The usual procedure is to dissolve the sulfone chloride in a mixture of alcohol and ether, and to add 150% of its weight of aluminum amalgam (for preparation of the amalgam, see Ref. 1a). The mixture is refluxed for about an hour, the necessary amount of water being added gradually. If the expected thiophenol is volatile, separation with steam is advantageous. The first alcoholic distillate is kept separate, as small amounts of the ethyl ester of the thiophenol are sometimes formed. Amphoteric thiophenols are isolated after filtration from the unchanged amalgam and aluminum hydroxide by evaporation of the solution.

Thus, 1,4-dichloro-2-phenylsulfone chloride, napthalene-β-sulfone chloride and acetanilide-*p*-sulfone chloride were reduced to the corresponding thiophenols. The yields varied from 50 to 70% of the theoretical amount.

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NEW BOOKS

Gmelins Handbuch der anorganischen Chemie. (Gmelin's **Handbook of Inorganic Chemistry.**) Edited by R. J. MEYER. Eighth edition, revised. **Bismuth.** Serial No. 19. Published by the Deutsche Chemische Gesellschaft, Verlag Chemie, G. m. b. H., Corneliusstr. 3, Berlin W 10, Germany, 1927. xxii + 229 pp. 11 figs. 18 × 26 cm. Price M. 33.

This excellent volume is the sixth instalment of the new edition of "Gmelin" being issued by the German Chemical Society. It covers the history, occurrence, metallurgy and properties of bismuth and of its compounds with those elements (Nos. 1–18) preceding it in the serial list adopted for this handbook. The chapter on the occurrence of bismuth is particularly complete, occupying some twelve pages. The far greater interest of bismuth to the physicist than to the chemist is shown by the relative lengths of the sections devoted to its physical and to its chemical properties. The former occupies sixty-four, the latter six pages. The compounds of bismuth with fluorine have been omitted in the table of contents.

The Editor's collaborators on this part of the volume were Ellen Schön, Rudolf Sahmen and Gertrud Wilcke.

There is a final chapter of twenty-six pages devoted to the radio-active isotopes of bismuth, namely, Radium C and E, Thorium C and Actinium C. Otto Erbacher was the collaborator on this chapter.

The literature has been covered in this volume up to July, 1926.

ARTHUR B. LAMB

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Applied X-Rays. By GEORGE L. CLARK, Ph.D., Assistant Professor of Applied Chemical Research, Massachusetts Institute of Technology. McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York, 1927. xiii + 255 pp. 99 figs. 24 × 15.5 cm. Price $4.00.

The primary purpose of this book is to make it possible for executives and research workers in industries to get a bird's-eye view of x-rays and their applications so that they may be better qualified to decide whether or not x-ray methods might be used to advantage in their work. The book is divided into three parts. Part one is entitled, "The Fundamentals of X-Ray Science;" Part two, "The Direct Effects and Applications of X-Radiation;" Part three, "The X-Ray Analysis of the Ultimate Structures of Materials." Part one commences with a short statement of the nature of x-rays and the way in which they are produced. There follows a short discussion of x-ray tubes and of electrical equipment. Thirty-five pages give the physical characteristics of x-rays (such as emission and absorption spectra, wave lengths and scattering) and a short discussion of the relation of x-ray data to the theories of atomic structure. Part two gives a short résumé of the ionization and electrical effects of x-rays and their chemical and biological effects, methods of measuring the intensity of x-rays and a seven-page résumé of radiography.

Part three covers more than half the book. It commences with a discussion of the diffraction of x-rays and a statement of x-ray methods of crystal analysis. This is followed by a short summary of the results of crystal analysis for both inorganic and organic compounds. This leads to a chapter on the relation between crystal structure and the properties of crystals. A chapter of twenty-six pages deals with the x-ray study of colloidal and so-called amorphous structures. The three final chapters cover the method of x-ray diffraction as applied to metallurgy.

The book is not intended as a class-room textbook. It is exactly what the author intends it to be—a missionary which tells about x-rays and their applications in language understandable to men in industries who have had a certain scientific training. In almost every case, the author has brought in illustrations to support the statements which he makes. Because of the enormous amount of work which the author has done in the laboratory, it is only natural for him to cite the results of his own experiments in the course of his discussions, and many of the figures in the book are taken from his own negatives.

The book will be of value to all industrial laboratory workers, and should be on the reference shelf of most colleges.

