# BOOK REVIEWS

THERMOCHEMICAL METHODS IN SILICATE INVESTIGATIONS, By Wilhelm Eitel. x+132 pp., 63 figures. Rutgers University Press, New Brunswick, New Jersey. $4.75, 1952.

This little book, dedicated to the memory of Walter P. White, presents a meticulously documented review of the literature on methods and principles for thermochemical studies of silicates and related materials. The book evidently is an outgrowth of the author's chapter on "Thermochemistry of Silicates" in his extensive treatise, *Physikalische Chemie der Silikate* (Leipzig, 1941). The author explains in the preface that "many of the special methods described have their origin in European laboratories, but an attempt has been made to combine them with the methods of American investigators, especially Drs. Kelley and White."

The subject matter covered is evident from the chapter titles: Introduction, Heats of formation and reaction, Calorimeters for determination of heats of reaction, Thermochemical principles for the problem of reaction affinities, Experimental methods for determining reaction affinities, Examples for the calculation of free energy changes and affinities, and Possibility of anomalies at low temperatures; statistical meaning of entropy. There are two appendixes: one is on the evaluation of the results of water equivalent and heat of solution determinations; the other is on numerical data taken mainly from Dr. Kelley's publications and arranged in four tables—Heats of Formation, Data for Changes of State, Heat Capacity Equations, and Entropies. There is both a subject index and an index to compounds. References are presented at irregular intervals in the form of notes referring to numbers scattered throughout the text. There are 226 such notes in all.

In the first chapter after the Introduction, Dr. Eitel briefly discusses the need for special methods in silicate thermochemistry and explains why solution calorimetry is used predominantly in evaluating the heats of silicate reactions. This is followed by a chapter on calorimeters which first describes nearly all the solution calorimeters that have been developed to function satisfactorily. Dr. Eitel then discusses methods for determining heats of phase changes and the possibility of using the results of calibrated thermal analysis for this purpose. This chapter also contains a short discussion of the computation of heats of fusion from the melting curves in binary systems and takes up some of the errors inherent in the method in case of systems which depart from ideality. A section on the calculation of the heat of formation from structure energy and fundamental physical constants, mentioning advances made by Kapustinsky and other Russian workers, concludes the chapter.

The material dealing with reaction affinities reflects the author's long-standing interest in Nernst's theorem and its utilization for the calculation of the free energies of reaction from thermal data. The theoretical discussion proceeds along the orthodox lines developed by the Nernst school rather than along more modern lines. Third law is equated with Nernst's theorem and third law entropy is identified as absolute entropy.

In the chapter on experimental methods for determining reaction affinities are described the various calorimeters for measuring low and high temperature heat capacities, mentioning calorimeters developed in Europe as well as in this country, and including a brief discussion of calorimeters for the measurement of true heat capacities at high temperatures.

Many examples of results obtained in the calculation of free energy changes and reaction affinities for silicates from thermal data are included in the next to the last chapter. The examples quoted comprise most of the studies published on this subject in the field of silicates.

The last chapter deals with low temperature anomalies among which the author includes

polymorphous transitions of second kind and the excess heat capacity of glasses over that of crystals. A very brief statement is given concerning the statistical meaning of entropy.

In Paragraph 21, the author mentions that tantalum presents certain advantages as material for the construction of a solution calorimeter for use with acids. It is not mentioned, however, that such a calorimeter could not be used with hydrofluoric acid solutions which corrode tantalum.

In a possible revised edition the reviewer would prefer to see a fundamental revision of the use of Nernst's theorem for the computation of reaction affinities. The Nernst theorem can not be said to be a strictly valid statement of the third law of thermodynamics. Such a revision would bring the treatment into accord with current practice in thermodynamic calculations and theory.

The book may be recommended as a useful manual for students wishing to familiarize themselves with the literature of the subject. It is well printed and attractively bound.

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GENETISCHE LAGERSTÄTTENGLIEDERUNG AUF GEOTEKTONISCHER GRUNDLAGE, by HANS SCHNEIDERHÖHN, E. Schweizerbart'sche Verlagsbuchhandlung (Erwin Nägele), Stuttgart, 1952; 42 pages, paper-bound. Price 6.00 DM.

