
 BOOK REVIEWS

The Hall Effect and Related Phenomena. Semi-Conductor Monographs. By E. H. PUTLEY, B.Sc., Ph.D., A.Inst.P., Royal Radar Establishment, Malvern. Butterworth Inc., 7235 Wisconsin Avenue, Washington 14, D. C. 1960. viii + 263 pp. 14 × 22 cm. Price, \$9.50.

Dr. Putley of the Royal Radar Establishment at Malvern has expanded an earlier review article on the Hall Effect into a small monograph which deals rather broadly with the behavior of semi-conductors in combined electric and magnetic fields under a variety of circumstances. The first third or so of the book treats the general theory of the semi-conductor, describing the models, the various effects which can be observed when the available parameters can be varied and provides an outline of the elements of conventional transport theory. The approach is both traditional and thorough so that the reader will obtain a completely honest account of what is known and should be known by any individual who hopes to use the information.

The mid-third of the book deals with an analysis of the observations on typical semi-conductors for which systematic work has been carried out. One will find an account of observations with silicon and germanium to which various chemical additions have been made, although a substantial part of the presentation centers about other materials such as the III-V compounds and substances such as lead telluride. The theory developed in earlier sections is applied whenever it can be with profit.

The volume ends with a broad survey of the properties of semiconducting materials and attempts to give the reader a picture of what now are the peripheral regions of the field.

As might be expected, the author focuses as much attention as possible on English and other European work so that the book has value as a complement to the surveys of American writers.

The book will have two principal merits: first, it is useful for the novice who wants a realistic and professional account of the main body of the subject; second, it is valuable for the individual who already possesses substantial experience in the field but wants a compact reference book for occasional refreshing.

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Fatty Acids. Their Chemistry, Properties, Production and Uses. Second Completely Revised and Augmented Edition. Part I. Edited by KLARE S. MARKLEY. Interscience Publishers, Inc. 250 Fifth Avenue, New York 1, N. Y. 1960. ix + 714 pp. 16 × 23.5 cm. Price, \$22.50.

The second edition of Dr. Klare S. Markley's "Fatty Acids" is a completely new work. Whereas the one-volume first edition was confined to the chemistry and physical properties of the fatty acids, the second edition has been broadened in scope to include production and uses. To cover the broader picture and to emphasize important new developments, the second edition will issue in four parts. As the subject matter is now too extensive for one author to handle, outstanding specialists are being called upon to cover their areas of interest.

The present volume is the first to issue. Besides editing the entire work, Dr. Markley, of the U. S. International Cooperation Administration, has covered the historical background, nomenclature, classifications and descriptions of fatty acids, and isomerism. Robert T. O'Connor and W. S. Singleton, of the U. S. Department of Agriculture, have handled the areas of X-ray diffraction and polymorphism, spectral properties, properties of the liquid state, and solution properties. The treatment of each subject is thorough and well-documented; more than 1500 references are cited, including those to the subsequent volumes in the series.

A systematic nomenclature that relates to the structure of the acid is stressed. The Geneva and IUPAC-Geneva systems are used, together with common trivial names, since both systems permit alternatives.

More than 250 fatty acids are discussed in some detail. Data on many others are tabulated under both systematic and common names with molecular and structural formulas.

One of the most exciting chapters is that on isomerism, for much of the work cited is of recent origin. The number of possible acids that might be obtained by isomerism or stereoisomerism offers an intriguing challenge to research workers seeking new compounds.

Much new work is given on X-ray diffraction and polymorphism. The discussion includes fatty-acid derivatives. Complete crystallographic data are given for about sixty fatty acids and derivatives. The complicated problem of the polymorphism of glycerides and multiple melting points is fairly presented by incorporating the data and arguments of the principal workers in this field.

The material on spectral properties points up the value of spectroscopy as an analytical tool for studying fatty acids and their derivatives. Mr. O'Connor handles this difficult subject clearly and covers the general types of information that can be obtained.

Data are given in a critical manner on the properties of the liquid state. Many tables and charts give such data for fatty acids, glycerides, esters and soaps.

