BOOK REVIEWS

Thermodynamic auf den Grundlagen der Quantentheorie, Quantenstatistik und Spektroskopie. Dritter Band. Ergebnisse in tabellarischer und graphischer Form. 1. Hälfte: Tabellen. By H. ZEISE. S. Hirzel Verlag, Schuhmachergässchen 1–3, Leipzig, Germany. 1954. xl + 311 pp. 17.5 × 24.5 cm. Price, DM 20.

Thermodynamik auf den Grundlagen der Quantentheorie, Quantenstatistik und Spektroskopie. Dritter Band. Ergebnisse in tabellarischer und graphischer Form. 2. Hälfte: Graphische Darstellungen und Literatur. B. H. ZEISE. S. Hirzel Verlag, Schuhmachergässchen 1–3, Leipzig, Germany. 1957. 299 pp. 17.5 × 24.5 cm. Price, DM 22.20.

The first of these two volumes gives values of thermodynamic functions for a wide variety of substances, mostly gases. The values are those calculated using the methods of statistical mechanics. This volume was completed after the death of Dr. Zeise by his colleague Dr. Frinz Matthes and is a continuation of two previous volumes. It consists of a brief description of the methods used in the calculation of the thermodynamic functions from statistical mechanics and molecular data and of tables of calculated values of the functions. While the substances for which values are given are too numerous to list, an idea of the material covered can be gained from the table of contents which follows:

Introduction: (1) The basical general formulas for the theoretical function values. (2) A short review. (3) The inner state of free atoms. (4) The inner state of free molecules. (5) *Ortho-para*-modification of hydrogen and other "nuclear-spin-isomers." (6) Dissociation and ionization equilibria in gases. (7) The equation of state and thermodynamical functions for gas mixtures which are produced through dissociation or ionization equilibria. (8) Relaxation.

Tables of Values: (I) Molar specific heat C_p^0. (II) Molar thermal enthalpy, $(H_T^0 - E_0^0)$. (III) Molar entropy, S_T^0. (IV) Molar free energy-function $G_T^0 - E_0^0)/T$. (V) Thermodynamic functions for some condensed substances. (VI) Gas equilibria. Appendix: Tables VII, VIII and IX. (X) Supplement. Name index and subject index.

Besides for the elementary and simple gases, values are given for organic vapors with as many as twenty carbon atoms. Values are given for condensed elements and certain solid substances (oxides, salts, etc.).

The second of the volumes contains graphs of equilibrium constants for certain gaseous reactions as a function of the temperature and a summary of the literature up to 1953 on which the data given in the previous volume are based. It was completed and edited by Hans-Jürgen Knopf after the death of Dr. Zeise.

The volumes cover data the equivalent of which has been largely published in the United States (for example the tables of the American Petroleum Institute) Even so they seem a useful, if not necessary, addition to any reasonably complete chemistry library.

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Interscience Monographs in Physics and Astronomy. Edited by R. E. MARSHAK, University of Rochester. Volume II. Radiation Effects in Solids. By G. J. DIENES, Department of Physics, Brookhaven National Laboratory, Upton, New York, and G. H. VINEYARD, Department of Physics, Brookhaven National Laboratory, Upton, New York. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. viii + 226 pp. 15.5 × 23.5 cm. Price, $6.50.

The systematic study of structural changes produced in solids by energetic radiation has proceeded rapidly since the development of nuclear reactors focused attention on the problem as one of considerable technological importance as well as of fundamental interest for the theory of solids; the literature in this field has been particularly active since the Geneva Conference of 1955 provided the occasion for publication of much wartime and postwar research hitherto classified. The present volume is one of the first treatments of the subject to appear in book form. It surveys the progress that has been made in understanding the fundamental physical processes of radiation damage, primarily those effects that arise from the displacement of atoms as opposed to ionization or purely electronic excitation. The central problem is the development of a quantitative description of the displacement processes which would permit calculation of the number and variety of lattice defects produced by a given bombarding particle—electron, nucleon, fission fragment or γ-ray photon—of given energy, together with a theory of the influence of such defects on the macroscopic properties of the solid which would permit quantitative evaluation of the radiation damage. Roughly half of the book (Chapters 2 and 3) is devoted to the basic theory of displacement production and analysis of those experiments which provide more or less direct measures of the yields and energy thresholds for atomic displacements. Theories of the production of lattice defects and of their macroscopic effects are approximate in character, subject to minor individual differences of interpretation, and the treatment here is one of fairly detailed review and summary of the alternative theoretical models rather than didactic exposition of a unique point of view. Chapter 4 deals with the effects of atomic imperfections on a wide range of physical properties: electrical and thermal conductivity, optical absorption, elastic behavior, and others. Chapter 5 treats the problem of annealing, applying the theory of diffusion of point defects to experimental observations of radiation damage recovery and release of stored energy brought about by warming samples irradiated at low temperature. The final chapter is reserved for brief descriptions of more complex or specialized effects less amenable to quantitative interpretation but of obvious interest: the drastic dimensional changes of irradiated uranium, for example, perhaps the most spectacular and impressive demonstration of radiation damage. Several chemical effects more or less peculiar to solids are also discussed here: decomposition of inorganic salts, manifested in the crystalline materials by coloration, density changes, etc.; radiation-induced polymerization, in crystalline monomers such as acrylamide; and radiation effects on reaction rates, the latter including one instance, the accelerated oxidation of neutron-irradiated graphite, in which the effect is distinctively a result of atomic displacement rather than ionization.

The bibliographical documentation throughout the book is both extensive in scope and generous in the information provided (including titles of papers in full). While the authors' viewpoint is that of the solid-state physicist, and the main emphasis on the microscopic processes of radiation damage, the experimental background is presented in sufficient detail, particularly in Chapter 4, to provide for the non-specialist reader a well-rounded picture of the nature and variety of the macroscopic effects and a feeling for the magnitudes involved.

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Pure and Applied Physics. Volume 1. Electron Impact Phenomena and the Properties of Gaseous Ions. F. H. FIELD AND J. L. FRANKLIN, Refining Research and Development Division, Humble Oil and Refining Company, Baytown, Texas. H. S. W. MASSEY, Consulting Editor, University College, London, England. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1957. ix + 349 pp. 16 × 23.5 cm. Price, $8.50.

The authors have "tabulated and where possible interpreted all available energetic data pertaining to electron impact phenomena." This is certainly a useful contribu-