

melting point may be given, however, as  $-111.5 \pm 0.5^\circ$  with a corresponding vapor pressure of  $600 \pm 20$  mm. The accepted value for the xenon melting point is approximately  $-140^\circ$ .

The processes of purification were checked by frequent density determinations and the densities of the best samples of krypton and xenon were rather carefully determined. The method employed was to collect a sample of the gas at a known temperature and pressure in a calibrated bulb, which was then weighed against a counterpoised bulb.

Density determinations made in connection with the fractionation work seem to indicate that the present accepted densities for krypton and xenon are too low. The value found for the heaviest krypton fraction was 3.733 g./l. and that for the heaviest xenon fraction 5.887 g./l. These figures would correspond, respectively, to atomic weights of 83.6 and 131.4 if Watson's [*J. Chem. Soc.*, **97**, 833 (1910)] corrections are employed. No effort has yet been made to make final density determinations and these will be reported later.

Much of the work of extraction and purification followed the lines indicated by earlier investigators, but a number of new methods were used which will be reported in the more complete paper.

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## NEW BOOKS

**Optical Activity and High Temperature Measurements.** By F. M. JAEGER. McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York, 1930. 450 pp. 137 figs.  $15.5 \times 23.5$  cm. Price, \$4.00.

This volume contains the lectures delivered at Cornell University by Professor F. M. Jaeger during the second semester of 1928-1929 under the George Fisher Baker Non-Resident Lectureship in Chemistry. There are three series of the lectures. The first deals with the spatial arrangement of atomic systems and optical activity; the second with the methods, results and problems of precise measurements at high temperatures; the third with the constitution and structure of the ultramarines. Taken as a whole the lectures furnish a systematic presentation of investigations carried out by Professor Jaeger and his co-workers at the chemical laboratory of the University of Gröningen.

The first lectures of the first series cover the principles of symmetry as applied to atomic systems, discussing the work of Pasteur, van't Hoff and Le Bel. The remaining lectures of this series are concerned chiefly with the optical activity of complex salts, many of them essentially inorganic. These latter lectures are of particular interest as demonstrating the wide-

spread occurrence of optical activity in the absence of any asymmetric carbon atom.

The lectures of the second series not only discuss and describe highly refined measurements of temperatures but also of specific heats and of the viscosities and surface tensions of liquids at elevated temperatures.

Systematic and connected accounts of this sort are always intrinsically useful, but this is particularly the case here, where the individual articles have already been published for the most part only in foreign journals.

We cannot but be grateful to Professor Jaeger and to the Baker Lectureship at Cornell for making it easy for us to become acquainted with these interesting and important researches.

ARTHUR B. LAMB

**Physikalisch-chemische Übungen.** (Manual of Physical Chemistry.) By W. A. ROTH, Professor in the Technical High School of Braunschweig. Fourth revised and enlarged edition. Leopold Voss, Leipzig, Germany, 1928. viii + 316 pp. 71 figs. 14 × 22.5 cm. Price, unbound, M. 13; bound, M. 15.

This fourth edition represents an extensive revision of this well-known manual, and is of interest as typifying the course in physical chemistry as given in the Technische Hochschule at Braunschweig. The manual is designed both for the beginners' course in which thirty obligatory exercises covering the general field are assigned, as well as for a more specialized course having an elastic program suitable as training for research candidates. The book is devoted largely to presenting the theory of the experiments and of the apparatus to be used along with concrete illustrative numerical examples.

Detailed directions for carrying out the experiments are exceedingly meager. Perhaps this is desirable. Instructive methods for evaluating graphically the errors in thermochemical experiments are set forth in considerable detail (pp. 72-75); likewise the introduction of nomographic methods deserves favorable comment, as well as the inclusion of experiments on the dielectric constant.

The treatment of electromotive force will be disappointing to most American readers. The reaction  $\text{Tl} + \text{KCNS} \rightleftharpoons \text{TiCNS} + \text{KCl}$  in aqueous solution with its uncertain and unavoidable liquid junction potential is certainly not a "hübsches Beispiel" today, particularly in discussing the Nernst Heat Theorem. The solubility of silver acetate in silver nitrate is discussed in detail in terms of the now obsolete degrees of dissociation of the salts followed by the statement (p. 159) "the small drift in solubility product becomes somewhat smaller on using activity coefficients," which makes one wonder if the "Moderne Anschauung" to which the student is referred has been grasped (*cf.* p. 157). The apparatus described for the conductivity experiments is hardly modern in character.

VICTOR K. LA MER

**A Comprehensive Treatise on Inorganic and Theoretical Chemistry. Vol. X. Sulphur and Selenium.** By J. W. Mellor, D.Sc. Longmans, Green and Company, 55 Fifth Avenue, New York, 1930. x + 958 pp. 217 figs. 25 × 16 cm. Price, \$20.00.

The present volume (Vol. X) of the Treatise represents a significant milestone in this great undertaking, for with it all the non-metals have now been covered. There remain still to be done the metals of Groups VII and VIII of the periodic system. Of these, iron in particular will require extended treatment.

This volume, like its predecessors, will be for the general reader as well as for students of inorganic chemistry an exhaustive and yet practical reference handbook.

ARTHUR B. LAMB

**Die Anwendung der Interferometrie in Wissenschaft und Technik. (Applications of Interferometry in Science and Industry.)** By E. BERL AND L. RANIS, of the Chemico-technical and Electrochemical Institute of the Technical High School of Darmstadt. Gebrüder Borntraeger, W 35 Schöneberger Ufer 12 a, Berlin, Germany, 1928. v + 52 pp. 28 figs. 16.5 × 25 cm. Price, M. 5.20.

