

BOOK REVIEWS

PHASE DIAGRAMS FOR CERAMISTS, by ERNEST M. LEVIN, HOWARD F. MCMURDIE, AND F. P. HALL. The American Ceramic Society, Columbus, Ohio, 1956. 286 pages, 811 figures. Price \$10.00.

This is the latest in a series of five compilations of phase diagrams which, starting in 1933, have been published under the auspices of the American Ceramic Society. The last previous such effort, that of Hall and Insley in 1947 (with Supplement by McMurdie and Hall in 1949), is hereby brought up to date.

The present revision and expansion embodies a number of improvements over the previous edition. The general discussion has been enlarged from the eighteen pages of the 1947 version to thirty-four pages. The glossary of terms has been greatly extended and rearranged in alphabetical order. A useful addition is an annotated bibliography of about sixty selected titles covering the more important aspects of phase diagrams. An author index and a system index are provided as keys to the upwards of 800 diagrams included in the compilation. There is one invaluable source of phase equilibrium data which does not appear in the bibliography. This is the chapter entitled "Heterogeneous Equilibria and Phase Diagrams," which has been a yearly feature of the Annual Review of Physical Chemistry since 1950.

Understandably, the authors considered it necessary to exclude some of the countless systems that have been investigated. This reviewer feels that exceptions might well have been made in the cases of such systems as: the carbon system (Goranson, *Scient. Monthly*, **51**, 524-535, 1940); recent additions to the $\text{Na}_2\text{O}-\text{CaO}-\text{SiO}_2$ diagram (Segnit, *Am. J. Sci.*, **251**, 586-601, 1953); the $\text{Li}_2\text{O}-\text{BaO}-\text{SiO}_2$ system (Dietzel, Wickert, and Koppen, *Glastechnische Ber.*, **27**, 147-151, 1954); the system $\text{MgO}-\text{Al}_2\text{O}_3-\text{SiO}_2-\text{ZrO}_2$ (Herold and Smothers, *J. Am. Ceram. Soc.*, **37**, 351-353, 1954); the systems $\text{CaO}-\text{MgO}-\text{Fe}_2\text{O}_3$, $\text{Mg}_2\text{SiO}_4-\text{MgO}-\text{Fe}_2\text{O}_3$, $\text{Ca}_2\text{SiO}_4-\text{MgO}-\text{MgO}-\text{Al}_2\text{O}_3$, and $4\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot \text{Fe}_2\text{O}_3-\text{MgO}-\text{MgO} \cdot \text{Al}_2\text{O}_3$ (Rait, *Basic Refractories*, Interscience Publishers, 1950); six different melilite solid solution systems (Nurse and Midgley, *J. Iron and Steel Inst.*, **174**, 121-131, 1953); the system $\text{Na}_2\text{O}-\text{V}_2\text{O}_5$ (Canneri, *Gaz. Chim. Ital.*, **58**, 6-25, 1928); the system $\text{CaO}-\text{V}_2\text{O}_5$ (Morozov, *Metallurgie*, **13**, 21-28, 1938); and the system $\text{CaSiO}_3-\text{Ca}_2\text{Al}_2\text{SiO}_7-\text{NaAlSi}_3\text{O}_8$ (Juan, *J. Geol.*, **58**, 1-15, 1950).

In view of the inclusion of constant-percentage planes across certain quaternary systems (Figs. 458, 460, 483, 514, 515, 539, 540, and 541), one wonders at the exclusion of similar cross sections of the equally important $\text{CaO}-\text{MgO}-\text{Al}_2\text{O}_3-\text{SiO}_2$ system (Osborn, DeVries, Gee and Kraner, *J. Metals*, **6**, 3-15, 1954; Prince, *J. Am. Ceram. Soc.*, **37**, 402-408, 1954). Retention of the numerous isofract diagrams, in the face of elimination of variation diagrams for optical properties of crystalline phases, is doubtless a concession to the needs of the glass technologist. The compilation reflects the rapidly expanding interest in hydrothermal systems, notably in those systems of most vital importance to the petrologist. A future similar increase in emphasis on high-pressure systems, both anhydrous and hydrous, is anticipated.

