The data indicate that the electric moment of nitrogen tetroxide cannot differ greatly from zero. This conclusion is based upon two facts. (1) Within the limits of experimental error the molar polarization of nitrogen tetroxide does not change as the temperature is varied over the interval mentioned above. (2) The value obtained for the molar polarization of this molecule, 16.87 cc., differs but slightly from the polarization, 16.73 cc., which is required by the optical data of Cuthbertson [*Proc. Roy. Soc.* (London), **A89,** 361 (1913)].

Zahn has emphasized that his experimental observations demand a higher moment for the tetroxide as compared to the dioxide. Our data are equally definite in that they require the opposite conclusion. It seems reasonable to expect the polarity of the associated molecule to be smaller than that of the units from which it is formed, especially if the union is through the nitrogen atoms. It may also be mentioned that as far as is known the infra-red spectrum of N_2O_4 can be accounted for if there is assumed a symmetrical molecule where all the atoms lie in a plane [Sutherland, *Proc. Roy. Soc.* (London), **A141,** 342 (1933); see, however, Harris and King, *J. Chem. Phys.*, **2,** 51 (1934)].

The values indicated for the dipole moment of nitrogen dioxide do not differ appreciably from those reported by Zahn. It is a difficulty we are at present unable to explain quantitatively that both sets of data seem to be completely accounted for only if the moment of the dioxide decreases as the temperature is increased. If the moment of a molecule is at all dependent upon temperature it is more natural to expect it to increase with increasing temperature because of an excitation of higher rotational and vibrational states.

The writers hope to be able to present in the near future a more detailed account of these investigations.

DEPARTMENT OF CHEMISTRY J. W. WILLIAMS
UNIVERSITY OF WISCONSIN C. H. SCHWINGEL
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RECEIVED MAY 22, 1934

NEW BOOKS

Handbuch der anorganischen Chemie. (Handbook of Inorganic Chemistry.) Edited by R. ABEGG, FR. AUERBACH and I. KOPPEL. Vol. IV, 3d Division Part III. **Cobalt and its Compounds.** 1st Instalment. Verlag von S. Hirzel, Königstrasse 2, Leipzig C 1, Germany, 1934. 626 pp. 18 × 25.5 cm. Price, M. 58, unbound.

This volume covers the cobalt atom, the atomic weight of cobalt, metallic cobalt, compounds of divalent and trivalent cobalt, the cobaltous ammines, the compounds and alloys of cobalt with the metalloids of groups I-VI and with the metals, and finally the colloid chemistry of cobalt.

The selection, arrangement and presentation of the subject matter are fundamentally the same as in the earlier volumes of this Handbook except perhaps that the great development of physical chemistry has permitted an even more thorough and lucid treatment from this point of view.

The outstanding merit of this Handbook as compared with others in the field, namely, its critical and comprehensible rather than comprehensive presentation, persists undiminished in this latest volume.

The publishers announce that the manuscript of the concluding volume on cobalt, covering the cobaltic ammines, is already completed and that this volume should therefore appear in the near future.

ARTHUR B. LAMB

Sixième Congrès International du Froid, Buenos Aires Août Septembre 1932. Première Commission Internationale (Commission Kamerlingh Onnes) de l'Institut International du Froid. Rapports et Communications Issus du Laboratoire Kamerlingh Onnes. (Review of the Reports and Communications from the Kamerlingh Onnes Laboratory presented at the Sixth International Conference on Refrigeration held at Buenos Aires, August and September, 1932.) Présentés par le Président de la Première Commission, W. H. Keesom. N. V. Boek-en Steendrukkerij Eduard Ijdo, Leiden, Holland, 1932. x + 460 pp. Illustrated. 16 × 24 cm.