This work on a geotectonic classification of ore-deposits is based upon a lecture before the Mineralogical and Geological Section of the Naturwissenschaftlichen Vereins für Kärnten in Klagenfurt on November 3, 1951, followed by a detailed discussion by many of the leading investigators of Alpine ore-deposits. It has already appeared in its entirety in the *Neues Jahrbuch für Mineralogie*, Nos. 2 and 3, 1952.

The hypothesis that Schneiderhöhn presents in this work is intended particularly to explain the Alpine type of ore-deposit, those that have no apparent "parentage" and do not fit well in the classifications of Lindgren or Niggli. The commonly accepted classifications of ore-deposits relate them to igneous intrusions and their emanations. This type of ore-deposit is recognized in Schneiderhöhn's new classification as the "magmatic sequence" and differs in no respect from classifications already accepted, but there are types of deposits that cannot be related to definite igneous intrusions, and these are the principal subjects of Schneiderhöhn's discourse.

One of the main points in Schneiderhöhn's hypothesis is that since Cambrian time there have been only one or two metallogenetic orogenies. In Eurasia the late Paleozoic Variscian orogeny is the parent of ore-deposits. All other European or Asiatic orogenies are sterile of juvenile metallization. In North America the Appalachian and Ouachitan Variscian orogeny is accompanied by relatively weak metallization, the principal metallogenetic orogeny being the Nevadan and its related Laramide orogenies.

If a metal-bearing orogen remains undisturbed, erosion eventually reveals its accompanying metallization in all its facies and their lateral and temporal transitions of pure magmatic type. But disturbance of an orogen may bring about a regeneration or redistribution of the metallization of the "Urorogen." The characteristics and classification of this new class "Regenerated Ore-deposits" are discussed in detail.

To the student of European ore-deposits, as well as the investigator of certain Asiatic areas (Japan, Indonesia, etc.), this hypothesis will have considerable interest. To the investigator of American ore-deposits, where the magmatic sequence is so well defined, there seems little opportunity to invoke this hypothesis. In the case of the "Tri-State" lead-zinc deposits a "regenerated" origin should be considered.

This small work of Schneiderhöhn's, while not entirely new, is formulated in precise terms, and should stimulate a renewed interest in some of the neglected phases of ore-

deposit classification. A reappraisal of the role of magmatism in metallogenesis would be in order at this time. This discourse is an important contribution to such a reappraisal.

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INCLUSIONS AS A MEANS OF GEMSTONE IDENTIFICATION, by EDWARD J. GUEBLIN, ix+223 pp., 258 illustrations which include 66 plates (1 colored). Gemological Institute of America, Los Angeles, Calif., 1953. Price $6.75.

This profusely illustrated book by Dr. E. J. Gueblin of Luzerne, Switzerland, is the result of prolonged study of the inclusions in gemstones. It is indicated that inclusions are a very valuable means of identification and may also serve to establish the source of natural gemstones. Natural and synthetic gems are reliably distinguished by means of their inclusions.

There are 23 chapters, a selected bibliography, and a statement concerning the author. Solid and liquid inclusions, cracks and fissures as inclusions and those resulting from growth phenomena, as well as inclusions in synthetic stones, in reconstructed ruby, and in glass and assembled stones are discussed in eight chapters. The inclusions observed in 16 gem minerals are described in detail in 14 chapters. The minerals considered are diamond, ruby, sapphire, emerald, aquamarine, garnet, topaz, spinel, tourmaline, quartz, peridote, moonstone, andalusite, kyanite, zircon, and fluorspar. There is no index.

The numerous plates are an impressive feature of the book. In describing the characteristic features of inclusions the author frequently does so in terms which are not currently used by petrographers, such as, "hoses," "hose-like," "slabs," and "crumbs." Thus, "slabs of hematite" may occur as inclusions. There are numerous other cases. In addition, the text includes many expressions which could be simplified and markedly improved.

The book should, however, serve as a valuable aid in the study of mineral inclusions and their use in the identification of the gemstones discussed.

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