

Doody [THIS JOURNAL, 55, 3504 (1933)]. The specific conductivities were respectively 1.83 and 2.59×10^{-4} , both giving for the ionization constant the value 0.59×10^{-5} . Unfortunately the heavy water used had a specific conductivity of 2.3×10^{-3} and in ignorance of the nature of its impurity it is difficult to apply the proper correction. If the whole conductivity of the water is subtracted from the conductivity of the acid the dissociation constant will be lowered by 20%. In any case we have the striking result that the ionization constant is less than one-third as great as that of acetic acid in common water, 1.84×10^{-5} . We hope to repeat this experiment with a purer solvent and also with a stronger acid

(monochloroacetic) in order to obtain more accurate ionization constants.

This enormous shift of equilibrium in going from a hydro- to a deuto-compound shows again how much more tenaciously a deuteron is held by a pair of electrons of another atom than is a proton. For although the ionization of an organic acid undoubtedly involves the addition of solvent molecules to the un-ionized acid and to the ions, still the main phenomenon is the separation of H^{1+} or H^{2+} from a pair of electrons of a carboxyl oxygen.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA

GILBERT N. LEWIS
PHILIP W. SCHUTZ

RECEIVED MARCH 22, 1934

NEW BOOKS

Goethe als Chemiker und Techniker. (Goethe as Chemist and Technologist.) By PAUL WALDEN. Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 10, Germany, 1932. 87 pp. 12 × 15.5 cm. Price, Mk. 2.

In the flood of books about Goethe which were published in 1932, occasioned by the centenary of his death, it is not surprising that there should have been one dealing with Goethe's relationship to chemistry—particularly when one recalls how many-sided was Goethe's genius.

The extent of Goethe's interests and activities in chemistry will, however, I think surprise most readers of this small volume. Joh. Philipp Fresenius, grandfather of Carl Remigius Fresenius, one of the great names in the history of our science, was Goethe's godfather; as an impressionable young man, Goethe's life was saved by the ministrations of an alchemical physician; the chemists Buchholz in Weimar, Götting, Wackenroder and particularly Döbereiner in Jena, and later the great Berzelius, were Goethe's intimate friends.

At Ilmenau we find Goethe busied with the development of the reverberatory furnace for the better smelting of lead, with the reopening of the coal mines and with the various textile industries practised in that vicinity. In 1799, with Götting, Goethe studied the extraction of sugar, and ten years later, with Döbereiner, the production of sugar and alcohol from beets.

In 1783-1784 we find Goethe deeply engrossed with the invention and perfection of the air balloon, only to be narrowly anticipated by Charles and Montgolfier in Paris.

Throughout his life, Goethe's notebooks are replete with descriptions and sketches of innumerable chemical and manufacturing establishments which he visited and inspected; the smelters at Rammelsberg, Clausthal, Andreasberg, etc., the porcelain and munition plants at Potsdam, the optical works at Stuttgart, the knife factory at Bad Pyrmont, the sulfur springs at Berka, the tanneries

at Ingelheim, the jewelry and textile factories at Hanau and a host of others.

These and many other interesting facts and observations showing the important role that chemistry played in Goethe's life are skilfully told in this small brochure, which is a reprint of a lecture delivered by Professor Paul Walden before the Verein Deutscher Chemiker in Berlin in connection with the Goethe Memorial Celebration in that city on March the 14th, 1932.

Chemistry is scorned by some humanists as the preoccupation of lesser minds; here we find it a life-long interest and a continual inspiration to perhaps the greatest poet, writer and philosopher of modern times.

ARTHUR B. LAMB

Säure-Basen-Indicatoren, ihre Anwendung bei der colorimetrischen Bestimmung der Wasserstoffionenkonzentration. (Acid-Base Indicators, and their Application in the Colorimetric Determination of Hydrogen-Ion Concentration.) By DR. I. M. KOLTHOFF and DR. HARRY FISCHGOLD. Fourth edition of "Der Gebrauch von Farbindicatoren." Verlag von Julius Springer, Linkstrasse 23-24, Berlin W 9, Germany, 1932. xi + 416 pp. 26 figs. 14 × 22 cm. Price, RM. 18.60; bound, RM. 19.80.

This is a very complete survey of the theory and the practical use of acid-base indicators, especially valuable for its treatment of recent developments. Notable in this respect is the discussion of the use of indicators in non-aqueous solutions and in highly acid systems and of the so-called salt and alcohol errors in indicator measurements.

In an ideal educational world one would object to the devotion of more than one-quarter of a book on indicators to a perfectly general discussion of the modern theory of electrolyte solutions. This material ought to be so universally accepted a part of even an elementary chemical

education as to be unnecessary in a specialized treatise. Actually, the elementary texts on physical chemistry have been so slow to make use of the great simplification which derives from Debye and Hückel, from Bjerrum and from Brönsted, that the inclusion of this section is no doubt wise. In any case it offers the reader an excellent elementary discussion of electrolytes and what is probably the most complete and readable condensed presentation of the theory of acids and bases in print.

