

Book Reviews

Works intended for notice in this column should be sent direct to the Editor (A.J.C. Wilson, Department of Physics, The University, Birmingham 15, England). As far as practicable books will be reviewed in a country different from that of publication.

Semiconductors. Von D. A. WRIGHT. S. 134 mit 41 Abb. London: Methuen & Co. Ltd., 1966. Preis 12s 6d.

Diese stark überarbeitete und auf den jetzigen Stand gebrachte Neuauflage eines schon 1950 erschienenen Büchleins kann nach wie vor als elementare Einführung in die Physik der Halbleiter vor allem auch Nichtphysikern empfohlen werden. Das Buch enthält weit mehr als der Titel erwarten lässt. Nicht nur die Elektrizitätsleitung in homogenen Halbleitern und in *pn*-Übergängen sowie ihre Anwendungen werden behandelt, sondern auch Photoleitung, Photospannungen, Glühemission, Sekundär-Elektronenemission und Photoemission. Mancher Leser wird vielleicht bedauern, dass in dem vom Autor gesteckten Rahmen dieses Buches viele quantitative Beziehungen ohne Herleitung nur angegeben werden können. Wer sich auch darüber genauer informieren möchte, findet aber reichliche Hinweise auf ausführliche Monographien über alle in dem Buch behandelten Gebiete der Halbleiterphysik.

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The Barker index of crystals. A method for the identification of crystalline substances. Vol. III. Crystals of the anorthic system. By M. W. PORTER and L. W. CODD. Part 1: Introduction and Tables, pp. vi + 144 + unnumbered pages. Part 2: Crystal Descriptions A. 1 to A. 831. Atlas of Configurations, pp. viii + unnumbered pages. Published for the Barker Index Committee. Cambridge: Heffer, 1964. Price £12.

Le troisième volume de l'Index de Barker est consacré aux cristaux anorthiques; il en contient environ 800.

Hommage doit être rendu à M. H. Hey (British Museum) et à une équipe de chercheurs dirigés par Prof. Terpstra (Groningen) pour l'établissement d'une méthode et de règles auxiliaires permettant d'éliminer toute ambiguïté dans la détermination correcte du 'Barker setting'.

Dans la recherche des indices les plus simples, la comparaison des angles observés et des angles calculés est évitée autant que possible; le critère du choix des plans paramétriques est fondé sur des relations topologiques et projectives au moyen d'un atlas de zonogrammes et de tables de configurations. Le calcul des angles interfaciaux (et le contrôle des données antérieures) déduit du 'Barker Setting' a été conduit par l'emploi de la méthode matricielle de W. L. Bond et d'un ordinateur.

Comme dans le volume II, l'exposé de la méthode proposée, des règles d'application et des exemples et exercices est développée en une cinquantaine de pages.

Les tables sont successivement: Table des tangentes multiples. Classification des angles. Indices de réfraction. Points de fusion. Matrices de Bond. Table de configura-

tions. Liste des composés en suivant l'ordre de Groth. Description des cristaux. Atlas de configurations.

Les cristallographes sauront gré aux éditeurs de cet ouvrage considérable de leur fournir des moyens éprouvés pour l'identification des cristaux anorthiques.

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Growth of crystals. Volume 4. Edited by A. V. SHUBNIKOV and N. N. SHEFTAL'. Pp. viii + 206. New York: Consultants Bureau, 1966. Price \$ 20.00.

When translations of Russian scientific texts are read they are generally found to fall into three groups. The first involves accurate translation of new material of great current scientific interest, the second is concerned with the publication of work by a particular Institute in a very esoteric field, whilst the third is the retranslation into English of a Russian translation of earlier work in English. Fortunately, the number of newly published texts falling into this last group has considerably decreased in recent years and, whilst this process is to be deplored, it does serve to remind the informed reader of the ease with which changes of emphasis, and often error, can creep into established scientific argument on translation by individuals who are primarily translators rather than practising scientists.

Growth of Crystals (Vol. 4) undoubtedly comes into group one. There has been considerable interest in crystal growth and with the increasing technological application of particular materials, very many 'materials laboratories' have been set up in recent years in Western Europe and North America to study crystal growth and device fabrication. An authoritative digest of recent Russian work is thus doubly welcome. However, these translations of individual research papers, although presenting information clearly, are often stilted, a dozen or more consecutive sentences beginning: 'The . . . '.