The compilers state that an attempt was made to eliminate outdated diagrams. In the opinion of this reviewer the following further eliminations could be justified. For the system $\text{BeO}-\text{Al}_2\text{O}_3$, Fig. 34 should be discarded. In the $\text{CaO}-\text{SiO}_2$ system Fig. 50 unnecessarily duplicates a portion of Fig. 49, and in the system $\text{Ti}-\text{TiO}_2$, Fig. 139 likewise duplicates a portion of Fig. 138. For the system $\text{CaO}-\text{TiO}_2$, Figs. 51 and 53 appear unnecessary. Of the three diagrams (Figs. 84, 85, and 86) for the system $\text{MgO}-\text{TiO}_2$, only Fig. 86 seems reliable. Figs. 119 and 129, for the systems $\text{Al}_2\text{O}_3-\text{TiO}_2$ and $\text{SiO}_2-\text{TiO}_2$ respectively, might well be

rejected as outdated. Two diagrams of the system $2\text{CaO} \cdot \text{SiO}_2$ - $3\text{CaO} \cdot \text{P}_2\text{O}_5$ - SiO_2 , Figs. 591 and 592 are virtually identical. For the system $3\text{CaO} \cdot \text{P}_2\text{O}_5$ - SiO_2 , Fig. 596 seems to be preferred over Fig. 594. In the light of recent data (Figs. 142 and 143) for the system TiO_2 - ZrO_2 , Figs. 140 and 141 should almost certainly be rejected as untenable.

Admittedly, it was not the intent of the authors to evaluate the accuracy of any diagrams. However, in the course of this review some irregularities were noted which seem to merit at least passing comment. The diagram for the FeO - Al_2O_3 system (Fig. 73) shows a theoretically impossible rendition of the intersection of the corundum and hercynite liquidus curves. Fig. 88 for the system MgO - ZrO_2 is obviously in error, since it reverses the known temperature ranges of monoclinic and cubic zirconia. The diagrams for the systems BeO - MgO - Al_2O_3 (Fig. 255), BeO - Al_2O_3 - ThO_2 (Fig. 258), and BeO - Al_2O_3 - ZrO_2 (Fig. 260) do not incorporate the latest data on the system BeO - Al_2O_3 (Fig. 33). Diagrams for planes through the system CaO - MgO -(Al, Cr) $_2\text{O}_3$ - SiO_2 (Figs. 539, 540, and 541) are unorthodox in assigning two phases to each primary field. In view of the probable inaccuracy of Fig. 140, the diagram for the system ZrO_2 - TiO_2 - SiO_2 (Fig. 415) is questionable.

It was the policy of the authors to reproduce the phase diagrams essentially as they appeared in the original references cited beneath the diagrams. This has understandably resulted in wide deviation from uniformity in the presentation of details of the various diagrams. The reviewer would like to suggest that, for future editions of the compilation, the authors seriously consider a departure from this rigid policy. For well established binary diagrams, it should be a simple matter to insert the percentage compositions and the temperatures of eutectic and peritectic points, and the percentage compositions and the melting and inversion temperatures of end-members and intermediate compounds. The more important of the ternary diagrams might be accorded the treatment given to the Na_2O - CaO - SiO_2 diagram (Fig. 206). Such innovations would greatly increase the worth and convenience of the compilation.

This review has aimed at a critical appraisal with the dual purpose of providing some assistance to the prospective user of the book, and of stimulating the compilers to further improvement of an already outstanding piece of work. The authors and the American Ceramic Society are to be highly commended for this invaluable contribution to the ceramic literature. Like its predecessors, this latest edition is certain to prove an indispensable reference-work, not only for the ceramists for whom it was primarily intended, but also for mineralogists, petrologists, and all those concerned with nonmetallic mineral technology.

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MY HOBBY IS COLLECTING ROCKS AND MINERALS, by DAVID E. JENSEN, 120 pages; Hart Book Company, Inc., New York (1955). Price, \$2.95.

Among the duties of the professional mineralogist is advice and counsel to youngsters whose eyes have become opened to the fascination of minerals, and this frequently involves suggesting a book which will contain the answers to most questions an intelligent beginner is likely to ask, and yet not be too technical. The book under review fulfills these conditions admirably. Divided into 20 chapters it includes not merely descriptions of some 60 minerals, but also simple determinative tables, the classification of minerals and rocks, where to find rocks and minerals, collecting equipment, how to display and catalogue a collection, fun with minerals and blowpipe experiments, rock and mineral clubs, etc. The index has about 400 headings, each with an average of 2 or 3 references to the text. The book is beautifully illustrated, well printed on good paper, and strongly bound in cloth.

Mr. Jensen is Director of Geology of Ward's Natural Science Establishment, Rochester, New York, and in preparing this book he has notably continued the outstanding services

of the Establishment to American mineralogy. It is safe to say that the first steps of many boys and girls to a future career in mineralogy and geology will be guided by this book.

