X = *p*-chlorophenyl), m.p. > 320°; λ_{max}^{EtOH} 228, 265 mμ (ε = 8,330, 4,730); λ_{max}^{Nujol} 2.92, 3.10, 6.05, 6.23, 6.47, 6.60 μ; calcd. for $C_7H_6BClN_2O_2$ (196.42): Cl, 18.05; N, 14.26; found: Cl, 18.48; N, 14.27.

The cyclization of *o*-aminobenzaloxime with benzeneboronic acid furnished the deep yellow compound VI, m.p. 249–251°; λ_{max}^{EtOH} 224, 337 mμ (ε = 40,100, 9,750); λ_{max}^{Nujol} 2.95, 6.13, 6.20, 6.40, 6.95 μ; calcd. for $C_{13}H_{11}BN_2O$ (221.05): B, 4.90; N, 12.68; found: B, 4.88; N, 12.42.

Finally, *o*-aminobenzenesulfonamides and arylene- or aralkyleneboronic acids afforded compounds of type VII. Thus, 5-amino-α,α,α-trifluoro-2,4-toluene-disulfonamide and 2-phenylethaneboronic acid gave VII (R = $C_6H_5CH_2CH_2$, Y = H_2NSO_2), m.p. 210–212°; λ_{max}^{Nujol} 3.03, 6.20, 6.40, 6.66, 6.96 μ; calcd. for $C_{15}H_{15}BF_3N_3O_4S_2$ (433.23): B, 2.50; N, 9.70; found: B, 3.09; N, 9.48, which had diuretic activity of the order of that of chlorothiazide.

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BOOK REVIEWS

Die Hochmolekularen Organischen Verbindungen. Kautschuk und Cellulose. By HERMANN STAUDINGER, Dr. Phil., O. Professor, Direktor des Chemischen Laboratoriums der Universität, Freiburg *I*. Br. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1960. xv + 540 pp. 17 × 25 cm. Price, DM 59.—.

This book represents a reprint of the original publication (1932) which at that time summarized the work of Staudinger and his groups in the then very new and controversial field of high polymers.

The review of the original book by W. H. Carothers (*J. Am. Chem. Soc.*, 54, 4469 (1932)) reflects the wealth of new ideas and fields of research which were just being discovered and indicates the problems and difficulties encountered by the pioneers in this area.

The present reprint will allow a larger number of polymer chemists not only to become acquainted with a large part of the early history of polymer research; it probably will surprise them by its scope, and still may be a source of suggestions for future investigations.

The book is well printed and gives an index and a bibliography of Staudinger's papers up to 1932.

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Thermoelectricity: Science and Engineering. By ROBERT R. HEIKES and ROLAND W. URE, Jr., Westinghouse Research Laboratories, Pittsburgh, Pennsylvania. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1961. xi + 569 pp. 16 × 23 cm. Price, $18.50.

This book contains a valuable store of information prepared by a group of sixteen experts including the two principal authors, Heikes and Ure. It covers the subject of thermoelectricity, one of several methods of direct energy conversion being vigorously pursued at the present time. Other schemes are thermionics, fuel cells and magneto hydrodynamics. The scientific and engineering aspects of the subject are well covered, about equal space being devoted to the topics: (1) physics and chemistry of thermoelectric materials, (2) the design of materials, and (3) the technology of thermoelectric devices.

The book begins at an easy level with a short introductory chapter on the elementary effects of thermoelectricity. These include the reversible phenomena: Seebeck, Peltier and Thompson effects; and the irreversible phenomena: joule heating and thermal conduction. The discussions of these effects and the calculation of the device efficiency constitutes a pleasing introduction. From a historical standpoint, the references to Kelvin's original treatment (1854) in Chapter 2 and the narration of the vindication of Kelvin's theory following Onsager's development of irreversible thermodynamics are interesting sidelights.

Chapter 3 treats the electronic properties of semi-conduction and semi-metals. It begins with a clear description of the band theory of solids, and treats the topics of density of energy states and the mass factor of current carriers. In turn, the subjects of defect electron levels, Fermi–Dirac distribution function, relaxation time and mobility of carriers are discussed. The Peltier and the Seebeck effects are then discussed from the standpoint of band theory and the reader begins to sense the desirable properties of materials for thermoelectricity. Other subjects discussed are transport properties and electron scattering mechanisms. The treatment of the latter subject is especially illuminating, dealing as it does with all the major classes of electron scattering.

In Chapter 4, transport phenomena for narrow-band semiconductors, ionic crystals and liquids are discussed from the band structure model. In spite of some lack of detailed knowledge about the motion of the charge carriers in these cases, the theory is adequate for the treatment of thermoelectric phenomena.

There is an interesting chapter on thermal conduction in thermoelectric materials, this being one of the main considerations in the development of thermoelectric devices. An excellent description is given of the mechanisms by which heat transport can take place and the factors which influence it.

An entire chapter is devoted to the effects of high energy radiation on thermoelectric materials. This is pertinent because of the prospects of using thermoelectric generators in combination with nuclear reactors. The mechanisms by which changes are produced by radiation are discussed: transmutation, ionization by electrons, fission of atoms, production of thermal or displacement "spikes," creation of interstitial atoms and vacancies, and ordering or disordering of atoms. Experimental data are included to illustrate the effects of radiation.

Because of the importance of diffusion processes in thermoelectricity and in the preparation of materials for this purpose, a chapter is devoted to the theory of diffusion and experimental results of diffusion for various semiconducting materials. Atomic migration resulting from thermal diffusion and ionic migration resulting from electric field gradients are also included.