This volume is the fourth of a series on crystal growth under the same general editors. They appear as a direct result of a very real effort in Russia to disseminate specialist information as widely as possible in order to maximize scientific and technological 'fall-out'. Volume 1 (published 1959) reports the proceedings of the First Conference on Crystal Growth (USSR) which took place in 1956 and represents 43 papers involving wide considerations from nucleation in supercooled melts, solute redistribution, eutectic solidification, to even the fracture of germanium and silicon crystals. One paper deals with the growth of 'negative crystals' (or voids). Volume 2 (published 1959) reports a rather less-mixed bag of 25 papers, including amongst contributions on *The Crystallization of Alum from Water in an Ultrasonic Field* and *A New Type of Pistonless Compressor for Producing Very High Gas Pressures*, some excellent descriptions of the Verneuil process and of the defects introduced during crystal growth. Volume 3 (published 1962) reports part of the Second Conference on

Crystal Growth, USSR, 1959, contains 79 papers, deals very comprehensively with theoretical and experimental studies of crystal growth and properties, but still finds space to report work on foil preparation for electron microscopy and grain growth in tin. Volume 4 contains work originally published in Moscow in 1964 but since 'expanded and updated by the editors'. The Foreword states that the volume 'contains 42 papers, of which ten deal with experimental studies on growth (in part, nucleation) of crystals and monocrystalline films, three with liquid crystals, twelve with the production of monocrystals of various materials, five with the search for ways of growing new crystals and four with reviews of some important aspects of crystal growth, crystal growing and methodical surveys for ferroelectric crystals. In addition there are two papers on crystal symmetry'.

Many of the papers might best be described as technical notes, briefly (often too briefly) reporting apparatus or experimental observations. Others stretch to ten or more pages, inviting drastic pruning before publication in a Western journal. With this imbalance, it is difficult to assess the rôle of the Editors of the series. Also, when reading through these papers, it is interesting to compare the content and treatment with the range of references cited. Some attention is given to vapour deposition, flux growth, propagation of defects from seed crystals, and growth by sublimation at very high temperatures. A most comprehensive paper on *Production of Monocrystals of Gallium Arsenide* is included, together with a similarly good dissertation on *Oriented Overgrowth of Crystalline Materials*. The paper on *The Definition of Symmetry* and the one on *The Physical Meaning of Symmetry* should be of particular interest to crystallographers. The whole is leavened by an article on *Frost Patterns on Windows* in which attention is drawn to the wealth of information that can be gained from simple direct observation of the world around.

In conclusion, this series forms a useful and interesting addition to the collection of English language texts on crystal growth and allied phenomena.

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Crystal symmetry and physical properties. By S. BHAGAVANTAM. Pp. x+230 with 14 figs. London and New York: Academic Press 1966. Price 57s. 6d.

This book of eighteen chapters gives the essential analysis in concise, but clear, form of the physical properties of single crystals in so far as these are related to crystal symmetry. In this book as well as the earlier work *Theory of Groups and its Application to Physical Problems* written with T. Venkatarayudu (1948), the author explains the use of group theory in determining the number of possible physical constants which can be associated with any physical property in a crystal of any symmetry. The new developments associated with magnetic space groups are considered in detail.

The first half of the book is taken up with concise statements on linear transformations, tensors, matrices, groups and crystallographic groups. One of the difficulties which the reader may experience in reading this part is the inadequacy of the index. Some references to books and publications are given in footnotes but there is neither an index of authors nor a bibliography.

The principles expounded in the early chapters are later applied to all the physical properties of crystals including even the most unusual ones. The tables of physical constants associated with particular symmetries, including the magnetic symmetries, are most valuable. The section on the higher order galvanomagnetic and thermomagnetic effects in single crystals is likely to prove especially valuable to all who study these properties in semiconductors.

The book is a little too condensed for student use because it assumes a considerable knowledge of crystallographic theory and does not indicate where more information on this may be found. For the research worker the book is a demonstration of the power of group theory and a justification of the use of this method. The tabular matter, relating various physical properties to crystal symmetries, is by itself a reason why all those concerned with the physical properties of crystals should have access to this work.

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