Most of the data on solution properties have been obtained since 1940. Only recently has our knowledge of the solubilities of the fatty acids and related compounds been placed in a position comparable with that of less-important homologous series of organic compounds. Mr. Singleton has performed a real service in consolidating these important data.

This volume is undoubtedly the most comprehensive work available on the subjects covered. It will be indispensable to workers in the fatty-acid industry and related industries that use fatty acids or their derivatives as raw materials. Research workers in other fields will often find it a valuable reference work.

RESEARCH AND DEVELOPMENT DEPT.
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Technique of Organic Chemistry. Volume I. Physical Methods of Organic Chemistry. Part IV. Third Completely Revised and Augmented Edition. Edited by ARNOLD WEISSBERGER. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1960. xii + 970 pp. 16 × 23 cm. Price, \$26.00.

The previous two editions of "Physical Methods" have established a reputation for quality and comprehensiveness which will not be diminished by this new one. That reputation is current even among non-organic chemists, though they have had to run the gauntlet of an egregiously inappropriate title and subtitle in order to discover what lies inside. The fact is that these articles are written neither by nor for organic chemists specifically, but rather are about experimental chemistry in general. (That is not to say that any organic chemist worth his salt will fail to profit from them.) The emphasis ranges from the basic principles on which various experimental methods are founded to specific recipes and tricks of the trade.

Doctor Weissberger is to be congratulated on having induced such a prestigious constellation of scholars to write about their specialties. For the most part, they have done their work with thoroughness, clarity, and distinction.

About the first third of the book is devoted to the various types of spectroscopy at radio frequencies (no chapter, however, being devoted to pure quadrupole spectra). Among them, H. S. Gutowsky's long and extensively annotated chapter on nuclear magnetic resonance must be especially praised. It could (and perhaps should) have stood by itself as a book. On the other hand, the chapters on microwave spectroscopy and paramagnetic resonance are disappointing. B. P. Dailey has devoted only about half of his exposition to microwave spectroscopy in the first place, and in that half gives no references to the periodical literature

since 1952. G. K. Fraenkel has arrested paramagnetic resonance for all practical purposes in 1955, a particularly serious matter in a field which has developed so enormously in the last five years. The editor surely deserves some blame here.

After a short chapter on magnetic susceptibilities by P. W. Selwood, the great middle reaches of the book are occupied by various of the modern analytical applications of classical electrochemistry—polarography, potentiometry, transference measurements, and so on. These seem to one not expert in the field to be carefully constructed, and they are without exception easy to read. The large amount of space (415 pages) devoted to this area is, to make the point again, somewhat surprising in a book whose title contains the words "Organic Chemistry" twice.

The volume concludes with long and elaborately referenced chapters on radioactivity (B. M. Tolbert and W. M. Siri) and mass spectrometry (D. W. Stewart). Both are models of intelligibility, coherence and usefulness, and are sure to be referred to repeatedly by those who are approaching one or another technique for the first time.

Just as I was coming to the exciting part of D. H. Moore's article on electrophoresis I was projected unawares into the middle of O. H. Muller's discourse on polarography, by the circumstance that twenty-six pages of the review copy were missing. Since another copy found in a book store had the same flaw, it is perhaps worth issuing an appropriate *caveat* to the few individuals who will consider buying this very expensive volume.

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Aspects of the Vitreous State. Edited by J. D. MACKENZIE, Ph.D., D.I.C., F.R.I.C., General Electric Research Laboratory, Schenectady, New York, Butterworth Inc., 7235 Wisconsin Ave., Washington 14, D. C. 1960. viii + 226 pp. 16 X 25.5 cm. Price, \$9.50.

This book consists of eight well written articles or brief reviews, each of which deals in some detail with different aspects of the physics and chemistry of glasses. The articles were prepared by seven different authors each of whom is an authority on a particular modern technique, either experimental or theoretical, which has been used in studies concerning the nature of glasses and vitreous systems generally.

