
NEW BOOKS

Electrochemistry and Electrochemical Analysis. By HENRY J. S. SAND, D.Sc., Ph.D., F.I.C. Volume III, Electrical Methods Applied to Titration, Moisture Determination and pH Measurement. Chemical Publishing Company, Inc., 234 King Street, Brooklyn, New York, 1942. ix + 118 pp. Illustrated. 12.5 × 19 cm. Price, \$2.25.

This volume is devoted primarily to potentiometric and conductometric methods. Probably a statement could have been added that activities of other radicals could have been determined by applying the same principles as in the electrometric and pH determinations. If the "Determination of Moisture" is to be available to chemists, it is buried in a book with this general title. Volume III seems to be written from the same point of view as Volume II and to be equally meritorious. It seems to include all workable methods up to date written in a readily understandable style.

D. J. BROWN

Polarography. Polarographic Analysis and Voltammetry. Amperometric Titrations. By I. M. KOLTHOFF, Professor and Head of the Division of Analytical Chemistry, University of Minnesota, Minneapolis, Minn., and J. J. LINGANE, Dept. of Chemistry, Harvard University. Interscience Publishers, Inc., 215 Fourth Avenue, New York, N. Y., 1941. xvi + 510 pp. 141 figs. 15.5 × 23.5 cm. Price, \$6.00.

This book is an excellent, timely and comprehensive treatise that covers the essentials of the theory and practice of the polarographic method of investigation that was originated by J. Heyrovsky and his associates. This text is the most complete and systematic treatise in the field that has thus far appeared. Both authors have made numerous and significant original communications to the development of the science and art of polarography and for this reason the text has a masterful and purposeful style that could only come from long and substantial work with the subject.

The book is divided into eight parts. *Part one* is a brief and simple introduction. *Part two* contains twelve chapters which expound fully the fundamental theory of the diffusion current along the lines established by Ilkovic and amplified by MacGillavry and Rideal. The diffusion coefficient and the other factors that enter into the magnitude of the diffusion current are thoroughly and critically discussed. Many of the illustrative data are taken from the careful and exhaustive researches of the authors and their associates. Separate chapters deal with the migration current, the electrocapillary curve of mercury, the residual current and with maxima in current-voltage curves and with the inadequacy of our present knowledge of the causes of these maxima. The detailed theory of the reduction of simple metallic ions, complex ions and of organic substances is treated in the three following chapters. The authors properly lay much stress upon half-

wave potentials, accurate measurement of capillary constants, and the analysis of waves by plotting $\log i/i_d - i$ versus potential (i being the diffusion current at any point in the wave and i_d the limiting diffusion current). A very generous number of formulations of simple and complicated cases of current-voltage relations is given to aid the unfamiliar worker to set up equations for use in connection with a particular problem. The rather involved question of hydrogen discharge in various media is well reviewed. The concept of mixed potentials is introduced and briefly discussed in a short chapter.

Part three deals with technique and equipment. A list of typical equipment is given with photographs of some commercially available instruments. The section on technique, though brief, is adequate and contains some very useful ideas not available in other books on the subject.

Part four attempts to summarize in rather brief space the fundamental facts about the polarographic behavior of the various inorganic ions. This section gives a very good summary of the facts that were known at the time the manuscript was prepared. There still remains a great need for systematic practical measurements in many instances. A few actual polarograms giving unusual forms of waves might be of some service to the worker. A final chapter in this part gives a few practical applications to the analysis of alloys and other substances.

Part five deals with the polarographic estimation of organic substances. This is a rapidly expanding field of work and the authors have made a careful study and summary of the published data. The information is well classified and systematically treated.

Part six is a very brief survey of the biological applications of the method. Here again the book gives a rather brief introduction to a rapidly growing body of literature.

Part seven treats briefly the measurement of current-voltage curves with micro-platinum electrodes. A large proportion of this work has come from the researches of the senior author and his associates. This line of study is still fragmentary but the results thus far obtained suggest that such electrodes may extend the application of the method to certain cases where the use of the dropping mercury electrode is impractical.

Part eight deals with polarometric or amperometric titrations. A beginning of the application of the polarized mercury electrode system to titrations was made by various associates of Heyrovsky, notably V. Majer, Strubl and others. The senior author and his collaborators have systematized and extended this field of work and have introduced improved techniques. The essentials of the theory and practice are briefly and clearly given.

The appendix gives tables of the potentials of reference electrodes and of the half-wave values for inorganic ions, and a chart for the latter in various media. The indices appear to be adequate and accurate.

