
NEW BOOKS

The Systematic Identification of Organic Compounds. A Laboratory Manual. By RALPH L. SHRINER, Professor of Chemistry, and REYNOLD C. FUSON, Professor of Chemistry, University of Illinois. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1935. ix + 195 pp. Illustrated. 15 × 24 cm. Price, \$2.25.

This book represents another attempt to place in the hands of the individual student concise directions for guiding his approach to the methods of identification of organic compounds. Considerably briefer than the second edition of Kamm's "Qualitative Organic Analysis," it bases its attack upon a systematic solubility scheme rather than upon Mulliken's methodical plan of classification into orders, suborders, genera, etc., based on elementary composition, color, class reactions, physical properties, etc. It contents itself with numerous tables, based upon the nature of the derivatives, rather than assembling the data applicable to each individual compound, as was done by Mulliken in his "Identification of Pure Organic Compounds." For this reason, the title appears to overstress the systematic element which is mainly confined to the solubility tests in the first part of the book.

The volume is divided into nine chapters of very unequal length, accompanied by an index. These chapters are as follows: 1. Introduction, 2 pp.; 2. Solubility of Organic Compounds, 18 pp.; 3. The Use of Classification Reagents, 22 pp.; 4. Procedure for Examination and Reporting of Unknowns, 5 pp.; 5. Special Laboratory Methods, 21 pp.; 6. Examination of the Literature, 2 pp.; 7. The Preparation of Derivatives, 79 pp.; 8. The Separation of Mixtures, 14 pp.; 9. Problems, 12 pp.; 10. Index, 19 pp. The detailed consideration of the content of these chapters has been fully indicated elsewhere [Review by E. C. Wagner in *Journal of Chemical Education*, 12, 596-597 (December, 1935)].

The chapter on Derivatives thus constitutes some 48% of the actual laboratory text (excluding problems and index), and is very up-to-date in the selection of material. Discussion of the chemistry of each reaction is accompanied by a compact table of the resulting derivatives from a selected list of compounds, but wholly separated (except by a cross reference) from the specific directions for its execution. These specific directions are grouped together later in the same huge chapter but are not there cross-referenced back to the general material or tables. In the tables the elements which the compounds contain are subordinated to the functional reaction of the group under consideration, so that chloro-, bromo-, iodo- and even nitrogenous derivatives, appear in the same table in the order of the melting points (or boiling points) of the original materials.

Thus the emphasis falls upon the use of certain selected reagents to identify many individuals rather than the use of several types of general reagent to increase the facility and certainty of identification of an individual compound. This point of view persists in the index: for example, propionic acid is indexed solely to that table which in-

cludes the anilide, *p*-toluidide, *p*-nitrobenzyl ester and *p*-bromophenacyl ester, leaving the reader to discover for himself the much more satisfactory use of Duclaux constant mentioned in another place. It is in this respect in which this book and that of Kamm both differ most from Mulliken's. As a convenient handbook for guidance in the preparation of certain derivatives of an individual it is valuable and useful: but its presentation under the present title covers more ground than the contents justify.

The problems in Chapter IX will be found interesting and stimulating, but correspond to a degree of experience rather more mature than represented by the rest of the book. Some of them would be more directly applicable to a course in general organic chemistry than to organic qualitative analysis.

The volume appears in the excellent paper, printing and binding characteristics of its publishers and will be of wide use in the laboratory instruction of large classes in the elementary tools of organic qualitative analysis, particularly where its use can be accompanied by systematic lectures and where access to detailed tables of the properties of individual substances is adequately provided.

ERNEST H. HUNTRESS

Die Photoelemente und ihre Anwendung. Teil I. Entwicklung und physikalische Eigenschaften. (Photocells and their Application. Part I. Development and Physical Properties.) By Dr. BRUNO LANGE. Verlag Johann Ambrosius Barth, Salomonstrasse 18 B, Leipzig C 1, Germany, 1936. vi + 132 pp. 100 figs. 15.5 × 23.5 cm. Price, RM. 9.60.

