NEW BOOKS

Qualitative Analysis and Chemical Equilibrium. By T. R. HOGNESS, Associate Professor of Physical Chemistry, and WARREN C. JOHNSON, Associate Professor of Chemistry, University of Chicago. Henry Holt and Company, 257 Fourth Avenue, New York, N. Y., 1937. xii + 417 pp. 14.5 × 17 cm. Price, $2.75.

A generation ago a course in "Qualitative Analysis" was devoted to the properties and methods of detecting the various ions, and the analysis of numerous unknown substances, frequently with little attention to the underlying causes and principles, but now more and more physical chemistry theory is being transferred into the field of Qualitative and a considerable portion of its lecture time is spent in review and further study of Ionization, Solubility Product, *p*H Theory and Practice, and Equilibrium. Modern textbooks of Qualitative Analysis have reflected this steady development, and this new book by Hogness and Johnson follows the trend.

In Part I (187 pp.), after a review of various fundamentals with emphasis on ionization, come chapters on Reaction Velocity, and Chemical Equilibrium, Equilibria Involving Weak Acids and Bases, Heterogeneous Equilibrium—The Solubility Product—Colloids, Polybasic Acids—Precipitation with Hydrogen Sulfide, The Ionization of Water—Hydrolysis, Equilibria Involving Complex Ions, Amphoteric Substances, and Oxidation and Reduction. The authors' literary style and mode of presentation are simple and direct, sufficient mathematics being introduced to support the theory but not overload the average student. Especially well done are the sections on Solubility Product, Precipitation, Hydrolysis, and Oxidation–Reduction, while at the end of each chapter are numerous problems with illustrative solutions of examples.

Part II (120 pp.) deals with "The Properties of the Positive and Negative Ions and their Compounds. Preliminary Experiments and Analytical Procedures." The system of cation analysis is basically that of Fresenius, modified to detect the alkali metals first, and, more important, to use "micro" amounts of materials. "Unknowns" are given in 3-ml. quantities, reagents handled with medicine droppers, and filtrations made in 4-cm. funnels. The discussion of anion analysis is very brief, as also is that of methods for treating solid unknowns.

The material of Part I is well chosen and carefully presented, and it can be recommended to teachers of Qualitative Analysis. The cation analysis scheme, however, seldom is preferred over the more lengthy but more precise Noyes procedure. The beneficial effects of training students to carry out separations and tests using small quantities of materials are obvious, but it is an open question whether with this system a student can become well grounded in practical qualitative analysis and develop the accuracy and sureness of touch necessary in a good analyst. The reviewer would be interested to see the Noyes procedure adapted to the really micro scale of operation suggested by the authors. An Appendix of 68 pages contains some 38 tables of useful facts, in particular an extensive tabulation of properties of compounds of the ions in the various groups.

ALLEN D. BLISS

Zur Entwicklung der Chemie der Hoch-Polymeren, Kunststoffe, Kautschuk, Anstrichmittel, Cellulosederivate. (Concerning the Development in the Chemistry of High Molecular Compounds, Synthetic Products, Cellulose, etc.). Reprints from *Angewandte Chemie* and *Die Chemische Fabrik*. Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 35, Germany, 1937. v + 214 pp. 48 figs. 15 × 23.5 cm. Price, RM. 2.80; in foreign countries, RM. 2.10.

The booklet under review is a collection of papers given in different divisions at the Annual Meeting of the Society of German Chemists, held in Munich, in 1936. The first part of the book contains contributions by O. Nicodemus on the development of the chemistry of acetylene, with special reference to a natural raw material supply of rubber and synthetic products. This is followed by a more general survey on the growth and importance of the chemistry of synthetic products, which is written by Georg Kraenzlein.

