
BOOK REVIEWS

Fundamental Principles of Polymerization—Rubbers, Plastics and Fibers. By F. G. D'ALELIO, A.B., Ph.D., Vice President and Manager of Research, Koppers Company, Inc., Pittsburgh, Pennsylvania. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1952. x + 517 pp. 16 × 23.5 cm. Price, \$10.00.

This book is a useful survey of the synthesis and properties of synthetic high polymers. The author points out in his preface that it "is not encyclopedic in scope, but summarizes what I believe is the minimum fundamental knowledge that a scientist in the field of polymers should have."

The book begins with a general discussion of the types of materials which are composed of polymeric molecules—*i.e.*, rubbers, fibers and plastics. It then treats the various methods of producing synthetic polymers (addition polymerization and polycondensation reactions). The determination of molecular weight and of molecular weight distributions is discussed in detail. The physical properties and chemical stabilities of various species of polymer are also covered.

The book is not aimed at specialists in the various branches of polymer chemistry, but rather at those who wish to obtain a sound over-all picture of the general principles of the field. In this the book is most successful. The scope is broad, and the treatment is a happy blend of physical and organic chemistry. Many useful tables and figures are included.

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Aromatische Kohlenwasserstoffe—Polycyclische Systeme. Second Edition. By E. CLAR, Universität Glasgow (Schottland). Springer-Verlag, Reichpietschstr. 20, Berlin W 35, Germany. 1952. xxii + 481 pp. 16.5 × 23.5 cm. Price, DM 69.—.

Clar's book is a relatively small volume, but it undoubtedly contains the best treatment of polycyclic aromatic hydrocarbons available at present in so few pages.

A little less than a third of the work is devoted to nomenclature, to a theoretical discussion of aromatic hydrocarbons and to general methods of preparing them. Here we find comparisons of structure, reactivity and color, a discussion of resonance, and of the meaning in modern terms of the Kekulé structures. The section on methods of preparation is not extensive, only 21 pages, but it is reasonably comprehensive, and contains enough leading references to be extremely useful.

The remainder of the pages are devoted to a discussion of individual aromatic hydrocarbons (including benzene). In general, no attempt is made to include the various known alkyl substitution products of the parent polycyclic compounds, although in certain cases (*e.g.*, naphthalene) certain homologs are listed.

Under headings which are the names of various parent hydrocarbons, is to be found a discussion of occurrence, preparation, properties and reactions. The ultraviolet absorption spectra, which are given for each of the polycyclic hydrocarbons discussed, are an extremely valuable feature of the work.

More than 10 years have elapsed since the publication of the first edition. Those interested in the chemistry of polycyclic aromatic hydrocarbons will certainly welcome the appearance of the new edition which contains references to work published as recently as 1950.

Typography is good; it is regrettable that paper and binding are not of better quality, for this book will be much used by all who are interested in polycyclic aromatic hydrocarbons.

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Heat Transfer Phenomena—The Flow of Heat in Physical Systems. By R. C. L. BOSWORTH, Ph.D. (Cantab.), D.Sc. (Adel), F. Inst. P., F.A.C.I. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1952. xii + 211 pp. 14.5 × 22 cm. Price, \$6.00.

A sense of the resistance which material substances offer to the flow of heat is undoubtedly as old as the human race, for the most primitive peoples quickly acquire knowledge of the practical importance of good and poor heat conductors.

From the point of view of a scientific development, precise knowledge of the subject of heat conductivity and heat transfer has evolved slowly, but in the last fifty years an impressive body of formulated knowledge has come into existence. In recent years several important volumes have appeared in English notably McAdams, "Heat Transmission," now in its second edition; and quite recently "Heat Transfer" by Max Jakob. The present volume of nine chapters differs in some respects from the preceding volumes in that related sciences of fluid flow, radiation, statistical mechanics, mass transfer, phase equilibria and chemical equilibria as these relate to the heat transfer processes, are presented in a unified manner favorable to a ready understanding of a quite complex subject.

A considerable amount of primary experimental material is referred to and tabulated, but the book makes no pretense at being a compendium of the voluminous body of data of importance in a solution of the many sided aspects of heat transfer. The volume, comprising approximately two hundred pages of text, would serve admirably as a text for a thorough course in a technical school, and with special advantages because of the fundamental aspects emphasized.

The first chapter classifies the transfer processes, while the second expounds the theory of gaseous conduction and the attendant effects of temperature and pressure, along with some of the disabilities attending the measuring of gaseous conduction. There follows an exposition of the part played by thermal radiation, the thermal conductivity of condensed phases, convection, natural and forced, along with the complicated subject of the simultaneous transport of heat and mass. The eighth and ninth chapters present the usefulness of the analogy between electrical conductivity and heat conductivity. The final chapter discusses thermodynamic similarity and coupled transport processes, for example, the chemical reactor in which heat, mass and momentum operate simultaneously.

The volume is a well-written and comprehensive exposition of the fundamental elements of an extremely complex subject.

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Methoden der Organischen Chemie. Volume VIII—Sauerstoffverbindungen III. By EUGEN MÜLLER (Editor). Georg Thieme Verlag, Diemershaldenstr. 47, Stuttgart, Germany. 1952. xviii + 775 pp. 19 × 26 cm. Price, DM 98.—.

For a long time Houben-Weyl's "Methoden" was a reliable and much-consulted source of guidance and of reference. Unfortunately, it was being relegated to more and more remote shelves of our libraries because the third edition of the work had become sadly outdated. Friends of the old "Houben" will, therefore welcome, and younger chemists will be pleased to make the acquaintance of, a fourth, revised and greatly expanded edition.