Following close upon the heels of radio in its rapid strides forward, came the talking film and telephotography, both primarily dependent upon the photoelectric cell. Thus, a persistent commercial research stimulus was established, and the cell was bound to attract investigators throughout the world. The growth of the photoelectric cell industry has been truly phenomenal. Ten years ago, the industry was practically non-existent. Accordingly, the present booklet from the pen of one of the foremost German investigators in the field, is a welcome addition to the relatively small number of compilations that have appeared.

There are, in the broader sense, two types of photocells—the one type which has found very wide application is the trigger type and to this belong both the cesium cell (often called the vacuum cell) and the cuprous oxide cell. The second type of cell is the generator type, in which radiant energy is converted into electrical energy. The booklet confines itself practically exclusively to the trigger type and here again, it devotes 90 per cent. of the space to the cuprous oxide cell—the type in which the author, himself, has been most active, as the many publications in physical and electrochemical journals testify.

Although the booklet comprises primarily a review of the large amount of data published within the last five or ten years, the subject matter is, nevertheless, well or-

ganized and the author's style is clear and concise, so that it will appeal to even those who have not specialized in the photoelectric field.

In the introduction, Dr. Lange divides primary cells into three distinct groups: first, the galvanic cells; second, the thermoelectric cells; and third, the photoelectric cells. In these photoelectric cells, "We are dealing neither with chemical reactions nor with electric current developed thermally." This statement may be challenged by some of the readers. The six theories that have been advanced to account for the reactions of the cuprous oxide cell are presented and discussed at length, but it is pointed out that the one theory that really takes into account the various phenomena involved is the electron diffusion theory. The third and last chapter is devoted to the physical properties of the cuprous oxide cell—the effect of temperature; sensitivity within different ranges of wave length; effect of cathode rays, magnetic field, etc. A bibliography is appended, comprising 105 journal references and 13 book references.

COLIN G. FINK

The Principles of Experimental and Theoretical Electrochemistry. By MALCOLM DOLE, Assistant Professor, Northwestern University. International Chemical Series (JAMES F. NORRIS, Ph.D., Consulting Editor). McGraw-Hill Book Company, Inc., 330 West 42d Street, New York City. 549 pp. Illustrated. 14.5 × 21 cm. Price, \$5.00.

This book is intended to serve as a text for "graduate students in chemistry who have already had an elementary course in physical chemistry." In addition to the usual material treated in a textbook of electrochemistry, the author includes two short chapters on dielectric phenomena and one on molecular rays. To justify the inclusion of these somewhat extraneous topics, the author redefines the term "electrochemistry" as "chemical knowledge accumulated through the application of electrical current or electrical (or magnetic) fields." This definition is obviously sufficiently broad to include many subjects not touched upon in the present volume. The treatment of dielectric and magnetic phenomena is brief and incomplete; while molecular rays are discussed, the important subject of magnetic susceptibilities is not touched upon.

If one bears in mind the purpose that the author has in mind, namely, to supply a textbook for graduate students, one may readily justify the inclusion of such material as dielectric and magnetic phenomena. The main question is, however: is it desirable to evolve texts for graduate students? Our graduate student body is very heterogeneous as to objectives, preparation and abilities and it may well be doubted whether there is a real place for textbooks in the graduate field. Timely monographs, covering more limited fields, would seem to be preferable. So far as dielectric phenomena are concerned, there are several such monographs now available that present the subject matter in admirable form. There seems to be no monograph covering magnetic phenomena generally save the extended treatise of Van Vleck.

The author introduces the various topics with the consideration of experimental methods and follows this with

the results of measurements and their theoretical interpretation. The experimental methods discussed are generally well selected and the experimental material is well chosen. In the theoretical interpretation of experimental data, the author finds it necessary to avoid a thoroughgoing development of underlying theories. This is justifiable in view of the purpose for which the text is intended. In some cases, however, the author treats very simple relations with unnecessary detail as, for example, Ohm's law—pp. 26–29. The treatment of the subject in the order: methods of measurement, experimental results, theoretical interpretation, leads to some repetition. Considerable space could be saved by avoiding such repetition and by condensing some of the descriptive material.