The book as a whole is attractively arranged and reflects well the skill and care that have been used by both authors and publishers in its composition and production. Anyone

who has worked even briefly in this interesting field can appreciate the meticulous care that the authors have used in the preparation of the manuscript and the proper emphasis that they have placed upon the fundamentals of theory and practice. The book can be recommended without reservation to anyone who is interested in the theory or the practical application of the methods.

N. HOWELL FURMAN

Principles and Practice of Chromatography. By L. ZECHMEISTER, California Institute of Technology, and L. CHOLNOKY, University of Pecs. Translated from the second and enlarged German edition by A. L. Bacharach and F. A. Robinson. Foreword by I. M. Heilbron. John Wiley and Sons, Inc., 440 Fourth Ave., New York, N. Y., 1941. xviii + 362 pp. 74 figs. 14 × 22 cm. Price, \$5.00.

The second edition of this invaluable pioneering book appeared only a year and a half after the first. The revision has kept pace with the rapid progress in the field and results in a larger volume of wider scope, with many new illustrations and 200 new references to the literature.

Chromatographic analysis (use of Tswett adsorption columns) is offered as a means of testing for homogeneity, establishing the possible identity of two substances, of concentration from great dilution, separating mixtures, and of purification. Some isomers have been separated by this method.

Since the book is both text and laboratory manual (in a general rather than detailed way) there is much helpful discussion of adsorption powders, solvents, eluents, development and extrusion. Micro-chromatography is included. The original technique of Tswett was applied to plant pigments and other colored substances, but Zechmeister and Cholnoky review the modern applications to separation of colorless substances, as by the use of ultra-violet light, indicators, color reactions, etc. The important triumphs of chromatographic separations in the fields of chlorophylls, porphyrins, bile pigments, carotenoids, flavins, anthocyanins, pigments, dyestuffs, alkaloids, vitamins, sterols, hormones, enzymes and even with inorganic cations and anions are well presented.

This book is most stimulating to biochemists, organic chemists and botanists, but many other scientists will find it extremely useful.

HARRY N. HOLMES

An Outline of Organic Nitrogen Compounds. By ED. F. DEGERING, CARL BORDENCA and B. H. GWYNN and collaborators. John S. Swift Co., 5 E. Third St., Cincinnati, Ohio, 1942. Prev. editions 1938, 1940. 381 pp. 16 × 23.5 cm. Price, \$2.00 and \$3.00.

This is a planographed edition of extensive chemistry notes accumulated by the senior author during his teaching career in dealing with a special Course on Organic Nitrogen Compounds offered for graduate students in Purdue University during the past twelve years. Acknowledgment is made of abstraction of much of the material presented in the book from several standard texts on organic chemistry including "Recent Advances in Organic Chem-

istry" by Stewart; "Organic Chemistry" by Gilman; Sidgwick's "Organic Chemistry of Nitrogen" by Taylor and Baker; and "Syntheses of Nitrogen Ring Compounds" by Hollins.

The edition is devoted chiefly to a concise and intelligible presentation of the chemistry of the ammonia system of organic compounds. Fundamental reactions illustrating the transformations of type compounds in both the aliphatic and aromatic series are reviewed.

The general concepts of organic structure and reaction mechanisms are explained according to the modern electronic theory of chemical change, but the authors have restricted the use of electronic formulas in the major text for the following reasons: "It must be apparent that the continuous use of electronic formulas and equations throughout the book would make its price prohibitive."

A short chapter is devoted to a condensed review of the chemical nature of alkaloidal substances, and one to the review of nitrogen heterocyclic chemistry. The latter is practically limited, however, to the chemistry and review of nitrogen ring compounds containing only one nitrogen atom as—dimethyleneimines, trimethyleneimines, pyrrols, pyrrolines, pyrrolidines, pyrrolidones, indols, pyridine, quinoline, isoquinoline and related condensed nitrogen ring compounds.

Cyclic ureide chemistry is illustrated briefly by reference to barbituric acid and its relationship to uric acid, and the naturally occurring purines—theobromine, theophylline and caffeine.

Comprehensive references to the original literature enhance the practical value of the book.

TREAT B. JOHNSON

Micromethods of Quantitative Organic Analysis. By JOSEPH B. NIEDERL, PH.D., Associate Professor of Chemistry, and VICTOR NIEDERL, Teaching Fellow, New York University, Washington Square College. Second edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1942. xiii + 347 pp. 62 figs. 15.5 × 23.5 cm. Price, \$3.50.