O. Jordan discusses the progressive changes that have taken place in paints and varnishes from a scientific point of view, tracing them in various countries. E. Konrad treats the development in the manufacture of synthetic rubber in Germany, and Richard Vieweg examines the physical factors involved in usable synthetic products. A general insight into the large field of organic glass-like matter is given by Otto Roehm. Lutz writes about a new raw material which is used in the manufacture of pipe lines. The first part of the booklet is concluded with a contribution by P. Nowak and H. Hofmeier, who survey new fields of application for synthetic products.

Part 2, which is devoted to a more scientific aspect of the field of high molecular compounds, contains a contribution by H. Staudinger on macromolecular chemistry. Kurt Hess points out the still existing problematic conceptions leading toward a closer understanding of high polymer, organic natural products. The growth of plant cell walls is discussed by Wilhelm Wergin. Werner Kuhn is represented by a contribution on the shape and properties of threadlike molecules in solution (and in the elastic solid state). A paper on the viscosity problem of organic colloids is contributed by W. Philippoff, and G. V. Schulz concludes Part 2 with a discussion on the osmotic molecular weight determinations of high molecular compounds.

The detailed genealogical-like chart by Nicodemus, of "Acetylene and Its Derivatives," which is inserted at the end of the book, gives an excellent general survey of the vast development and possibilities in this comparatively new field of synthetic organic chemistry. Its importance to countries that lack natural resources of rubber and drying oils is predominant, but the discussion of synthetic resins derived from acetylene is treated in an equally

comprehensive fashion. Kraenzlein's contribution is subdivided into special chapters pertaining to the most important synthetic products, such as linoleum, artificial leathers, fibers, cellulose, acetyls, and the modern ethylene polymerisates, the vinyl compounds, etc. This paper is written by one of the chief men in the industrial production of synthetic products of Germany today, and gives us an excellent survey of the great development this field has taken during the last years. The treatise by Jordan is equally important as it discusses the scientific basis for the most important coating materials and their production from the various synthetic products available now. In connection with this paper, it may be pointed out that special stress is laid upon the fact that such development is not only of vital importance to countries lacking certain raw materials, but is also equally valuable in furthering modern chemical research and national economy even in those countries where problems of currency and raw material supply are not as serious as they are in Central Europe.

The paper by Konrad is an historical survey of the production of synthetic rubber by the I. G. Dyestuff Trust and is written in commemoration of the 70th birthday of F. Hofmann, the originator of the Butadien process. Vieweg's contribution is valuable to us as it precisely discusses the physical properties essential for a good synthetic product. The increasing demand for glass-like substances produced from organic compounds becomes evident upon reading Roehm's paper. Dr. Lutz presents a discussion on the new synthetic product of thermoplastic properties produced from Polyvinylchloride, known as "Mipolam," which is being used extensively now in the manufacture of pipe-line construction. The high acid resistance and resistance to several other chemicals, the ease of producing pipe-lines of different shapes as well as connections, etc., make this material seemingly of great interest for a variety of applications.

The contribution by Nowak-Hofmeier should prove to be extremely important to all who are interested in the future possibilities of synthetic products as it discusses briefly but nevertheless fully the needs for such materials, as for instance, for insulating properties, mechanical properties, the possibility of adding fillers, manufacture of films, etc.

Little need be said regarding Staudinger's paper as it contains a summary, exceptionally well-put, of his innumerable important contributions to the chemistry of high molecular compounds; while the purpose of Hess's article is to discuss chiefly the existence of end groups in cellulose derivatives. It also summarizes recent publications of various authors and concludes with the assumption that a closer knowledge of end group existence will permit a better understanding of the structure of cellulose in general. Ulmann discusses a new method of determining the state of solution of high-polymer, natural products.

The contribution by Dr. Wergin in regard to the growth of natural cellulose in different plants opens up some new aspects concerning cellulose chemistry which so far have been seemingly overlooked by chemists. The formation of a primary substance which is not identical with cellulose in the first stages of growth is referred to and certain conclusions are drawn as to the importance of this chemistry to the not yet identified substance.