The present volume represents a distinct advance over earlier electrochemical texts, which still reflect the influence of the original text of Le Blanc. While many electrochemical phenomena remain obscure, great theoretical advances have been made during the past fifteen years and experimental methods have been improved enormously. Those who are interested in gaining an insight into modern electrochemical theory, without consulting the original literature or more extended treatises, will find the present volume readable as well as informative.

CHARLES A. KRAUS

General Chemistry. An Elementary Survey Emphasizing Industrial Applications of Fundamental Principles. Fourth edition, rewritten and revised. By HORACE G. DEMING, Professor of Chemistry, University of Nebraska. John Wiley and Sons, 440 Fourth Ave., New York, N. Y., 1935. xiii + 776 pp. 170 figs. 14.5 × 22.5 cm. Price, \$3.50.

"So swift is chemical progress that no text can hope to reflect the spirit of the time except by thorough-going revision at frequent intervals" is a belief expressed by the author of this popular textbook, which has led him to offer now the fourth edition since 1923. Each edition in turn has been so much revised from its predecessor, that this fourth edition differs greatly from the original edition except in the clear style of the author and the excellence of the volume in physical appearance.

The current edition is indeed a "General Chemistry," since it contains little of descriptive inorganic chemistry not used as illustrative material for the principles which are so clearly presented. For example, the chapter on Chromium and Manganese is only two pages in length. This does not mean, however, that the student is overwhelmed with masses of theoretical discussion, but on the contrary, the book contains much factual matter, so skillfully chosen and arranged as to serve the double purpose of information and illustration.

Many authors set forth in their prefaces the pious intention of presenting general laws and concepts in the early part of their books, that they may be used later, and then they fail to make these applications. In this book, on the contrary, nearly every paragraph heading states the principle involved in the subject presented, as "Oxidation of a Halide by Free Hydrogen—(Illustrating Electron Transfer, ¶182)."

If any unfavorable criticism to an otherwise admirable book is to be offered, it is that it contains much more difficult material than the average first-year student can really comprehend.

The book is bristling with the "New Chemistry"—Oxonium-ion, Activity-product, Einstein's photochemical law, wave mechanics, Raman spectra and many other modern conceptions, not omitting "Heavy Water," are discussed. Many references to articles in current journals are given.

KENNETH L. MARK

Exercises in General Chemistry and Qualitative Analysis.

Fourth edition, rewritten and revised. By HORACE G. DEMING, Professor of Chemistry, University of Nebraska, and SAUL B. ARENSON, Associate Professor of Inorganic Chemistry, University of Cincinnati. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1935. xv + 326 pp. 14.5 × 22.5 cm. Price, \$1.80 + postage.

No important changes from previous editions appear in this edition of the "Exercises" designed to accompany the "General Chemistry" by Professor Deming. The order of exercises has been rearranged to conform to the fourth edition of the text and a few new experiments have been added. Actual experience in using the manual has resulted in improvement in the details of many of the experiments which appear in the earlier editions.

The admirable arrangement of each experiment under the headings, "Reference," "General Statement," "Materials," "Directions," is retained, and the students' notes are to be entered in the book itself as answers to questions.

KENNETH L. MARK

Principles and Applications of Electrochemistry. Vol. I.

Principles. By H. JERMAIN CREIGHTON, Professor of Chemistry, Swarthmore College. Third edition, revised and enlarged. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1935. xviii + 502 pp. 84 figs. 15.5 × 24 cm. Price, \$4.00.

In this third edition the author has sought to bring the treatment of many topics into harmony with recent theoretical advances, and in this he has been singularly successful, for the underlying point of view throughout the book is sound from the standpoint of both atomic structure and thermodynamics. The desire to keep the size of the book reasonable has necessitated brevity in the thermodynamics and some may wish a lesser emphasis on principles generally taught in quantitative analysis, such as hydrolysis and solubility products, and the inclusion of topics dealing with the calculation of electromotive forces from free energies, or reaction heats and entropies, and an amplification of the relation between electromotive force and equilibrium constants. However, the author's selection of subjects is the one which probably meets the greatest demand. The clarity and directness of presentation, the thoughtful organization of material and careful selection of problems, combine to make this text an excellent introduction to the subject.

