation to equipment and its performance. The author has been personally involved in the development of catalytic conversion of coal and steam to gaseous and liquid fuels.

The chemical content of this book is small, and is essentially empirical or highly applied. Thermodynamics and energy balances are dealt with in detail, using Btu's and pound-moles rather than metric units. There is a very large amount of engineering information in the form of tables and flow sheets. Occasional lapses from literacy can be found, such as "belying the organic origins of coal" where "betraying" is presumably meant, and the consistent misspelling of "beneficiation" as "benefication", but these are very minor flaws when seen against the vast amount of practical information that makes up most of the book.

Chemical Desulphurization of Coal. By Geoffrey F. Morrison. IEA Coal Research, 14/15 Lower Grosvenor Place, London. 1981. 73 pp. £10.00.

This report is the latest in a series of documents produced by the Technical Information Service of IEA Coal Research. The express purpose of this report is to review the literature on chemical coal desulfurization and compare the available processes on a technological basis. The document succeeds quite well in this regard.

The author begins by briefly stating the problem posed by sulfur in coals used for utility boiler fuels and reviewing the impact of past and current EPA legislation on coal utilization. A basic background on the forms of sulfur in coal and the distribution of sulfur types (both organic and inorganic) is presented along with illustrative micrographs of pyrite

framboids and crystals. This is followed by a discussion of the chemistry of coal cleaning by chemical means. The bulk of the remainder of the text is given over to fairly detailed descriptions of 15 chemical desulfurization processes, all of which have demonstrated the potential for reducing either the inorganic sulfur in coal or organic sulfur or both by mild chemical processing. The text then winds up with a section on current research on coal cleaning and some concluding remarks regarding the current economic status of chemical coal cleaning. There are 116 references cited in the text.

As a reference document for chemical coal cleaning, the manuscript succeeds quite well. While elementary, the opening discussions on coal chemistry and coal cleaning provide the background necessary for understanding the processes presented. Each process discussed is well described, and data on desulfurization results achieved are presented where available. In each case, the chemistry of the process being discussed is stressed rather than any detailed engineering analysis of the system. Since many of the processes are not well developed past the laboratory stage, this emphasis is appropriate.

The concluding section, however, seems somewhat too detailed. The author states that little if anything is known about how organic sulfur occurs in coal, but then devotes eight pages to a rigorous discussion of the reactions of model sulfur heterocycles in various chemical desulfurization systems. This section seems overly emphasized in light of the admitted lack of understanding of organic sulfur species in coal.

In summary, this report presents a comprehensive literature review on chemical coal cleaning, with a strong emphasis on the chemistry and chemical reactions, and is a valuable addition to the literature on chemical coal cleaning.

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Biochemistry. By Frank Bradley Armstrong (North Carolina State University) and Thomas Peter Bennett (The Academy of Natural Sciences of Philadelphia). Oxford University Press, New York. 1979. xi + 491 pp. \$24.95.

Designed for an introductory course for undergraduates from a variety of disciplines, this book begins with five chapters of background material, including a brief history of biochemistry, a discussion of the chemical elements associated with life processes, an introduction to the properties of water and buffers, considerations of the chemistry and structural features of carbon compounds and noncovalent interactions, and a description of various kinds of cells and organelles. The introductory material is succinct and provides sufficient information to preclude most of the difficulties encountered by students with highly variable backgrounds.

The biochemical topics begin in a very functional manner, building from amino acids to protein structure and function to enzymes. The chemistry and structures of carbohydrates and lipids follow. There are useful comments on the functions and locations of principal classes of lipids. However, the metabolism of lipids, other than as sources of energy, is limited to abnormal aspects of medical interest; the biosynthesis of lipids is not covered. With the very adequate treatment of membrane features from a structure-function viewpoint, perhaps the absence of commentary on elongation mechanisms and other anabolic steps of lipids is not a serious deficiency for a one-semester course. Other chapters complete the presentation of the chemical components of cells and introduce the primary metabolic pathways. The treatment of nucleic acid structure and function is well done with inclusion of methods of sequencing DNA and material on recombinant DNA. The absence of comments on splicing events in the synthesis of RNAs is understandable with a 1979 publication date for the text.

The text is easily read and figures, tables, and structures are well done with a minimum of errors. (Labels on photosystems I and II are reversed, and a table on vitamins has misleading comments on functions of pyridoxal phosphate and biotin.) The textbook appears to be composed of about 50% text and 50% figures, etc. Each chapter includes two categories of references for additional reading and a set of problems. Answers are in the back of the book. The format on the whole is very good.

The rapid advances in biochemistry and associated disciplines create severe problems in producing current textbooks. This book has, as its authors intended, concentrated on the concepts necessary for a foundation in biochemistry. Because the book has been available since 1979 and it has been in use at Kansas State University, I can comment that we have found the book to be well accepted by students and to satisfactorily fill the need for one of our one-semester general courses in biochemistry (with the usual comments added in lecture to cover more timely topics).

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