The volume of reports and communications is comprised of thirty-six papers from the Kamerlingh Onnes Laboratory dealing with a wide variety of subjects directly and indirectly relating to the realization and maintenance of low temperatures. Many of the papers are progress reports on important problems which the Leiden Laboratory has continued under investigation for many years. Thus further data and information on thermometry at low temperatures are reported with new determinations of the boiling points of oxygen and hydrogen (normal −252.754 and para −252.871). The decision of the Leiden Laboratory not to use the International scale of temperature as interpreted by the electrical resistance thermometer of platinum subject to the specifications of the Paris Convention of

1927, composed of the National Laboratories of Great Britain, Germany and the United States is emphasized. The reasons given for this decision appear sound to the reviewer. Further work on the phosphor bronze electrical resistance thermometer for liquid helium temperatures is referred to and detailed reports on the thermoelectric characteristics of various metals and a number of alloys.

The record of results obtained at the Leiden Laboratory since the preceding Congress on Refrigeration includes studies on heat capacities, pressure–volume–temperature properties, thermal conductivity, freezing point–pressure curves for hydrogen, separation of isotopes of neon by distillation, theory of rectification, crystal structure analysis by x-rays at very low temperatures, luminescence of solidified gases, normal electrical and super-electrical conductivity of metals and alloys in relation to a magnetic field, para magnetism, para magnetic circular polarization, diamagnetic susceptibilities, luminescent bacteria at helium temperatures, and the survival of plants at liquid nitrogen and liquid helium temperatures.

FREDERICK G. KEYES

Handbuch der Lebensmittelchemie. (Handbook of Food Chemistry.) Vol. I. Edited by A. BÖMER, Münster i. W., A. JUCKENACK, Berlin, and J. TILLMANS, Frankfurt a. M. Verlag von Julius Springer, Linkstrasse 23–24, Berlin W 9, Germany, 1933. xvi + 1371 pp. 17.5 × 25.5 cm. Price, RM. 126; bound RM. 129.60.

This is Volume I of an encyclopaedic treatise of eight volumes upon the chemistry of that large group of foods, beverages, etc., which are classified under the German word "Lebensmittel." This term according to the Deutsches Lebensmittelgesetz (p. 1287) comprises all substances which in the raw, prepared or manufactured state are intended to be eaten or drunk by man. The present introductory volume of the series treats of the general constituents of foods; the detailed discussion of methods of analysis and of the special classes of foods, beverages, condiments, etc., is reserved for the future volumes. The following synopsis of the main divisions of the first volume is given: I. Scope and purposes of food chemistry, its significance in public health and economy, its history by H. Fincke (94 p.). II. The important constituents of foods: Water by J. Tillmans and P. Hirsch (22 p.); Proteins and other nitrogenous compounds by J. Tillmans and P. Hirsch (138 p.); Fats by A. Bömer (118 p.); Carbohydrates by P. Karrer (92 p.); Glucosides by J. Tillmans and P. Hirsch (45 p.); Tannins and related compounds by J. Tillmans and P. Hirsch (59 p.); Natural pigments by F. Mayer (67 p.); Organic acids by J. Tillmans and R. Strohecker (21 p.); Inorganic constituents by J. Tillmans and R. Strohecker (20 p.); Enzymes by E. Waldschmidt-Leitz and A. K. Balls (91 p.); Vitamins by A. Scheunert (225 p.); Preservatives, artificial colors, and other adjuncts by E. Rost (74 p.); Poisons (and other substances dangerous to health) by E. Rost (78 p.). III. Nutrition by the late M. Rubner (104 p.); Preparation of foods by K. Täufel (35 p.). IV. General digest of pure food laws of different countries: Germany, by H. Holthöfer (42 p.); Other countries, by E. Bames (28 p.); Subject matter index (17 p.).