WHEELER P. DAVEY

Lehrbuch der Mineralogie: II. Spezielle Mineralogie. (**Textbook of Mineralogy: II. Special Mineralogy.**) Second edition. By P. NIGGLI with the assistance of L. WEBER. Bornträger, Berlin, 1926. xvi + 697 pp. 17 × 25 cm. Price, bound, 33 M.

There are those who call mineralogy a branch of inorganic chemistry. They are wrong, but their view would be supported by a glance through this volume, if the fact were overlooked that this is only volume 2 of a three-volume work. The real mineralogy, the natural science of the inanimate but symmetrical objects that one picks up in the field, will come in volume 3, which has not yet appeared in this enlarged second edition.

To hint that this book is "chemical" is not quite correct, either, for the fundamentally chemical classification of minerals, a classification which Dana and the other reference books have made so familiar, is here subordinated to a classification based primarily upon symmetry and morphology, properties which we are inclined to call "physical." Yet this is a book about the specific properties of the principal substances of which minerals are made, and not about their properties in the abstract.

Niggli's radical rearrangement of the material raises some interesting questions as to the future of the chemical handbooks themselves. For a century they have been written with the chemical element as the unit of classification. But if there are only two chemical elements, the positive and the negative electron, and if the properties of a substance depend upon the placing of its atomic nuclei and planetary electrons in space, then why should we not classify our facts on a geometrical basis? The idea will probably not be popular with the chemists, at least not for several generations to come, but the mineralogists, who usually have the better training in crystallography, may take to it more kindly.

The first edition of this work appeared in 1920 as a single volume. The second edition began in 1924 with volume 1, "General Mineralogy." The book here reviewed is volume 2, which has just been supplemented by a book of tables of properties, and is to be followed by volume 3, which covers "Minerocönologie," the science of mineral associations in Nature. The printing of the book is excellent, but the binding is poor and will not stand the heavy wear which this work is certain to receive in any library.

ROBERT B. SOSMAN

Über die Natur und Bildungsweise der marinen Eisensilikate insbesondere der chamositischen Substanzen. (On the Nature and Mode of Formation of the Marine Iron Silicates, Especially the Chamositic Substances.) By KARL C. BERZ. (No. 11 of *Fortschritte der Geologie und Palaeontologie.*) Bornträger, Berlin, 1926. viii + 157 pp. 6 figs. 17 × 25.5 cm. Price, unbound, 12 M.

After reviewing existing data on chamosite and glauconite, the author describes his petrographic studies of various chamositic sedimentary rocks and iron ores, and then devotes Part II, which makes up the greater part of the book, to theories of the modes of formation and alteration of the marine iron-bearing silicates. There has been a revival of interest in recent years in these geochemical problems, but their study is not easy, because the material is of that troublesome kind which shows birefringence yet is so fine-grained that it is difficult to tell whether or not it is crystalline. This book will be very useful to those engaged in the study of coagulated colloidal sediments of all kinds, siliceous, calcareous, or ferruginous.

The title-page leaves the reader in some doubt whether this book is an independent unit or part of a larger volume; no volume number is visible, yet the book carries that abomination, a double set of page numbers. The reviewer has observed in several of Bornträger's books during the past few years this fault of being difficult to refer to—not a fatal defect but an unaccustomed one in these days of interchangeable parts and the elimination of waste by standardization.

ROBERT B. SOSMAN

Practical Colloid Chemistry. By WOLFGANG OSTWALD, Professor of the University of Leipzig, with the collaboration of Dr. P. WOLSKI and Dr. A. KUHN. Translated by I. NEWTON KUGELMASS, Yale University School of Medicine, and THEODORE K. CLEVELAND, Ph.D. E. P. Dutton and Company, 681 Fifth Avenue, New York City, 1926. xvi + 191 pp. 22 figs. 19 × 13 cm. Price $2.25.

The translation, which is based on the 1922 edition of the German text, gives brief laboratory directions for some 180 colloidal preparations. Descriptive material is arranged under the headings: condensation methods, dispersion methods, diffusion, dialysis, ultrafiltration, surface tension and viscosity, optical properties, electrical properties, experiments with gels, adsorption, coagulation, peptization, commercial colloids and dispersoid analysis. Most of the descriptive material is brief but clear, though it does not appear to have been brought closely up to date.

Many of the references are to works published 15 to 25 years ago and these have been supplemented only in a few cases by reference to more recent literature. Thus, the descriptions of the stalagmometer and the viscosimeter illustrations are those of the early primitive design. The author's reasons for not including an index do not appear convincing to the reviewer.