The purely theoretical paper by Kuhn is a summary of several of his well-known contributions to the problem of shape and properties of threadlike molecules. For any one interested in the physics of high molecular compounds and their properties, a study of this paper is essential.

This booklet can be highly recommended to all who are either actively engaged in industry or scientific research pertaining to the problems of the production or application of high molecular compounds or to research pertaining to a better understanding of their make up and correlation of structure to properties. It may be considered as an exceptionally well-condensed and excellent survey of the entire field, compiled by the men in the first ranks of German industrial enterprise or science.

ERNST A. HAUSER

Les Solutions Concentrées. Théorie et Applications aux Mélanges Binaires de Composés Organiques. (Concentrated Binary Solutions of Organic Compounds. Theory and Application.) By JEAN TIMMERMANS, Professor of Physical Chemistry at the University of Brussels. Masson et Cie., Éditeurs, 120 Boulevard Saint-Germain, Paris VI^{e}, France, 1936. vii + 646 pp. 540 figs.

The study of the properties of solutions, in actual breadth of importance and significance of theoretical and practical results, constitutes one of the major interests of physical chemistry. Progress in understanding the phenomena presented by the case of dilute solutions has been extensive and especially interesting since the introduction of the interionic attraction theory in the Debye–Hückel form. The case for concentrated solutions of all proportions or specifically the phenomena presented by mixtures of organic liquids is something else, where progress in devising a comprehensive or general molecular theory is at most very slow and reliance must usually be placed on empirical correlation schemes appropriate to individual cases. An important step in providing the proper factual basis for sound progress in the development of general theory may well be obtained from a comprehensive knowledge of the varied facts represented in the behavior of binary mixtures of organic liquids where almost every conceivable gradation and differentiation in chemical and physical characteristics is possible. Perhaps the reviewer is not alone in having shunned the really tremendous task of critically reviewing the enormous amount of scattered data in a field where the purity of the materials employed is more often than not dubious and the lack of proper physical data a severe handicap in correlating the phenomena reported.

The contents of the present volume or treatise offer a fine example of a difficult and laborious task well organized and admirably executed. The author has brought together the material pertaining to organic binary mixtures (down to Jan. 1, 1935) from a very widely scattered though extensive literature. The reviewer estimates that well over six thousand compounds are listed in the tables of formulas arranged in the order adopted in the Richter-lexicon of hydrocarbon compounds. The consideration of dilute solutions is omitted.

The material is discussed in a text consisting of three main divisions comprising a total of fourteen chapters, as

follows: (1) binary mixtures whose components are as nearly alike as possible; optical isomers, allotropes, isomorphs (four chapters); (2) binary mixtures whose components are from different groups excluding however those compounds containing hydroxyl (five chapters); (3) binary mixtures one of whose components possesses hydroxyl, with chapter fourteen devoted to mixtures both of whose components contain hydroxyl (five chapters). The material of each division is further subdivided and classified in a most comprehensible and convenient system.

Each chapter is laid out on the same general plan of a theoretical or correlative survey followed by a description and critical presentation of the data accompanied by numerous examples. A bibliography is given at the end of each chapter and a summary of all the cases included in the classification with complete reference indications. The existence of measurements of the various properties, as for example constants of state, densities, thermal dilation, compressibility, viscosity, surface tension, refractive index, dielectric constant, degree of optical rotation, electrical conductivity, magnetic susceptibility, heat capacity, heat of mixing, heat of transformation, etc., is noted with appropriate reference for each substance.

The representation of the behavior of the binary mixtures is facilitated by the use of 540 uniform and clear diagrams. Cases of maximum–minimum constant boiling mixtures (azeotropes) are noted, and where the case is given in Lecat's work the fact is noted by special reference. All the data have been calculated uniformly to mole per cent.,[1] no inconsiderable task when the diverse modes of representing concentrations are recalled. Conversion tables are given for convenience in converting diverse units to mole per cent. units.

