

The data of Volume 12B, part 6 are derived from about 750 journals up to and including 1944, and an earlier Elsevier policy has been revised to include the patent literature. Literature concerning structure has been consulted up to 1953. These data cover the naphthalenes and hydronaphthalenes containing one or more carboxyl groups in side chains, together with their substitution products and derivatives related by what Beilstein calls the principle of anhydrosynthesis. Obviously hydroxy acids are included, but it is characteristic of the insight of the Elsevier editors into the needs of chemists that the corresponding lactones are listed, despite their heterocyclic nature. In his preface Dr. Radt assures the reader that these lactone entries will again appear in the heterocyclic series.

A letter accompanying the copy sent for review indicates that the publishers will send "this valuable but costly volume" for a "limited free examination." In view of its importance to American organic chemistry, the reviewer urges strongly that professional chemists examine the "Encyclopaedia" according to Elsevier's offer if they have doubts about its value in their libraries.

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LABORATORY MANUAL IN PHYSICAL CHEMISTRY

Richard B. Ellis, Research Physical Chemist, Southern Research Institute, Birmingham, Alabama, and *Alfred P. Mills*, Assistant Professor of Chemistry, University of Miami, Coral Gables, Florida. McGraw-Hill Book Co., Inc., New York, 1953. vii + 94 pp. 18 figs. 21 × 28 cm. \$3.50.

This new physical chemistry manual is primarily intended, according to the preface, to serve the needs of the small college whose physical chemistry laboratory may be lacking in some of the more elaborate items of equipment. However, the experiments presented do not indicate any notable improvisations, the equipment used being generally the same as that used in fully equipped laboratories for the corresponding experiments. Twenty-three experiments are included, with the following distribution of topics: gas laws (3), properties of liquids (6), solutions and phase equilibria (7), thermochemistry (1), kinetics (1), electrochemistry (2), surface chemistry (3). For a one-semester course, the authors propose the selection of 15 experiments which students would complete in 15 three-hour laboratory periods. If a two-semester course is to be offered, a program of 10 experiments each semester is suggested, with a correspondingly greater degree of precision and accuracy being required. Extensive use is made of unknowns.

The descriptive matter provided with each experiment is well organized and concise, the usual headings of purpose, equipment, discussion, procedure, and calculations being used. It is assumed that textbooks and handbooks are available in the laboratory, as no attempt is made to present a comprehensive theoretical or historical background, and no appendix is provided. The apparatus assemblies are very clearly represented by large line drawings and schematics. The procedures are generally familiar ones and should yield satisfactory results.

Many physical chemistry teachers may be interested in the detailed data sheets provided for each experiment. These appear to be very systematically designed to provide a neat, clear, and compact record of the results of the experiment on a single sheet of paper which is perforated for easy removal from the manual. The potential user's attitude toward this feature will depend upon his feeling as to the function of experiment write-ups in general and those in physical chemistry in particular. This reviewer believes that the experience of organizing complete reports, patterned to some extent on the form expected of scientific publications, is extremely desirable for undergraduate training in the natural sciences, and that the physical chemistry laboratory is an appropriate place for this to be emphasized.

Contrary to the intention expressed in the preface, this manual may appeal more generally to the large institutions than to the small, because (a) large numbers of students in the physical chemistry laboratories and the use of graduate assistants may make the standard forms an important time-saving feature, and (b) the availability of other courses involving individual project reports may lessen the need for them in the physical chemistry laboratory. For the smaller institution where the enrollment in this course permits, the instructor may prefer to operate the physical chemistry laboratory in such a way as to simulate a research situation, with detailed directions at a minimum and the student encouraged to select and develop his own experimental methods.

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CHYMIA. VOLUME 4

Henry M. Leicester, Editor-in-Chief. University of Pennsylvania Press, Philadelphia, 1953. viii + 217 pp. 14 figs. 16 × 24 cm. \$4.50.

OF THE ten contributions to this volume, five are biographies, of Madam Lavoisier (by Denis Duveen), Benjamin Rush (by Wyndham Miles), Auguste Laurent (by the late Clara de Milt), Charles Caldwell (by Herbert Klickstein), and Maxwell Simpson (by Desmond Reilly).