E. B. MILLARD

Kolloidchemische Technologie. Ein Handbuch kolloidchemischer Betrachtungsweise in der chemischen Industrie und Technik. (Colloid Chemical Technology. A Handbook of Colloid-Chemical Aspects of Chemical Industry and Technique.) Edited by Dr. RAPH. ED. LIESEGANG, Frankfurt A.M. Theodor Steinkopff, Dresden and Leipzig, 1926. Part 1, pp. 1–80; Part 2, pp. 81–160. Illustrated. 25.5 × 18.5 cm. Price, R. M. 5 per part.

The purpose of this book is to supply within about a thousand pages the theoretical foundation of colloid chemistry and a thorough treatment of its wide application to industry in general. Sections of 80 pages are to appear serially, and the individual chapters are by about thirty different authors. In the first two sections of the theoretical part now under review (160 pages) a discussion of the general methods for preparing colloids is given, with numerous references to the literature, more especially to German patents. This is followed by detailed directions for preparing colloidal solutions of inorganic materials, the arrangement being that of the periodic table. A brief description of the Plauson colloid mill is followed by descriptions of its specific applications to industrial products. Ultrafiltration and dialysis, the preparation of ultrafilters on a laboratory scale, then on an industrial scale, are described. In the chapter on electro-osmosis a distinction between electro-endosmosis and cataphoresis is more carefully made than usual. Industrial applications include a description of electro-osmosis machines, their use in refining kaolin, an electro-osmotic filter press, the impregnation of materials with rubber, treatment of blood serum, and finally a description of the Cottrell precipitator.

A discussion of the chapter on viscosity measurements of colloid systems must be postponed until the remainder of this chapter appears in a later section. The subdivision into 80-page sections follows only the printer's convenience, a word being divided between Sections 1 and 2.

E. B. MILLARD

The Carbon Compounds. A Textbook of Organic Chemistry. By C. W. PORTER, Associate Professor of Chemistry in the University of California. Revised edition. Ginn and Company, 15 Ashburton Place, Boston 2, Massachusetts, 1926. ix + 501 pp. Illustrated. 24 × 15.5 cm. Price $4.00.

The first edition of this work represented a distinct advance over the ordinary type of organic textbook, especially in the treatment of general reactions of organic chemistry, which comprises about the last hundred pages of the work. The present edition is equally good. It is, however, unfortunate to call it a revised edition since the first 472 pages are practically word for word the same as in the first edition.

On pages 34 and 45 misprints in the first edition have been corrected. On page 42 a new value for the heat of combustion of acetylene has been used. On pages 210 and 219 new references have been added. On page

440 a structural formula has been removed and four additional lines, including a new reference, have been added. The author index of the present edition is much more extensive than in the first edition. This, however, is not due to an increase of references in the text, but to the fact that the first edition had a very sketchy index. In the first edition there were included 92 questions and problems for review. The new edition has 221 of these.

The reviewer cannot resist the temptation to call attention to the statement on page 5 of both editions that "Dalton discovered the law of multiple proportions (1804) and almost immediately offered a satisfactory explanation." This is not in entire agreement with the more modern conceptions of the genesis of Dalton's atomic theory. On page 47 of both editions the date given for Leeuwenhoek is 1860.

Although "The Carbon Compounds" remains one of the best organic textbooks, it could undoubtedly be improved by a revision. It might be worth while to include some of the modern chemistry of a simpler type, such as the preparation of acetone as a by-product of the butanol industry, and the preparation of "hexalin" by the reduction of phenol.

FRANK C. WHITMORE

Die Katalyse in der organischen Chemie. (Catalysis in Organic Chemistry.) By PAUL SABATIER. Translated from the Second French Edition by Dr. BERTHOLD FINKELSTEIN. With a directory of the literature for the years 1920 to 1926 prepared by Dr. HANS HÄUBER. Akademische Verlagsgesellschaft m.b.H., Leipzig, 1927. xi + 466 pp. 24 × 16.5 cm. Price, unbound, M. 22; bound, M. 24.

Sabatier's useful book is already available in English in the translation of E. Emmet Reid. The present volume differs from the original and from the English translation in that two appendices have been added. In one of these the literature for the years 1920 to 1924 on catalysis in organic chemistry is reviewed; the second contains (together with brief comments) a list of contributions which have appeared since 1924. The patent literature is included.

In spite of a few minor omissions, these bibliographies are surprisingly complete. They are well arranged, and will be extremely useful to anyone wishing to orient himself in the great mass of literature on this subject. References to the text and to the appendices are brought together in a single comprehensive subject index. The format is excellent.

WALLACE H. CAROTHERS