

Book Reviews

Works intended for notice in this column should be sent direct to the Editor (P. P. Ewald, Polytechnic Institute of Brooklyn, 99 Livingston Street, Brooklyn 2, N.Y., U.S.A.). As far as practicable books will be reviewed in a country different from that of publication.

X-ray Diffraction Patterns of Lead Compounds. Pp. 81 with 9 figs. Chester: Shell Petroleum. 1954. Obtainable free of charge from Thornton Research Centre, Shell Petroleum Company Ltd, P. O. Box 1, Chester, England.

The identification of a substance by means of its X-ray diffraction powder pattern is a straight-forward procedure provided a standard pattern corresponding to the unknown can be found in an index of patterns. Failing this, one turns to crystallographic calculations or a literature survey, often followed by chemical analysis and in turn by chemical synthesis, all in an effort to identify the unknown pattern. To avoid repetition of this time-consuming search, many firms have set up data files from the detailed examinations they have made of compounds of particular interest.

The problem then arises, should one publish these data which would be helpful to others working in similar lines? Several companies have answered this question emphatically in the affirmative and have gone to considerable expense to present their collection of data in a manner which would be most helpful. The notable example of this was the publication in 1938 by the Dow Chemical Company of Midland, Michigan, of the powder data for one-thousand compounds. This became the foundation of the now widely used method for powder-pattern identification. This publication, together with other data, is consolidated in the index of the American Society for Testing Materials which is universally consulted.

The book under review presents the powder diffraction data of forty-two compounds of lead, many of which have been identified in deposits formed in internal combustion engines using leaded fuels. Data had been previously published on less than half of these compounds. The care evident in the presentation of the data suggests that new and improved standards are now available for these compounds as well as those published for the first time.

We trust that in the publication of this book, by the Shell Petroleum Company Limited, other companies will find inspiration to prepare for publication data from their files which may be released to the benefit of all.

*Canadian Industries (1954) Limited,
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Précis de Minéralogie. By P. LAPADU-HARGUES. Pp. 310 with 69 figs. Paris: Masson. 1954. Price bound 2200 fr.; paper cover 1700 fr.

The express intention of the author was to provide 'a mineralogy for those who are not mineralogists professionally'—in particular for students of allied sciences, such as physics and chemistry. There is nothing novel in the approach, however, and the form common to many mineralogical texts is followed. About one-third is devoted to general principles of morphological crystallography,

physical properties and chemical tests, and the remainder to descriptions of minerals. These are grouped as non-silicates, silicates, and radio-active minerals, the classification being chemico-structural.

In spite of the attention called, both in the preface and conclusion, to the remarkable advance of mineralogy by the impact of structural physics and the frequent comparisons made between mineral structures, no introduction to the principal types of mineral structures is given. With the exception of SiO₄ groupings and linkages, no structures are described or figured, and even the basic structural feature of oxygen close-packing, common to so many minerals, goes without mention.

It is surprising that, having admitted the logical, universal and rational character of the Miller system of crystal indexing, the author adopts the Levy system throughout, and every crystal drawing is indexed with Levy symbols only. Mistakes of fact abound and begin with the description of the cover design as a twin crystal. Misprints too are unnecessarily frequent. Some of the crystal drawings glaringly disobey the rules of perspective and symmetry.

With these shortcomings it is difficult to commend the book, although it is well printed and bound.

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Der Ultraschall und seine Anwendungen in Wissenschaft und Technik. By L. BERGMANN. Pp. xvi+1114 with 609 figs. Stuttgart: Hirzel. 6th ed. 1954. Price DM. 72.

The fifth (1949) edition of this standard work on ultrasonics was called *the* book of ultrasonics by the reviewer in this journal, J. Weigle (*Acta Cryst.* (1952), 5, 298). The sixth edition deserves the same praise: in it the same standard of completeness and alertness is maintained, in spite of a vastly augmented output of research papers in this field. The numbers of pages, figures and references have been increased from 748, 460 and 2212 to 1114, 609 and 3550, respectively. This indicates only partly the great amount of work spent by the author on the new edition, since most chapters have been entirely overhauled. The barium titanate and the ammonium dihydrogenphosphate ultrasonic generators are given a full discussion. The 260 pages on technical applications of ultrasonics form stimulating reading.