WENDELL M. LATIMER

Kolloidchemisches Taschenbuch. (Handbook of Colloid Chemistry.) Edited by Dr. ALFRED KUHN, Dresden-Radebeul. Akademische Verlagsgesellschaft m. b. H., Markgrafenstrasse 6, Leipzig C 1, Germany, 1935. viii + 369 pp. 91 figs. 13.5 × 19.5 cm. Price, RM. 19; bound, RM. 21.

This little book by 16 authors is a condensed compendium (in German) for ready reference for those who wish to refer to current theories and formulas, technical terms, methods of measurement and the chief principles of colloid science. It thus serves as an authoritative review of the present development of the subject. It gives in each field a systematic account of the chief laws and principles, short descriptions of the available methods of measurement and then, in the form of tables and graphs, typical data for systems of scientific or technical interest. Copious references are given throughout and there is a good index of subjects, but naturally none of authors. It is inevitable from the enormous scope of this subject that any reviewer will find surprising omissions, both in subject matter and in references. However, it occupies a unique position as a handy and readable work of reference and is valuable alike to those who wish to be informed quickly and precisely, to those who are organizing courses in the subject, and to those who are interested in a particular application.

J. W. MCBAIN

Die Fermente und ihre Wirkungen. (Enzymes and their Action.) Supplement. Lieferung 1 (Bd. I, Spezieller Teil, Hauptteil VII-XV). By Prof. CARL OPPENHEIMER, Dr. Phil. et Med. W. Junk Verlag, Scheveningsche Weg 74, The Hague, Holland, 1935. 160 pp. 17 figs. 20.5 × 28 cm. Price \$6.80.

It may be said that "Die Fermente und ihre Wirkungen" by Professor Carl Oppenheimer is to the enzyme chemist what Beilstein's "Organische Chemie" has been to the synthetic chemist. Both of these encyclopedic works contain not only correlated information gathered from the literature in their respective fields, but they constitute excellent sources for references to the original literature.

Probably in no branch of organic chemistry have significant experimental data accumulated as rapidly during the past few years as in the enzyme field. Dr. Oppenheimer is therefore rendering a very valuable aid to progress in this line of study, by bringing his Hauptwerk up to date, and all enzyme chemists will feel grateful to him for continuing his contributions requiring such a laborious effort.

The first Lieferung which has just appeared starts as a supplement to the Special Part of the Hauptwerk, and covers only the section devoted to the chemistry of the lipases and esterases. Omitting any attempt to bring out a supplement to the General Part of the Hauptwerk strikes the reviewer as wise, since the general discussion to which the latter is mainly devoted contains so much that is of an extremely speculative character. In the introductory paragraphs in the sections of the supplement devoted to different types of esterases, etc., brief attempts at discursive generalizations occur, but only briefly. It

these generalizations the author leans to some extent toward the views held by Willstätter and his co-workers. Thus terms such as Agon (active group), Pheron (carrier) and Simplex (combined Agon and Pheron) are used. Many workers in the field will very likely hesitate to accept generalizations such as these, believing that more experimental evidence is still necessary to justify them. After all these generalizations are only of minor significance, the important point being that by means of the supplement the literature on this branch of enzyme chemistry has been abstracted, correlated and brought up to date.

J. M. NELSON

Alchemy Child of Greek Philosophy. By ARTHUR JOHN HOPKINS. Columbia University Press, New York, N. Y., 1934. xii + 262 pp. 21.5 × 14 cm. Price, \$3.50.