In general, the author has succeeded in the difficult task of being comprehensive without being uncritical in a way which is only possible for one as active as he is in the development of the subject. The discussion of the supposed contrast between the ionization and the chromophore theories of indicator action is especially enlightened. On the other hand, the adoption without question or explanation of the electrometric *PH* measured with a salt bridge as the norm, which all good indicator measurements should approach, seems unfortunate. Surely Taylor and Guggenheim have demonstrated that the electrometric method is an approximate one justified only in so far as its results parallel those obtained by conductivity or colorimetric methods of determining ionization.

LOUIS P. HAMMETT

Gmelins Handbuch der anorganischen Chemie. (Gmelin's Handbook of Inorganic Chemistry.) Edited by R. J. Meyer. Eighth edition. System Number 59, Iron. Part A, instalments 1, 2, 3, 4 and 5. Issued by the Deutsche Chemische Gesellschaft. Verlag Chemie, G. m. b. H., Corneliusstrasse 3, Berlin W 10, Germany. 17 × 25 cm. A1, 1929, 224 pp., RM. 26, singly RM. 20. A2, 1929, 88 pp., RM. 8.50, singly RM. 10.50. A3, 1931, 274 pp., RM. 25, singly RM. 32. A4, 1932, 260 pp., RM. 30.50, singly RM. 35.50. A5, 1933, 310 pp., RM. 37.50, singly RM. 43.50.

These volumes (Part A, Instalments 1-5) of Gmelins Handbuch dealing with iron began to issue in 1929 and have now been brought to the point where they can be advantageously reviewed.

The first section (59 pages) covers the history of iron. This history is so nearly coextensive with that of the human race itself that merely an abstract of such a history would be beyond the scope even of this compendious encyclopedia. Actually this section constitutes only a bibliography of bibliographies and of books and articles on the subject, dating from the earliest times and written in many languages.

The second section (125 pages) discusses the occurrence of iron from a geological, geographical, economic and statistical point of view.

The third section (238 pages) covers *pure* iron, its preparation and its physical, chemical and electrochemical properties. A special chapter of 50 pages by E. Liebreich, and another of 64 pages by M. Rudolph, A. Eisner and A. Kotowski on the corrosion of both pure and technical iron are included in this section.

The fourth and largest section (615 pages) is devoted to technical iron. This section was prepared by R. Durrer

of the Technische Hochschule in Berlin, assisted by the Editorial Board of the Handbook, and F. C. Althof, H. Lueb, M. W. Neufeld and W. Bankloh. The manufacture of crude iron (pig iron) and of wrought iron and steel is discussed in full. There is a remarkably complete special chapter of over 100 pages dealing with the general physico-chemical phenomena involved in the processes for the preparation of iron and steel. Another special chapter deals with the casting of iron and steel.

The fifth section (90 pages) by R. Durrer and H. Wentrup deals with ferro-alloys and addition agents.

A postscript covers articles on technical iron published since the appearance of the earlier instalments, so that the subject as a whole is covered up to August, 1933.

There is, so far as I am aware, no other treatise or encyclopedia which covers the existing knowledge regarding iron and steel with anything approaching the thoroughness and completeness achieved in these volumes of the Gmelin Handbook. They are simply indispensable to anyone engaged in research or study in this field.

ARTHUR B. LAMB

BOOKS RECEIVED

February 15, 1934-March 15, 1934

R. ABEGG, FR. AUERBACH AND I. KÖPPEL, Editors. "Handbuch der anorganischen Chemie." Vierter Band, dritte Abteilung, dritter Teil, Lieferung 1, Kobalt. Verlag von S. Hirzel, Königstrasse 2, Leipzig C 1, Germany. 626 pp. RM. 58.

R. G. AUSTIN. "Aids to Qualitative Inorganic Analysis." William Wood and Company, Mt. Royal and Guilford Ave., Baltimore, Md. 204 pp. \$1.50.

JOHN WILLIAM BAKER. "Tautomerism." George Routledge & Sons, Ltd., Broadway House, 68-74 Carter Lane, E. C. London, England. 332 pp. 25/- net.

ZOLTÁN KERTESZ. "Rechnerische Betrachtungen über Verbrennungsvorgänge und Abgasverluste bei Feuerungen, insbesondere bei Kalk- und Zementöfen." Verlag von Wilhelm Knapp, Halle (Saale), Germany. 72 pp. RM. 4.80; bound, RM. 6.00.

J. E. NYROP. "A Treatise on the Catalytic Action of Surfaces." Levin and Munksgaard, Publishers, Nørregade 6, Copenhagen, Denmark. 75 pp.

"Arkiv för Kemi, Mineralogi och Geologi," Utgivet av K. Svenska Vetenskapsakademiens. Band 11, Häfte 3. Library of the R. Swedish Academy of Sciences, Stockholm 50, Sweden.

"Proceedings," World Petroleum Congress, Organized by the Institution of Petroleum Technologists, Held at the Imperial College of Science and Technology, South Kensington, London, July 19-25, 1933. Vol. I, Geological and Production Sections. Published at the Offices of the Congress, Aldine House, Bedford St., W. C. 2, London, England. 592 pp.