
BOOK REVIEWS

Semi-Conductor Monographs. Preparation of Single Crystals. By W. D. LAWSON, B.Sc., Principal Scientific Officer, Royal Radar Establishment, Malvern, and S. NIELSEN, B.Sc., Ph.D., Senior Scientific Officer, Royal Radar Establishment, Malvern. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y. 1958. vii + 255 pp. 14.5 × 22.5 cm. Price, \$8.80.

The scope of the book embraces the basic principles and specific techniques pertaining to the production of metallic and non-metallic single crystals from their liquid and gaseous phases, with particular emphasis on semi-conducting material.

A brief summary of the electrical and optical properties of semi-conductors is followed by a detailed survey of the various methods of growing single crystals.

A variety of equipment for crystal production and the auxiliaries for the control of pressure, temperature, etc., are described in considerable detail.

Three chapters are devoted to purification methods (zone melting, distillation, sublimation, filtration, electro-deposition, extraction, etc.) and to the residual impurity evaluation.

One chapter concerns the preparation of intermetallic compounds with minimal contamination.

The final chapters discuss the various types of defects in single crystals, their detection, causes, and reductions to minimal significance.

An appendix enumerates a list of semi-conductors and some of the physical properties. The bibliography is quite comprehensive.

The authors avoid lengthy mathematical discussion in favor of the practical approach to the large variety of problems involved in the subject to which they themselves have made significant contributions.

The concise presentation of the well illustrated subject matter should render this monograph equally useful to the newcomer and to the already experienced worker in this field.

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Principles and Practice of Gas Chromatography. Ed. by ROBERT L. PECSOK, Associate Professor of Chemistry, University of California, Los Angeles. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1959. xii + 226 pp. 15.5 × 23.5 cm. Price, \$6.75.

The use of gas chromatography as an analytical method, and more recently as a separation method, has shown a remarkable growth since the publication of the basic papers in the field by James and Martin in 1952. This growth can be ascribed to the simplicity of the method, the low cost of the equipment involved, the speed with which analyses can be made, and the power of the method in separating members of a homologous series of compounds. Thus analytical, organic, physical and biological chemists have been quick to adopt the use of gas chromatography as an aid in their work. The need has thus arisen for an elementary book on the subject.

The present book is an outgrowth of a course in gas chromatography given at the University of California at Los Angeles in February, 1959. The course was given as a practical guide for use of gas chromatography by beginners. The contributions of the various lecturers have been edited into a unified text aimed at the same type audience as the course. This editing was well done and there is only a small amount of duplication in the material presented by the various contributors. The writing style has also been carefully edited so the reader is scarcely aware of a change from one contributor to another. The book has been printed by the photo offset process. While this has resulted in a book essentially free of printing errors, it is difficult to read. The binding is attractive but head bands have been omitted.

The book is divided into thirteen chapters and two appendices. In the first two chapters, H. W. Patton discusses various types of elution chromatography and the fundamental principles on which gas chromatography is based. In chapter 3, H. S. Knight discusses the mechanism of separations in gas-liquid chromatography and gas-solid chromatography. In Chapter 4, S. A. Greene considers the parameters involved in the choice and use of the mobile phase (carrier gas). In Chapters 5, 6, 7, 8 and 9, H. S. Knight discussed the stationary phase, column conditions, selection of column type and column construction.

In Chapter 10, S. A. Greene and E. F. C. Cain describe methods of sample introduction, and in Chapters 11 and 12, C. M. Drew considers temperature control of the column and detector and the selection of the detector. In Chapter 13, R. L. Pecsok sums everything up in a discussion of the gas chromatography as an analytical tool.

There are two appendices. The first is a list of manufacturers of equipment. The second is bibliography of the pertinent literature to early 1959. This is arranged chronologically by years and alphabetically within each year. The title of each article is given. This bibliography is an extremely valuable contribution as it contains over 600 references and appears to be quite complete. An index to the subject matter is found at the end of the book. It is rather brief, but will be found adequate for most purposes.

There are a few places where the book could be improved by a few simple changes. One of these concerns the use of abbreviations on some of the figures in Chapters 5, 6, 7 and 8. In some cases these abbreviations are identified in the text, but such "hunting" should be unnecessary. In others, such as in Fig. 7.2, where the abbreviations AA and DAA are nowhere identified in the book, one must look to the original reference to discover that these refer to allylamine and diallylamine, respectively. These names are clearly printed on the figure in the original reference, and it is not obvious to this reviewer why it was necessary or desirable to hide their identity in the book, particularly when no space was saved by the process.