In a chapter "On the origin of alchemy," R. J. Forbes tries with some success to break the monopoly which Egypt has had in this connection. The Sumerian and other Near Eastern sources he discusses have hitherto been little known.

W. Ganzenmüller deals, in German, with some of the future problems in the history of alchemy, particularly bibliographic, and other problems dealing with the literature of the subject.

The story of Meissner porcelain is told, in German, by Wilhelm Prandtl.

A biography of Robert Boyle which was projected but never published was mentioned in a letter found in the Pierpont Morgan Library. The letter is reproduced and commented upon in a chapter by Curt F. Bühler.

A final chapter by Glenn Sonnedecker gives a picture of chemistry teaching in the pharmacy schools of the nineteenth century.

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ORGANIC CRYSTALS AND MOLECULES: THEORY OF X-RAY STRUCTURE ANALYSIS WITH APPLICATIONS TO ORGANIC CHEMISTRY

J. Monteath Robertson, Gardiner Professor of Chemistry in the University of Glasgow, Scotland. Cornell University Press, Ithaca, New York, 1953. xi + 340 pp. 132 figs. 14 tables. 15.5 × 24 cm. \$5.

THE author of this book is a renowned authority on the analysis of the structures of crystals by means of X-ray diffraction. He has contributed probably more than any other person to the world's knowledge of the precise relative locations of the atoms in organic molecules and crystals.

In Part I he describes the nature of crystals, their symmetry and other geometrical properties, and the methods currently used for determining their structures. The language of crystallographers, often quite unintelligible to others, is simply and lucidly interpreted. Difficulties, such as that of determining the phases of the X-ray reflections, are not glossed over, but explained, and the methods by which they may sometimes be overcome are outlined.

In Part II the results of structure analyses of crystals of organic substances are described. Only a small proportion of the many substances which have been studied are included, but the author has chosen his examples wisely. Among those dealt with are the following: various condensed ring hydrocarbons, hydrogen-bonded structures, steroids, strychnine, penicillin, and fibrous and corpuscular ("globular") proteins. The emphasis throughout is on the significance of the structural results to the noncrystallographic reader.

Each of the two parts of this volume stands on its own feet and could be read or studied with understanding without reference to the other. Both are excellent. The reviewer enthusiastically recommends the book to anyone interested in learning either about modern methods of crystal structure analysis or about the results of such analysis in the field of organic compounds.

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● **GMELIN'S HANDBUCH DER ANORGANISCHEN CHEMIE. SYSTEM 9: SCHWEFEL. PARTS A2 AND B1**

Edited by *Erich Pietsch*. Verlag Chemie, GMBH, Weinheim, Germany, 1953. Eighth edition. Part A2, ix + 450 pp. 76 graphs. 17.5 × 25.5 cm. \$35.30. Part B1, xi + 372 pp. 75 graphs. 17.5 × 25.5 cm. \$29.40. (Available through Walter J. Johnson, Inc., 125 E. 23rd St., New York 10, N. Y.)

THE complete revision of Gmelin's classical handbook of inorganic chemistry, the eighth edition of which began to appear in 1922, is making progress and is expected to be completed some time within the next ten or twelve years, under the present editorship-in-chief of Dr. E. H. E. Pietsch. The guiding principle continues to be the maintenance of the reference character of the work, with critical evaluation of the entire available material, in all but exceptional cases based upon the original literature versions. As usual, chief emphasis is placed upon currently accepted knowledge, and older works are covered only in condensed fashion. Coverage is sufficiently inclusive so that this reference work is a valuable source of information not alone to the chemist, but frequently to those engaged in related fields, such as physics, metallurgy, geology, and mineralogy.

The practice of extending the period of coverage of the literature up to January, 1950, is continued in these issues, and it is the intention to apply this restriction to all subsequent volumes of the eighth edition.

Part A2 of these volumes on sulfur deals with the occurrence and the technology of sulfur and certain of its compounds, with colloidal sulfur, and with the harmful physiological effects of some sulfur compounds.