The following statements, taken from the Introduction, indicate the scope of changes introduced into the second edition of this successful text. "In the present edition the chapters on balances and weighing have been enlarged to include the use of ordinary analytical balances of proper sensitivity and precision. Additional paragraphs treating the calibration of weights, the determination of the zero reading and the determination of the sensitivity and precision of microanalytical as well as the ordinary analytical balance have also been included." "To the changes in the carbon and hydrogen determination as given in the first edition, . . . have been added several types of combustion-tube fillings," and the manometric method of D. D. Van Slyke and J. Folch has been described. "The determinations of halogen and sulfur have been improved" and "the standard solutions have been unified in a single chapter." "To the ebullioscopic, cryoscopic and vaporimetric molecular-weight has been added an iso-thermic method." "Liberal time estimates have been given for all the more important determinations in order to facilitate the planning of a day's working or teaching schedule."

A valuable feature of this edition, as well as the earlier one, is the literature survey, which has been brought up to 1941. The citations number well above a thousand references.

The present edition maintains the same high standard set by its predecessor.

W. M. LAUER

Volumetric Analysis. By I. M. KOLTHOFF, Professor and Head of Division of Analytical Chemistry, University of Minnesota, and V. A. STENGER, Analytical Research Chemist, The Dow Chemical Company. Second Revised Edition, 1942. Vol. I. Theoretical Fundamentals. Interscience Publishers, Inc. 215 Fourth Ave., New York, N. Y. xv + 309 pp. 31 illus. 23.5 × 15.5 cm. Price, \$4.50.

The reviewer believes that the first edition of this book has become so well known that a detailed enumeration of the contents of this revision is not necessary. Such an omission seems further justified because, although this edition appears to have been quite completely rewritten, there has been no radical change in either contents or arrangement.

The number of chapters remains the same. An introductory chapter has been added and the chapter on the "Stability of Solutions" has been eliminated and is to be included in the second volume; with these exceptions the chapter headings and order are essentially as before. A much more liberal use of references to the original literature adds substantially to the value of the book. The chapters on "Reaction Velocity" and on "Adsorption and Coprecipitation Phenomena" have been extensively revised and there has been added to Chapter X a discussion of amperometric titrations.

The present first chapter, which contains considerable material previously found in Chapter X, affords a more logical introduction to the book. It contains various definitions, a classification of volumetric methods, and a general introductory discussion of ionization and oxidation-reduction principles. The Brønsted definition of acids and bases is presented briefly but thereafter the treatment of neutralization methods and hydrolysis effects is along conventional lines.

The reviewer obtained the impression that the present edition has been held to a slightly more elementary level than the former one: this may account for the change on the title page from "Theoretical Principles" to "Theoretical Fundamentals." Also, there seems in some cases a lack of consistency in the extent to which certain topics are treated. Hydrogen ion indicators are presented as organic compounds behaving as weak acids or bases with no discussion of their structures or of the theory of their color change, while thirty pages are given to potential indicators with fifty or more detailed structural formulas being shown.

In some few cases it seems unfortunate that topics should be discussed without reference to more recent work. Thus in the discussion of the permanganate-oxalate reaction the only reference is to the work of Skrabal (1904). Also in the very interesting chapter on "Volumetric Methods of Organic Chemistry" it would seem that the behavior of the double bond could have been more explicitly discussed in the terms of modern organic theory rather than by resorting to the "partial valence" and "complete affinity quantity" of Thiele (1899, 1901).

The above are minor criticisms of a very valuable book which should be available to everyone seriously interested in the theory and development of volumetric methods of analytical chemistry.

E. H. SWIFT

BOOKS RECEIVED

September 10, 1942–October 10, 1942

- F. RUSSELL BICHOWSKY. "Industrial Research." Chemical Publishing Company, Inc., 234 King Street, Brooklyn, New York. 126 pp. \$2.50.
- H. C. DAKE AND JACK DE MENT. "Ultra-Violet Light and its Applications." Chemical Publishing Company, Inc., 234 King Street, Brooklyn, New York. 209 pp. \$3.25.
- ED. F. DEGERING and One Hundred Six Collaborators. "Fundamental Organic Chemistry." Reproduced by Photo-Offset and Planographed by John S. Swift Co., Inc., Cincinnati, Ohio. 485 pp. Paper binding, \$2.00; cloth binding, \$3.00.
- CARL J. ENGELDER. "Calculation of Qualitative Analysis." Second edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 174 pp. \$2.00.
- NORMAN KHARASCH AND HELEN S. MACKENZIE. "Essentials of College Chemistry." D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 513 pp. \$3.50.
- C. B. NEBLETTE. "Photography, its Principles and Practice." Fourth edition. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 865 pp. \$7.50.
- M. CANNON SNEED AND J. LEWIS MAYNARD. "General Inorganic Chemistry." D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 1166 pp. \$4.50.
- HUGH S. TAYLOR AND H. AUSTIN TAYLOR. "Elementary Physical Chemistry." Third edition. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 551 pp. \$3.75.