Chapter 9 on column construction is trivial as presented. It would have been better omitted entirely or rewritten to follow the chapters on introduction systems, column heaters and detectors. The chapter could then have presented a discussion of unified system of apparatus suitable for various types of gas chromatography.

The above criticisms do not detract from the basic value of the book. It is highly recommended as an introduction to gas chromatography, and as a basic work book for the effective use of gas chromatography as an analytical method.

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Experimental Nuclear Physics. Volume III. E. SEGRÉ, Editor. John Wiley and Sons, Inc., 440, Fourth Avenue, New York 16, N.Y. 1959. ix + 811 pp. 15.5 × 23.5 cm. Price, \$23.00.

This is the third and last of a series of volumes which were undertaken immediately after the war (the second world war, that is), in order to "bring the experimentalist up to date" in nuclear techniques, significant data and broad theoretical interpretation. As the editor further remarks, "difficulties arising from extended coöperation" prevented earlier completion of that work. One can readily imagine what lies behind that poignant understatement.

Since it is a little late to be preparing the experimental nuclear physicist for the brave new post-war world, let us examine the new book in terms of usefulness to the contemporary experimental nuclear physicist, nuclear chemist or other nuclear scientist who proposes to do experimental work involving the use of radio-active substances. The high energy field, involving mesons and other new particles, is excluded from consideration, except in the last article.

To begin with, the book can be recommended almost without reservation to the serious student who wishes to do experimental work involving the use of radioactive substances. It is not an easy book; the theoretical discussion, which is suited to advanced graduate students in physics, is likely to present difficulties to nonphysicists. The book is more a textbook of experimental physics than a manual of laboratory procedures or techniques. These articles contain descriptions of the techniques now in use in radioactivity measurements, adequate to orient the student, who will then consult original papers in the literature. In fact, one might remark that in the field of β - and γ -rays, it complements most admirably the important Siegbahn compendium "Beta- and Gamma-ray Spectroscopy," published in 1955. The study of these two books constitutes an excellent introduction to research in the field.

There are five parts to the book. The first, by Segré, deals with radioactive decay; the second, by G. C. Hanna, with α -radioactivity. The next two parts, on γ -rays and β -rays, are written jointly by M. Deutsch and O. Kofoid-Hansen. The last section, by E. M. McMillan, is on particle accelerators.

Of the various articles, Segre's, on the general nature of radioactive decay, discusses concisely the problems of counting fluctuations and statistics, and measurements on lifetimes and branching ratios; he includes a section on what every young man ought to know about dosimetry. A 200-page review of α -decay by Hanna is divided almost equally into discussions of the theory of α -decay and a detailed account of experimental methods in alpha-detection and measurement.

The two articles on γ - and β -decay are more theoretical. Both are based mostly on material compiled up to 1955. The first constitutes an excellent exposition of the physical processes involved in γ -ray emission, absorption, internal conversion and angular correlation. The discussion of experimental techniques, though good, is somewhat too sketchy for immediate reduction to practice; Siegbahn here is more useful. The expert will find both articles somewhat outdated now. The long article on β -rays has required much recent modification because of the advent of parity non-conservation, which profoundly alters our view of the subject. However, the article suffers not so much by being late as by being slightly premature; it just misses the conclusive identification of the nature of the β -ray interaction as a mixture of axial-vector and vector. The relatively simple techniques of β -ray measurement are well described. One can only regret that this lucid and well-written pair of expositions is so unfortunately timed.

The last article, McMillan's on accelerators, is an authoritative description of all the machines that have been developed to accelerate particles to high energies, and to which the development of both classical nuclear physics and high energy physics is indebted. This is perhaps the best treatment of the subject this reviewer has seen; it is clear, concise and meticulous in historical detail—a point on which nowadays apparently only novelists can be praised. Not intended primarily for accelerator specialists, this article is just what non-specialists should welcome.

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Contributi Teorici e Sperimentali di Polarografia. Volume IV. Edited by GIOVANNI SEMERANO. Centro di Polarografia, Via Loredan 4, Padova, Italy. 1959. 361 pp. 17 × 24 cm. Price, 2500 Lire.