This first volume upon general food constituents is a loosely assembled collection of monographs with apparently but little editorial effort to secure the proper balance of subjects and uniformity of treatment which one would expect in a well-coördinated treatise. This lack of uniformity is most apparent in the use of citations. Some of the contributors, as Scheunert, are especially careful to refer the reader in all cases to original articles, which is helpful and necessary for those who desire to review the source materials of a subject. In other monographs, the reader is continually referred to previous compilations by Abderhalden, Czapek, Hammarsten, Plimmer, etc., with very inadequate citations of original authorities. This reliance upon old digests and compilations, when more recent reliable information is available, is a serious criticism of many contributions in the present work. On page 674, for example, Tillmans and Strohecker quote the old erroneous formula for thyroxin from Hammarsten's "Lehrbuch der physiologischen Chemie" (1922 ed.) without reference to the later correct formula of Harington and Barger. This omission is wholly inexcusable for in the monograph of this volume upon food poisons by Rost the formula established by Harington and Barger is given both in the text on p. 1101 and in the footnote on p. 1136. This is only one of several cases where the Chief Editor seems to be ignorant not only of the latest journal literature but of what his own collaborators have contributed. Again on p. 131 and 236–237 Tillmans and Hirsch quoting from the 1914 German translation of Plimmer's "Chemical Constitution of the Proteins" give tables for the amino acid content of proteins which are over twenty years behind present day knowledge. No mention is made in tables or text of the amino acid methionine or of other more recently discovered cleavage products of proteins. On p. 132 it is stated that the separation of valine from leucine is difficult, whereas it is easily accomplished by the lead salt method of Levene and Van Slyke.

The section on the organic acids of foods by Tillmans and Strohecker is also inadequate for a large reference work, both from lack of information and from lack of citations. Under formic acid (p. 636) no mention is made of its presence in sugar-cane sirups and molasses. The mention of the occurrence of tricarballylic acid in maple sap (p. 651), of aconitic acid in sugar-cane juice (p. 652), of the use of the copper, arsenic and lead salts of adipic acid as insecticides (pp. 653), etc., etc., should be accompanied by references to the original sources of information. The meager information and bibliography upon oxalic acid on pp. 645–646 are amplified much more satisfactorily by Rost on pp. 1062–1065 with copious references to its natural occurrence in food products. Rost's excellent treatment of oxalic acid is, however, out of place in a chapter upon preservatives, artificial colors and other adjuncts. Rost has also not taken the pains to verify some of his references. His accrediting (p. 1030) Bureau of Chemistry Bulletin upon Benzoic Acid and Benzoates to the joint authorship of Wiley, Remsen and Chittenden will appear to American food chemists not only surprising but immensely tickling.

But notwithstanding these and other defects of the present introductory volume of the Handbuch der Lebensmittel there are many sections of the work which are de-

serving of the highest praise. The monograph by Scheunert upon vitamins is carefully prepared with a very full 33-page bibliography of original references. It is undoubtedly one of the best compilations upon the subject. The monograph by Waldschmidt-Leitz and Balls upon enzymes is also deserving of great commendation. It is to be hoped that in the future volumes of the Handbuch greater attention will be given by the editors to the correction of some of the deficiencies which have been enumerated in the present review.

In the opinion of the reviewer the only argument for the publication of such voluminous expensive collaborative chemical treatises as the present Handbuch is that of careful editorial coördination which, by cross references, by elimination of duplication and by other supervision, will weld the different contributions into a uniform homogeneous work. If this is not done the *raison d'être* of such a miscellaneous collection of contributions disappears, in which case it is vastly more satisfactory and economical for the chemist to purchase independent reliable monographs for each of the special subjects in which he is interested.

C. A. BROWNE

BOOKS RECEIVED

April 15, 1934–May 15, 1934

G. ALLARD. "Mécanique Quantique et Chimie." Hermann et Cie, Éditeurs, 6 Rue de la Sorbonne, Paris V^e, France. 31 pp. Fr. 8.

JOHN P. ARNOLD and FRANK PENMAN. "History of the Brewing Industry and Brewing Science in America." Prepared as Part of a Memorial to the Pioneers of American Brewing Science. Dr. John E. Siebel and Anton Schwarz. Siebel-Schwarz Memorial, Room 611, 820 North Michigan Ave., Chicago, Ill. 250 pp. $3.00.

GEORGES BROOKS. "Laque d'Indochine, Rhus Succedanea. La Laccase et le Laccol." Hermann et Cie, Éditeurs, 6 Rue de la Sorbonne, Paris V^e, France. 100 pp. Fr. 18.