In Chapter 1, Dr. J. D. Mackenzie presents some general aspects of the vitreous state. Chapter 2 by Dr. S. Urnes is a rather searching enquiry into the interpretation of X-ray diffraction patterns of glasses. Chapter 3 by Drs. Turnbull and Cohen, deals with crystallization kinetics and glass formation. In Chapter 4, Dr. A. E. R. Westman of the Ontario Research Foundation discusses the constitution of phosphate glasses. Chapter 5, by Prof. P. J. Bray, Brown University, deals rather completely with nuclear magnetic resonance and glass structure. In Chapter 6, Dr. I. Simon (Arthur D. Little Inc.) presents a study of glass structure as revealed by infrared and Raman spectra. Chapter 7 by Prof. Gibbs is largely a theoretical derivation of the partition function for a "polymer chain quasi-lattice" model "liquid-vitreous" state.

Finally, Chapter 8, by the editor Dr. Mackenzie, is a brief critical review concerning the structure and physical chemistry of inorganic glasses at higher temperatures.

While the reviewer found all of the articles of considerable interest, of the eight articles perhaps those constituting Chapters 2, 3 and 7, being of somewhat more general nature, will appeal to the larger audience. The review by Dr. S. Urnes of the Norwegian Institute of Technology (Chapter 2) dealing with the relation between radial distribution functions and X-ray diffraction patterns is of quite general interest, many of the points brought out being applicable to almost all ultra-finegrained systems. Although perhaps over emphasizing the "Criticism of Warren's Work," Dr. Urnes presents an excellent critical article which brings out the

advantages and disadvantages of the "Fourier transform" the "difference," "additivity," etc., methods of analysis of X-ray diffraction diagrams.

The general behavior of very vitreous materials and the influence of "Kinetics" on apparent "second order" transitions, anomalous thermodynamic properties, etc., are presented very clearly in Chapter 3, by Dr. D. Turnbull and Dr. M. H. Cohen of the General Electric Research Laboratory. Many of the considerations of the chapter are of considerable generality.

Prof. J. H. Gibbs of Brown University (Chapter 7) derives in a very convincing manner a statistical model of a very viscous thermodynamic system. This model obeys the "Third Law" and exhibits a "second order" transition temperature. The behavior of the theoretical model, with suitable parameters (chain length, etc.), is remarkably close to that of real systems.

"Modern Aspects of the Vitreous State" is considered to be a worthwhile and timely addition to the scientific literature. It is not in any sense a school textbook. The book is highly recommended to glass specialists as well as to anyone interested in either the viscous liquid state or in the vitreous state, quite apart from any special interest in ordinary glasses as such.

Literature references seem adequate, except perhaps the spelling of Staveley.

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Progress in Semiconductors. Volume 5. ALAN F. GIBSON, B.Sc., Ph.D., General Editor, Prof. R. E. BURGESS, Vancouver, B. C., American Editor, and Dr. F. A. KRÖGER, Salfors, European Editor. John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. vii + 316 pp. 16 X 23.5 cm. Price \$11.00.

After a number of years of yeasty growth and ferment, the pattern of research in the field of semiconductors has settled down to a point where one may expect a steady sequence of well-digested review articles on various parts of the field. The present volume is the fifth in a series of books devoted to such reviews. It is a pleasure to state that all of the articles are very well written by experts in particular facets of the subject. Each gives a reader a fairly broad prospective of the portion of the field it covers.

This volume has seven articles in about 315 pages so that the typical article tends to be brief and descriptive. All are quite well written and well documented with many references. As the editor points out, the guiding theme in this member of the series tends to focus on the optical properties of semiconductors, although there are quite important exceptions.

The titles of the component articles, which suffice to give a description of the content, are as follows: The Electrical Properties of Semiconductor Surfaces (T. B. Watkins), The Absorption Edge Spectrum of Semiconductors (T. P. McLean), The Chemical Bond in Semiconductors (E. Mooser and W. B. Pearson), Thermal Conductivity of Semiconductors (J. Appel), Indium Antimonide (T. S. Moss), Magneto-optical Phenomena in Semiconductors (B. Lax and S. Zwerdling), The Band Structure and Electronic Properties of Graphite Crystals (R. R. Haering and S. Mrozowski).

One of the very happy features of this series of survey volumes is that it is quite international in character. Since various workers have a tendency, perhaps natural, to feature the work of their own national groups, the wide geographical distribution of authors makes it possible to obtain a picture of what is going on in the various fields in a substantial part of the world. One can wish the editors continued success in their endeavor.

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