The aim of this serial publication was described in the review of the third volume in THIS JOURNAL (80, 3170 (1958)).

This fourth volume is a collection of twenty-one papers, dealing mainly with polarography but also including some related topics. The publication is polylingual; the papers are in either Italian, French, German or English, and each of them has summaries in these languages.

This is not a "book" in the accepted sense, but rather it seems rapidly to be acquiring the character of a "journal of polarography and related subjects." After reading several of the papers my impression is that it is a "good" journal. However, any attempt at reviewing it would be tantamount to an attempt to review a current issue of any of the estab-

lished journals, which attempt obviously is unfeasible. If you are involved in electroanalytical chemistry, and polarography in particular, you will need to add this publication to those you already regularly consult.

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The Chemistry of Heterocyclic Compounds. Volume XIII. *s-Triazines and Derivatives.* By EDWIN M. SMOLIN and LORENCE RAPOPORT, Central Research Division, American Cyanamid Co., Stamford, Connecticut. Arnold Weissberger, Consulting Editor. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1959. xxiv + 644 pp. 16.5 × 23.5 cm. Price, \$30.00. Subscription price, \$28.00.

The book begins with an introduction (16 pp.) covering in addition to nomenclature problems the parent compound, *s*-triazine, and some of its reactions. This is followed by chapters on cyanuric acid and derivatives (130 pp., mainly halides and esters), alkyl(aryl)-*s*-triazines (38 pp.), monohydroxy-, hydroxyamino-, dihydroxy-*s*-triazines and related compounds (32 pp.), mono and diamino-*s*-triazines (52 pp.), ammeline, ammelide and related compounds (40 pp.), melamine and substituted melamines (80 pp.), isocyanuric acid and derivatives (33 pp.), condensed ring *s*-triazines (50 pp.), hexahydro-*s*-triazines (71 pp.), and hexamethylenetetramine (51 pp.). Attached is a chapter on *s*-triazine-borane (borazole) and its derivatives (30 pp.). A subject index, but no author index, concludes the volume.

The preface of this book claims the literature to be covered from 1860 through 1953, and occasionally in some areas of special importance to the beginning of 1955. This is a modest understatement as far as the older literature is concerned. With a total of more than 1500 references the authors have done exceedingly well so far. It is, however, regrettable, especially in a field where the knowledge increases so rapidly, that no closer literature target date was possible. Only a very modest use has been made of the possibility of adding recent knowledge in form of footnotes. Some grossly erroneous statements, mainly in the chapter on *s*-triazine itself, could otherwise have been avoided. The authors have wisely restricted themselves to low-molecular triazine compounds of definite composition and therefore have only slightly touched the immense field of amino-triazine-aldehyde resins. The chemically much better defined dyestuffs containing *s*-triazine rings, however, have been treated shortly, but adequately. The referee believes that the inclusion of the *s*-triazaboranes with the *s*-triazines is an unfortunate choice. It stresses formal analogy without doing justice to the entirely different characteristics of hydrogen and nitrogen bonds to boron *versus* carbon. It is perhaps unnecessary to mention that this chapter suffers especially from the early literature-closing date.

The book is well written, the style clear and concise, the presentation amply fortified by structure formulas and reaction schemes. Individual compounds, besides being discussed in the text, are compiled in forty-nine tables scattered over the different chapters with mode of preparation, yield, and some physical data usually given. The description of the numerous and complex reactions of hexamethylenetetramine with nitrating agents, leading to a variety of mono- and bicyclic hexahydropolynitro-*s*-triazines, among them commercially important explosives, deserves special praise.

The referee has found many otherwise excellent and carefully written books edited in this country to be deplorably negligent in correct citation of author's names, especially from foreign countries. The book under review unfortunately exceeds in this respect all those the referee has seen so far in the past. Hechenbleikner, who has been associated with the same company as the authors, is cited sometimes as Hechenbleikner or Hechenbleickner. Leibig instead of Liebig, Wohler (throughout the book!) for Wöhler, Blitz for Biltz, Willstatter for Willstätter are only a few more examples which tend to impress the reader that the book might be as careless too in other more important aspects.

The most serious objection the referee has, however, is to the awkward arrangement of the contents of this book as far as simple *s*-triazine compounds are concerned which was perhaps justified at a time when the knowledge of *s*-tri-