WILHELM EITEL, Editor. "Veröffentlichungen aus dem Kaiser Wilhelm-Institut für Silikatforschung in Berlin-Dahlem." Vol. VI. Verlag von Friedr. Vieweg und Sohn Akt.-Ges., Braunschweig, Germany. 234 pp. RM. 28.

H. v. EULER, W. FRANKE, R. NILSSON and K. ZEILE. "Chemie der Enzyme. Zweiter Teil, 3 Abschnitt. Die Katalasen und die Enzyme der Oxydation und Reduktion." Verlag von J. F. Bergmann, München 27, Germany. 663 pp. RM. 58.

EMIL J. FISCHER. "Wachse, Wachsähnliche Stoffe und Technische Wachsgemenge." Verlag von Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany. 192 pp. RM. 13; bound, RM. 14.

VIKTOR FISCHL and HANS SCHLOSSBERGER. "Handbuch der Chemotherapie. Zweiter Teil. Metallderivate." Fischers Medizinische Buchhandlung, Rossplatz 12, Leipzig C 1, Germany. 540 pp. I + II, M. 89; bound, M. 92.

GILBERT J. FOWLER. "An Introduction to the Biochemistry of Nitrogen Conservation." Longmans, Green and Co., 55 Fifth Ave., New York. 280 pp. $4.50.

SAMUEL GLASSTONE. "Recent Advances in Physical Chemistry." Second edition. P. Blakiston's Son and Co., Inc., 1012 Walnut St., Philadelphia, Pa. 498 pp.

H. KUHN. "Atomspektren." Eucken-Wolf, "Hand- und Jahrbuch der chemischen Physik," Band 9, Abschnitt I. Akademische Verlagsgesellschaft m. b. H., Markgrafenstrasse 6, Leipzig C 1, Germany. 266 pp. RM. 24.50; bound, RM. 26.

ALEXANDER LOWY and WILMER E. BALDWIN. "A Laboratory Book of Elementary Organic Chemistry." Second edition. John Wiley and Sons, Inc., 440 Fourth Ave., New York. 182 pp. $2.50.

N. MARINESCO. "Équilibre de Membrane." Hermann et Cie, Éditeurs, 6 Rue de la Sorbonne, Paris V^e, France. 69 pp. Fr. 15.

J. W. MELLOR. "A Comprehensive Treatise on Inorganic and Theoretical Chemistry." Vol. XIII, Iron, Part II. Longmans, Green and Co., 55 Fifth Ave., New York. 948 pp. $20.00.

M. PRETTRE. "L'Inflammation et la Combustion Explosive en Milieu Gaseux. 2^e Partie. Les Hydrocarbures." Hermann et Cie, Éditeurs, 6 Rue de la Sorbonne, Paris V^e, France. 54 pp. Fr. 15.

SUZANNE VEIL. "Les Phénomènes Périodiques de la Chimie. I. Les Périodicités de Structure." Hermann et Cie, Éditeurs, 6 Rue de la Sorbonne, Paris V^e, France. 39 pp. Fr. 15.

CLARENCE J. WEST, Editor. "Annual Survey of American Chemistry." Vol. VIII, 1933. Published for the National Research Council by The Chemical Catalog Company, Inc., 330 West 42d St., New York City. 403 pp. $4.50.

C. HAROLD WRIGHT. "Soil Analysis. A Handbook of Physical and Chemical Methods." Thomas Murby & Co., 1 Fleet Lane, London E. C. 4, England. 236 pp. 12s./6d.

"Annual Reports on the Progress of Chemistry." Vol. XXX, 1933. The Chemical Society, Burlington House, London W 1, England. 462 pp. 10s./6d., postage 6d.

"Table International des Poids Atomiques. Quatrième Rapport de la Commission des Poids Atomiques, 1934." (In English, German and French.) Union Internationale de Chimie, Secretariat Générale, 49 Rue des Mathurins, Paris, France. 62 pp.