The typography of the book is excellent. The English reader wishes, probably forever in vain, that French editors would place the Table of Contents in the fore part of the volume rather than at the end.

(1) The first column of the table on p. 107 is 100 p or α instead of p as labelled, while the second column is 100 c instead of c.

FREDERICK G. KEYES

BOOKS RECEIVED

August 15, 1937–September 15, 1937

HOMER ADKINS. "Reactions of Hydrogen with Organic Compounds over Copper–Chromic Oxide and Nickel Catalysts." The University of Wisconsin Press, Madison, Wis. 178 pp. $3.00.

ALEXANDER FINDLAY. "A Hundred Years of Chemistry." The Macmillan Company, 60 Fifth Ave., New York, N. Y. 352 pp. $4.25.

ROSS AIKEN GORTNER. "Selected Topics in Colloid Chemistry with Especial Reference to Biochemical Problems." Cornell University Press, 124 Roberts Place, Ithaca, N. Y. 169 pp. $2.50.

HANS HELLMANN. "Einführung in die Quantenchemie." Franz Deuticke Verlag, Helferstorferstrasse 4, Wien I, Austria. 351 pp. M. 20; bound, M. 22.

WILHELM JOST. "Diffusion und chemische Reaktionen in festen Stoffen." Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany. 231 pp. RM. 20; bound, RM. 21.

I. M. KOLTHOFF. "Acid-Base Indicators." Translated by Charles Rosenblum. The Macmillan Company, 60 Fifth Avenue, New York, N. Y. 414 pp. $7.00.

GG. KRÄNZLEIN and R. LEPSIUS. "Kunststoff-Wegweiser durch die Kunststoff-Ausstellung 1937. Achema VIII, Frankfurt am Main." Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 35, Germany. 140 pp. RM. 1.50.

FREDERICK GEORGE MANN and BERNARD CHARLES SAUNDERS. "Practical Organic Chemistry." Longmans, Green and Co., 114 Fifth Ave., New York, N. Y. 403 pp. $3.60.

J. R. PARTINGTON. "A Textbook of Inorganic Chemistry for University Students." Fifth edition. The Macmillan Company, 60 Fifth Ave., New York, N. Y. 1062 pp. $4.60.

K. H. SAUNDERS. "The Aromatic Diazo-Compounds and their Technical Applications." Longmans, Green and Co., 114 Fifth Ave., New York, N. Y. 224 pp. $4.25.

H. I. SCHLESINGER. "General Chemistry." Third edition. Longmans, Green and Co., 114 Fifth Ave., New York, N. Y. 857 pp. $3.50.

JOCELYN FIELD THORPE and M. A. WHITELEY. "Thorpe's Dictionary of Applied Chemistry. Fourth Edition, Vol. I, A-Bi." Longmans, Green and Co., 114 Fifth Ave., New York, N. Y. 703 pp. $25.00.

ANDREW L. WINTON and KATE BARBER WINTON. "The Structure and Composition of Foods. Vol. III. Foods of Animal Origin." John Wiley and Sons, Inc., 440 Fourth Ave., New York, N. Y. 524 pp. $8.00.

"Abridged Scientific Publications from the Kodak Research Laboratories. Vol. XVII, 1935." Published by the Eastman Kodak Company, Rochester, N. Y. 136 pp.

"Collected Papers from the Faculty of Medicine, Osaka Imperial University, 1936." Redaction of the Collected Papers, Faculty of Medicine, Osaka Imperial University, Nakanoshima, Osaka, Japan. 269 pp.

"Macopharden." Published by the 1937 Graduating Class of the Manila College of Pharmacy and Dentistry, Manila, Philippine Islands.

"Minerals Yearbook, 1937." Bureau of Mines, U. S. Department of the Interior. Superintendent of Documents, Government Printing Office, Washington, D. C. 1502 pp. $2.25.