Prof. Eugen Müller is the editor-in-chief and Profs. Otto Bayer, Hans Meerwein and Karl Ziegler constitute the board of editors who are being assisted by numerous colleagues from both the industrial and the academic field. Volume VIII out of a projected 14-volume collection has just appeared; the remainder is to follow within four years. One volume each is to be devoted to the discussion of laboratory technique, analytical methods and physical means of in-

vestigation. A further volume will treat the large classes of organic reactions, *i.e.*, oxidation, catalysis, handling of isotopic compounds, free radical reactions, etc., and the bulk of the set is to deal systematically with the preparative methods themselves. The criterion for classification of any one reaction is the nature of the compound resulting from it; *e.g.*, the Favorsky rearrangement will be found in the chapter on carboxylic acids rather than in that on ketones where it may occur merely as a cross reference. The compendium concludes with a special index volume which is to contain a new and generally applicable system of symbols for organic chemical reactions.

The volume at hand is the third part of the section devoted to "oxygen compounds" and discusses peroxides (Criegee), derivatives of carbonic acid (Petersen and Piepenbrink), nitriles and isonitriles (Kurtz), carboxylic acids, esters, nitrogen derivatives (Henecka, Ott and Kurtz). Each section and subsection briefly describes the general background of the transformation to be discussed; then scope and limitations are set forth by quoting pertinent researches from the literature. In each subsection several selected complete preparative procedures are given, after which the research chemist may pattern new experiments.

Since complete coverage was neither possible nor desirable, the editorial policy adopted is to include only tried and reliable as well as significant procedures. This required the authors and editors to make critical selections from a wealth of material, a problem which in the reviewer's opinion has been solved very well. The cooperation of industrial chemists (four of the six contributors to volume VIII are associated with the Bayer Company at Leverkusen and at Elberfeld) assures the inclusion of much material from the patent literature or from unpublished experiments. Discussion and presentation of procedures are on a high level. The important section on carboxylic acids, esters, etc., which includes, *e.g.*, the entire field of Claisen, Dieckmann, Michael and related condensations, is attractive because of the brief and lucid descriptions of the transformations in which mechanistic and electronic concepts are used to advantage. The remaining sections, on the whole, limit themselves to non-theoretical exposés. Typography and quality of paper and binding are of a high standard.

Because of the comprehensive coverage of the field, the series fills a definite need notwithstanding the existence of such excellent collections as "Organic Syntheses," "Organic Reactions," or Theilheimer's "Synthetic Methods" which address themselves to more narrowly defined areas. Even though the second and third volumes are likely to overlap some of the specialized treatises now in existence, such as Weissberger's "Physical Methods of Organic Chemistry," this is hardly avoidable and should not detract from the usefulness of either work.

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An Introduction to the Chemistry of the Hydrides. By DALLAS T. HURD, Research Associate, General Electric Research Laboratory, The Knolls, Schenectady, New York. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. x + 231 pp. 15.5 × 23.5 cm. Price, \$5.50.

This book comprises seventeen chapters of which the earliest are an introduction to hydride chemistry and a discussion of chemical bonding and the structures of hydrides;

the last is on nomenclature. Between these is given systematically some of the material available on the binary compounds of hydrogen and related substances. In general plan this material is divided into sections on the saline, the covalent and the complex hydrides, together with a chapter each on the hydrides of the transitional elements and the "borderline hydrides." Within sections the treatment is usually according to periodic groups. Preceding each section is a survey chapter on the class of hydride to be considered, and before the material on each group is a generalized treatment of the hydrides of those elements. Finally, each element which forms a hydride is discussed separately to a degree roughly proportional to the amount of information available. This plan has led to a great deal of needless repetition. Five brief appendices are concerned with Deuterides, Toxicology of Hydrides, the Vacuum Manipulation of Volatile Compounds, Commercial Sources of Hydrides and Tables of Physical Properties and Thermodynamic Data for the Boron Hydrides.

The second chapter on "Chemical Bonding and the Structure of Hydrides" is very well done, and the influence of polarization upon bonding and the properties of molecules is excellently described in a qualitative way. Another interesting feature is the catalogue of uses for hydrides which the author has compiled. Parts of this are distributed at the ends of chapters and others are embodied within the text. The reader will be astonished at the number of practical purposes for which these chemical curiosities have been adopted. Appendix B is a timely warning that many hydrides can be dangerously toxic if exposure to more than a minute quantity is experienced. Another useful aspect is to be found in the bits of hitherto unpublished information, perhaps some of it from the author's own experience at the General Electric Laboratories.

The treatment is generally at rather elementary level, and some of the discussion is more reminiscent of a general chemistry text than of the more erudite exposition expected for a specialized topic. This is particularly true of the chapter on "Acids and Bases," where opportunities are missed for including some of the really elegant examples of acid-base behavior afforded by the hydrides.

The beginner who relies upon this book for his introduction to the hydrides should be wary of some inaccuracies, over-generalizations and misinterpretations. Taken out of context each appears trivial, but summed up they become substantial. For example, the greater reactivity of lithium hydride in ether as compared with other saline hydrides is ascribed to its (actually negligible) solubility, a topic more clearly elaborated by Schlesinger, *et al.*, THIS JOURNAL, 75, 187 (1953). In another case the monomeric character of dimethoxy borine, better explained on the basis of mesomerism, is ascribed to steric hindrance. In a third example the author writes, "These halogen derivatives of germane resemble the chloro silanes in many of their general properties," yet from others can be learned that in reactions of thermal decomposition, hydrolysis and ammonolysis the halogermanes, quite unlike the silicon compounds, show conversion to compounds of the element in the divalent state. In Appendix C, on vacuum manipulation, the reader is invited to consider a design for a fractional condensation apparatus which is not used by those skilled in the art because in practice it will not work well.

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