The intent of the authors is made clear in the preface of this booklet. The increasing number of applications of the interferometer to scientific and technical investigations justifies the special consideration of procedures and principles already described in the literature as well as additional new titration methods developed by the authors. Some of the topics discussed include (a) methods of measurement by the interferometer; (b) principle and construction of interferometers and their four general topics.

- I. The gas interferometer.
  - a Innovations in construction.
  - b Calibration.
  - c Calculations.
  - d Absolute and relative calibration.
  - e Selection of gases for comparison.
- II. Possible application of the gas interferometer.
- III. Interferometer for liquids.
- IV. Field of application of the interferometer for liquids.

The special uses for these two types of interferometers described in the text are not given in detail. The reader is referred to original articles which are listed in each case. An exception to this is the application of the interferometer for liquids to various titrations. This is the special contribution of the authors and the description of this investigation constitutes one-half of the paper. The titrations include precipitation as well as neutralization reactions. Graphic representation of the data makes it possible to see at a glance the relative change of refractive index as the equivalence point of the titration is approached. From the many interest-

ing examples given it is evident that the sensitivity of the interferometer makes possible the extension of the usual methods employed in Refractometry. The authors for the most part have given an applied rather than a highly theoretical presentation of the subject. The publication should prove to be interesting reading to those interested in technical and scientific applications of instrumental analysis.

VILLIERS W. MELOCHE

**Select Methods of Metallurgical Analysis.** By WILLIAM ARCHIBALD NAISH, Ph.D. (Eng.), A.R.S.M., B.Sc., F.I.C., M. Inst. M. M., and JOHN EDWARD CLENNELL, B.Sc. (London), Assoc. Inst. M. M. Introduction by Sir H. C. Harold Carpenter, F.R.S. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1930. xii + 495 pp. 32 figs. 15.5 × 24.5 cm. Price, \$7.50.

In this book of five hundred pages a serious attempt has been made to give in concise form methods for the determination of all of the elements and analyses of most of the raw materials and products with which the metallurgical laboratory is confronted. The authors have taken up the elements alphabetically, giving selected and proved methods for their determination. In addition, methods are given for the complete analysis of ores and many metallurgical products, both ferrous and non-ferrous and including silicate analysis and fire assaying. Of course, it would not be possible within the scope of any ordinary sized book to take up in detail the complete analysis of all metallurgical materials, but the book is sufficiently complete to enable any reasonably trained metallurgical chemist to make chemical analysis of practically any metallurgical material. The book is so complete that it suffers somewhat from too great a condensation when giving analytical procedures. The chapter on "Electrometric Titration" is so condensed that it might almost as well have been left out, especially since the book does not make use of electrometric methods when describing the analytical methods used for each element. Perhaps the most outstanding omission in the book is its complete failure to include methods of gas analysis and its very sketchy two and one-half pages given to coal analysis. Neither is any mention made of water analysis.

From the point of pedagogy the chief criticism which the teacher of metallurgy will make will be directed against the almost complete absence of any discussion of the laws of physical chemistry as applied to the equilibria involved in the analytical procedures. This would be a serious matter if it were not for the fact that the teacher will have to drill the students in these matters anyhow. On the other hand, the authors are to be complimented on their thorough and uncompromising effort to give the chemical facts involved in analytical separations. There is all too great a tendency to neglect the facts and deal too much in theory in present-day pedagogy and book writing.

The most notable advance taken in this book is its up-to-date treatment of the application of spectrum analysis to the work of the metallurgical laboratory, because it is certainly true that metallurgists and metallurgical chemists must become "spectrum conscious." Since physical methods of analysis have been introduced in this chapter it would seem that the authors should have gone further and have included microscopic methods of analysis. The book is very thorough in its bibliography work, which will enable the users of it to get easily the details of procedure which the authors have been forced to omit.

This work will be frequently used in the reviewer's laboratory and will surely find a wide usefulness in the metallurgical world.

D. J. DEMOREST

**Soap Films. A Study of Molecular Individuality.** By A. S. C. LAWRENCE. Foreword by Sir William Bragg, F.R.S. G. Bell and Sons, Ltd., Portugal St., London, W. C. 2, England, 1929. xi + 141 pp. 61 figs. 14 × 22.5 cm. Price, 12s. 6d. net.

Everyone interested in the intriguing subject of soap films—and everyone who dips into the pages of this unusual little book will find he is fascinated by it—will be under a debt of gratitude to Mr. A. S. C. Lawrence for having brought together in such readable form so much material of high scientific value which is not available elsewhere.

It is only those who have had the privilege of attending in person the Discourses at the Royal Institution, who will fully appreciate the opening sentence of Sir William Bragg's Introduction: "The researches of the late Sir James Dewar on the properties of soap films are well known for their variety, beauty and importance." The unrivaled practical experience in the demonstration of the properties of soap films and the production of black bubbles accumulated there through the course of many years was supplemented by the repetition of the more important studies of other investigators. The whole is vividly described and carefully discussed and systematized by the author, who was Lecture and Research Assistant to Sir James Dewar. The co-relation of these phenomena and the attempt to link them with existing theory represents, in itself, a substantial advance in this subject and will undoubtedly lead to further rapid developments. Amongst the subjects treated are discussions of surface tension and its inadequacy to explain the phenomena of soap films, reflection and interference of light by films, constitution of soap solutions and their surfaces and the remarkable phenomena presented by black and stratified films.

JAMES W. MCBAIN