It is sometimes not sufficiently realized what a magnificent tool ultrasonics provide for the determination of the elastic constants of crystals by means of the diffraction pattern obtained when light traverses the ultrasonic stress field in an oscillating crystal. This method was inaugurated experimentally by Schaefer and Bergmann in 1934 and the theory was formulated by Fues and Ludloff in 1935 and recast by Nath and Mueller a little later. In the case of barytes the discussion of only three diffraction photographs yields the nine elastic

constants in substantial agreement with the values W. Voigt obtained laboriously from about 15,000 single measurements on a multitude of oriented sections of many individual crystals. The theory of the effect is a beautiful combination of crystal dynamics and diffraction; it is closely related to L. Brillouin's theory of thermal scattering of X-rays, and it also is reminiscent of the dynamical theory of X-ray diffraction, especially in operating with surfaces in Fourier space for the study of simultaneous diffraction of light by several systems of elastic waves in the crystal. The essential ideas and results of the theory are explained in the book, but details have to be read in the original papers.

Bergmann's treatment is biased towards the experimental side. While the gist of the explanations of the phenomena is well given, the presentation is often not mathematical enough in detail to admit a quantitative understanding. Unfortunately, this holds also for the (new) Chapter 1 on the physics of the ultrasonic field; this should be thoroughly overhauled for the next edition so as to make it a fool-proof introduction worthy of the high standard of the book.

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Structure Reports for 1945-1946. Edited by A. J. C. WILSON, C. S. BARRETT, J. M. BIJVOET and J. M. ROBERTSON. Pp. viii+325 with many figs. Published for the International Union of Crystallography. Utrecht: N.V. A. Oosthoek's Uitgevers Mij. 1953. Price 45 Dutch florins.

Volume 10 of *Structure Reports* covers the years 1945-6 and its late appearance is in accord with the scheme for progressively closing the gap with the old *Strukturbericht*, working at the same time backward and forwards. There is little to be said about the actual presentation of the material that has not already been said about Volumes 11 and 12 (*Acta Cryst.* (1952), 5, 299; (1953), 6, 671). The standard of coverage and the clarity of description has been well maintained. The main criticism lies in the very difficult problem of order and ease of reference.

As to the first, it is probable that little can be done in the absence of a really systematic crystal chemistry to improve on the frankly arbitrary method employed: purely alphabetical in the metal section, conventional chemical in the rest. This results, however, in separating, often widely, substances of intrinsically similar structures, as for instance Al_2Br_6 on p. 104 and KFeS_2 on p. 124. It further ensures that these volumes cannot be read, but must be treated as for reference only. Here the indexes, particularly the formula index, have come in for some criticism. It is not difficult to use, but the chemists have a strong case for the use of a scheme with which they are already familiar, for after all the users of the index will largely be chemists. Crystallographers will find what they want by looking through the sections. I may say that I have, myself, used this and other volumes of the reports for more than one systematic search, and though I have been a little irritated by the order have always succeeded in finding what I wanted.

The value of the reports will only fully be realized when the whole series is completed and the gap of the war years is filled up. Then it should form an essential basis of systematic crystal chemistry. The structures available in one year do not form a unity. Two years are covered by Volume 10 but the years 1945-6 were necessarily poor years, largely presenting structure investigations undertaken during or even before the war. The fact that much time has elapsed since then has ensured that the important results have already become familiar to crystallographers and little would be gained by discussing them again here. The period was a transitional one just entering into the modern phase of three-dimensional refined analysis, as exemplified by the classical exact determination of geranylamine hydrochloride (p. 218) and the three-dimensional analysis of camphor and cholesteryl iodide (p. 288). Among inorganic compounds the most interesting were the multi-metal complexes of Al_2Br_6 (p. 104) and of Mo_6Cl_8 (p. 132), while in the metallic section we find an extensive study of NiAs-type structures (p. 26) and of high-melting-point carbides (p. 38).

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Books Received

The undermentioned works have been received by the Editors. Mention here does not preclude review at a later date.

The Theory of Cohesion. By M. A. JASWON. Pp. viii+245 with 42 figs. London: Pergamon Press. 1954. Price 37s.6d.

Structure Reports for 1950. Edited by A. J. C. WILSON, N. C. BAENZIGER, J. M. BIJVOET and J. M. ROBERTSON. Pp. 643 with many figs. Published for the International Union of Crystallography. Utrecht: N.V. A. Oosthoek's Uitgevers Mij. 1954. Price 80 Dutch florins.

Einige Fragen zur Theorie der Lumineszenz der Kristalle. By E. I. ADIROWITSCH. (Translated from the Russian by H. Vogel.) Pp. 298 with 123 figs. Berlin: Akademie-Verlag. 1953. Price DM. 19.

Untersuchungen über die Elektronentheorie der Kristalle. By S. I. PEKAR. (Translated from the Russian by H. Vogel.) Pp. viii+184. Berlin: Akademie-Verlag. 1954.