Inasmuch as in a given volume of Gmelin the coverage includes all combinations of the element concerned with those with lower system numbers, these two sections of System 9 deal only with the combinations of sulfur with elements of Systems 1-8. Accordingly, in addition to elementary sulfur, Part A2 treats of the hydrides and oxides of sulfur, with sulfuric and chlorosulfonic acids.

The geochemistry of sulfur is thoroughly discussed in the first 200 pages of the volume; the remainder of the book is chiefly devoted to the technological aspects of elementary sulfur, hydrogen sulfide, sulfur dioxide and trioxide, and sulfuric acid, with a brief account of chlorosulfonic acid. The instructive account of the preparation of sulfuric acid alone covers more than 160 pages, including not only the pertinent underlying physicochemical principles, but also full details of the industrial methods currently employed.

Part B1 of System 9 deals with the hydrides and oxides of sulfur. The first 155 pages are concerned with a detailed account of hydrogen sulfide: its formation and decomposition and the physical and chemical properties of the gas and of its aqueous

and nonaqueous solutions, followed by deuterium sulfide and hydrosulfide and the polysulfides of hydrogen. The oxides of sulfur, including SO, S₂O₃, extensive accounts of SO₂ and of SO₃, and S₂O₇ and SO₄ complete the volume. This account includes a summary of the combustion reactions of sulfur and of the homogeneous gas equilibria of the sulfur-oxygen system. Treatment of SO₂ includes its behavior as a solvent and a discussion of its nonaqueous solutions, as well as its reactions with various metals and other reducing agents. The chapter on SO₃ covers its formation and preparation in a variety of ways; a detailed description of its physical properties, and of its chemical reactions with nonmetals, metals, and the compounds of nonmetals (water, ammonia, hydrazine, oxides of nitrogen, hydrogen halides, etc.), as well as the compounds of metals (metal oxides, nitrates, halides, etc.); and the nonaqueous solutions of SO₃, as well as the solvent properties of liquid SO₃.

The completion of Part B of the sulfur volume, covering the remaining compounds of sulfur, is expected to be accomplished in 1954. There will thus be provided a thoroughgoing and reliable, clear and systematic account of the chemistry of this important element, which will form a welcome addition to the already imposing eighth edition of the Gmelin Handbuch.

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● **CRYSTAL STRUCTURES. SECTION III AND SUPPLEMENT II**

Ralph W. G. Wyckoff, Laboratory of Physical Biology, National Institute of Arthritis and Metabolic Diseases, Bethesda, Maryland. Interscience Publishers, Inc., New York, 1953. 128 pp. 83 figs. 128 tables. 21 × 26 cm. \$14.50 with binder. (With second supplement to Chapter XIII. 15 pp. 28 figs. 30 tables. \$4.)

THE third volume of "Crystal Structures" is now available, together with a supplement to Chapter XIII on the structures of aliphatic compounds. Volume III contains Chapter XIV, the Structure of Benzene Derivatives, and Chapter XV, Alicyclic and Heterocyclic Compounds and Carbohydrates.

The Structure Reports, which at present cover the years 1947 to 1949, are the only other volumes containing descriptions of crystal structures which have been determined since 1939. The publication of these volumes of "Crystal Structures" should represent a valuable addition to the literature. It is unfortunate, therefore, that this book is so difficult to read. In each chapter the material is grouped into text, tables, illustrations, and bibliography, and each group is paged separately.

Thus, in Chapter XIV, for *p*-aminophenol, the substance is listed on table page 6; there is a description and discussion of the crystal structure on text pages 59 and 60; there are illustrations of the structure on illustration pages 60 and 61; and finally there is a reference to the literature on bibliography page 20. So to obtain a description of the crystal structure it is necessary to refer to four different parts of the book.

The description of complete structure determinations contains no account of the way in which the final atomic parameters were obtained, and it is therefore difficult to assess the accuracy of these parameters. This is an unfortunate omission, since different methods can yield results of greatly differing accuracy. The drawings accompanying complete determinations are of excellent quality and show very clearly the packing arrangements of the molecules in the crystal.

The way in which substances are listed in the tables makes it easier to locate specific substances than before. But those who use the book will be pleased to know that an index is being prepared and will be published soon.

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