There is at present a general tendency to ascribe all knowledge to the East and to look upon Greek philosophy as an isolated island in the great ocean of Eastern philosophy. Those who still look to the Greeks as the founders of all scientific knowledge are regarded as marooned sailors on the deserted island of Greek thought. To those who are thus marooned, among whom the writer is happy to count himself, Professor Hopkins' book is a welcome event, and many perhaps would prefer to spend their days in leisure on this island of Greek thought in the company of "Alchemy Child of Greek Philosophy" than sail in comfort on the ocean of Eastern verbosity.

Alchemy has been looked upon by many historians as the child of either Chinese, Persian, or Arabic thought. The latter has been given preference because of the word alchemy, and it has been assumed that it is derived from the Semitic *chemor* meaning *matter* and the Arabic definite article, *al*. Professor Hopkins quotes among others the suggestion of Lagercrantz that *Alchymia* may be a changed form of the Greek *ἀλτεια*, meaning *perfection*, and even the difficulty as regards the name of this science is thus easily overcome.

As far back as 1902 Professor Hopkins published in *The Chemical News* an article in which he called attention to the parallelism between the ancient recipes for coloring metals and the methods of modern bronzing. This parallelism, Professor Hopkins thought, provided a key by which to discover, from known results, what the ancient artisans were striving to attain. "Alchemy Child of Greek Philosophy" is a continuation of this idea postulated by Professor Hopkins. He traces with remarkable ingenuity the Greco-Egyptian methods of artificially producing colors, and shows how these ideas have endeavored to perfect matter. There is no doubt whatever that the idea of transforming one form of matter into another is the logical consequence of Aristotle's philosophy of matter, and that the whole idea of ancient chemistry is imbued by the philosophy of Aristotle. The artificial production of matter seems to have not been looked for by the ancients. They seem only to have strived to improve or to beautify what already existed, and to quote from Petrus Bonus (p. 214), who lived

in 1330, "The art of alchemy does not create metals, or even develop them out of the metallic first substance; it only takes up the unfinished handicraft of nature and completes it . . .," the kernel of Professor Hopkins' thesis, dealt with in a most attractive manner.

"Alchemy Child of Greek Philosophy" is a work of much weight to the history of chemistry and forms an important stepping-stone in the evolution of chemical thought. It should be read by everybody who is truly interested in the history of our subject.

M. NIERENSTEIN

Textbook of Quantitative Analysis. By WILLIAM THOMAS HALL, Associate Professor of Analytical Chemistry at the Massachusetts Institute of Technology. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1935. ix + 350 pp. 46 figs. 15 × 23.5 cm. Price \$3.00.

In the preface to the second edition, Prof. Hall states: "Some of the methods of analysis described in the first edition have been omitted, and a few new procedures have been added. The theoretical discussions and the explanation of stoichiometric problems have been expanded." The number of chapters has been increased from seventeen to twenty-two, and the expansion includes one on the ceric sulfate methods, one on bearing metal analysis, and one on practical methods of ore analysis.

The reviewer regrets that he failed to note one error in the first edition, which is repeated in the second, *viz.*, the definition of a "molal" solution, page 32, is really the definition of a "molar" solution.

On page 35 the statement is made that: "A solution of potassium permanganate, therefore, will contain $\frac{1}{5}$ mole of KMnO_4 because the atom of manganese loses five positive charges in changing from a polarity of +7 to +2." It would seem preferable to say that the manganese gains five electrons.

The section on co-precipitation (page 151) should be thoroughly revised and modernized in the next edition. From it a student would get the idea that adsorption and occlusion are synonymous. In the procedure for the determination of sulfate (page 180) no precautions are taken against the co-precipitation of barium nitrate with the barium sulfate, although this is stressed on page 183.

Only two typographical errors were noted: On page 46, the wrong symbol is used for "infinity," and on page 79, the tenth line should read: ". . . . HAsO_5^- can be oxidized to HAsO_4^- ," instead of ". . . . by HAsO_4^{--} ."

The division of the text into two parts, one for the first and one for the second semester's work, and a more logical arrangement of the material should make this a much more teachable textbook.

The above criticisms should not be misconstrued as deductions from the well-deserved reputation of a standard quantitative textbook. The second edition will win for itself an even higher place than the first.

LOUIS WALDBAUER