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STRUCTURE REPORTS FOR 1942-1944. Vol. 9. General Editor A. J. C. WILSON; Section Editors: N. C. BAENZIGER (Metals), L. M. BIJVOET (Inorganic Compounds), J. MONTEATH ROBERTSON (Organic Compounds). Published for the International Union of Crystallography. N. V. A. Oosthoek's Uitgevers Mij, Utrecht, Netherlands. viii+448 pp. (1955). Price 65.—Dutch florins, postpaid. Alternative: Polycrystal Book Service, 84 Livingston St., Brooklyn 1, N. Y. \$17.00.

Those who have already learned the value of the previous volumes of *Structure Reports* will welcome this latest volume. Those who are not familiar with this undertaking should know that the gap between the last volume of the old *Strukturbericht* (no. 7) and the new series of *Structure Reports* now lacks only Vol. 8 of being completely filled. This has been a long and tedious job for the editors and their associates, but they are performing a very valuable service.

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NEW HAMPSHIRE MINES AND MINERAL LOCATIONS by PHILIP MORRILL. Reproduced from typewritten manuscript, 64 pages, 16 maps (parts of U. S. Geol. Survey topographic sheets). For sale by Dillingham Natural History Museum, Naples Maine, at \$1.25. (1956 (?)).

This is a compendium of mineral localities in New Hampshire with listings of the various occurrences and the mineral species that have been found there. The pamphlets will be of considerable interest to mineral collectors, even though many of the minerals listed for some deposits have not been found there for many years. The localities are not evaluated in any way as present sources. The most valuable information is perhaps the pinpointing of many localities on maps in the rear.

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DIE BERGWIRTSCHAFT DER ERDE, by FERDINAND FRIEDENSBURG. 5th ed. 562 pp.+xvi. 49 figures. Ferdinand Enke Verlag, Hasenbergsteige 3 (14a), Stuttgart-W, Germany. 1956. DM 69.

Every attempt has been made, in this the fifth edition of this well known reference work, to incorporate up-to-date information on the mining industry of the world. As the subtitle indicates the book deals with the "ore deposits, mining industry, and mineral supplies of individual countries." A short general statement precedes the data for individual countries, which are presented alphabetically, "Aden to Vereinigte Staaten von Amerika"—154 entries, several embracing more than one country or geographic unit. The illustrations are sketch maps showing the location of ore deposits by means of appropriate symbols. Nearly every entry is accompanied by a table that presents data on mineral production, commonly through 1954. For each country a general statement on its mineral economy is followed by information on its mineral fuels, major metallic ores, rare metals, other metals, salts, and other minerals. The section on Germany is, of course, in notably greater detail than are those of other countries. One valuable feature is a attempt, even though necessarily much generalized, to evaluate the potential of many of the ore deposits or mineral resources.

Another is the inclusion of summaries on the political significance of the mineral industries and their functions in the economies of the countries. Numerous references close each section. A group of tables detailing production of the various individual metals and non-metallic substances (35 pages), usually for each year from 1945-1954 and broken down by countries, forms the concluding section of the book.

This is an exceedingly valuable work of reference to which all economic geologists should have ready access.

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GLANS EN GLOED UIT DONKERE DIEPTEN. by B. MIDDERIGH-BOKHORST (Glitter and Glow from dark depths.) 27×22 cm.; pp. 83, cardboard covers. The Hague (Holland), NILLMY, n.d. (1955).

Having learned of the success and interest shown in "Rockhound" clubs among teenagers in the U.S.A., the author, an accomplished artist, has produced a stimulating book for similar clubs in the Netherlands. Since the country has practically no rock outcrops, she confined herself to the description, illustration and identification of precious and semi-precious stones. Their characteristics are introduced through informal conversations between an elderly jeweller and teen-age boys and girls, in the course of which many interesting anecdotes and stories about famous gems are told. An outstanding feature is the collection of illustrations accompanying the text. This comprises reproductions in colors of some three dozen mineral species and varieties of natural and cut specimens after original paintings by the author. Many of them are strikingly beautiful. It is all the more remarkable that this excellent book sells for only fl. 2.80 (=80¢ U.S.), the proceeds of which are donated entirely to an organization that cares for physically handicapped children.

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SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS
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Dr. W. M. Murray,
Secretary-Treasurer,
Society for Experimental Stress Analysis
Post Office Box 168,
Cambridge 39, Massachusetts
