

In the development of any field there is a time of reconnaissance followed by a period in which more precise data are sought. In experimental petrology, this time has arrived. If we are to progress to the assignment of more exact conditions of stability in more complex systems, then we must look critically and intelligently at experimental results and methods. The term "equilibrium diagram" should not be used unless it is reasonably justified by both experimental and geological criteria. Where, as has commonly happened, experimental

results conflict with inferences based on geological observations, the experimentalist has a special responsibility to scrutinize and state clearly the limitations of his laboratory procedure.

ACKNOWLEDGMENT.—The writer wishes to gratefully acknowledge the assistance of Professor F. J. Turner in the preparation of this paper. The work has also been supported by grants from Research Corporation and the Petroleum Research Fund, American Chemical Society.

## REFERENCES CITED

- BARRER, R. M., 1950, Hydrothermal synthesis of potash feldspar in the range 195–200° C.: *Nature*, v. 166, p. 562.
- and WHITE, E. A. D., 1952, Synthetic crystalline sodium aluminosilicates: *Chem. Soc. London Jour.*, p. 1561–1571.
- BOWEN, N. L., and TUTTLE, O. F., 1949, The system  $MgO-SiO_2-H_2O$ : *Geol. Soc. America Bull.*, v. 60, p. 439–460.
- CARR, R. M., and FYFE, W. S., 1958, Some observations on the crystallization of amorphous silica: *Am. Mineralogist*, v. 43, p. 908–916.
- COOMBS, D. S., ELLIS, A. J., FYFE, W. S., and TAYLOR, A. M., 1959, The zeolite facies; with comments on the interpretation of hydrothermal synthesis: *Geochim. et Cosmochim. Acta*, v. 17, p. 53–107.
- DICKSON, F. W., and TUNELL, G., 1958, Equilibria of red HgS (cinnabar) and black HgS (metacinnabar) and their saturated solutions in the system  $HgS-Na_2S-H_2O$  and  $HgS-Na_2S-Na_2O-H_2O$  from 25° C. to 75° C. at 1 atmosphere pressure: *Am. Jour. Sci.*, v. 256, p. 654–679.
- EHLERS, E. G., 1953, An investigation of the stability relations of the Al-Fe members of the epidote group: *Jour. Geology*, v. 61, p. 231–251.
- ERVIN, G., and OSBORNE, E. F., 1951, The system  $Al_2O_3-H_2O$ : *Jour. Geology*, v. 59, p. 381–394.
- FYFE, W. S., 1955, Results obtained by 1955 and contained in *Fyfe et al.* (1958).
- 1958, A further attempt to determine the vapor pressure of brucite: *Am. Jour. Sci.*, v. 256, p. 729–732.
- TURNER, F. J., and VERHOOGEN, J., 1958, Metamorphic reactions and metamorphic facies: *Geol. Soc. America Mem.* 73.
- GIAUQUE, W. F., 1949, An example of the difficulty in obtaining equilibrium corresponding to a macrocrystalline non-volatile phase. The reaction  $Mg(OH)_2 \rightarrow MgO + H_2O$ : *Am. Chem. Soc. Jour.*, v. 71, p. 3192–3194.
- and ARCHIBALD, R. C., 1937, The entropy of water from the third law. The dissociation pressure and heat of the reaction  $Mg(OH)_2 \rightarrow MgO + H_2O$ : *Am. Chem. Soc. Jour.*, v. 59, p. 561–569.
- GOLDSMITH, J. R., 1953, A "simplexity principle" and its relation to "ease" of crystallization. *Jour. Geology*, v. 61, p. 439–451.
- GRIGGS, D. T., and KENNEDY, G. C., 1956, A simple apparatus for high pressures and temperatures: *Am. Jour. Sci.*, v. 254, p. 722–735.
- HARKER, R. I., and TUTTLE, O. F., 1955, Studies in the system  $CaO-MgO-CO_2$ . Part I. Thermal dissociation of calcite, dolomite and magnesite. *Am. Jour. Sci.*, v. 253, p. 209–224.
- JAMIESON, J. C., 1953, Phase equilibria in the system calcite-aragonite: *Jour. Chem. Phys.*, v. 21, p. 1385–1390.
- 1957, Introductory studies of high-pressure polymorphism to 24,000 bars by x-ray diffraction with some comments on calcite II: *Jour. Geology*, v. 65, p. 334–343.
- KENNEDY, G. C., 1955, Pyrophyllite-sillimanite-mullite equilibrium relations to 20,000 bars and 800° C.: *Geol. Soc. America Bull. (abs.)*, v. 66, p. 1584.
- 1956, The brucite-periclase equilibrium: *Am. Jour. Sci.*, v. 254, p. 567–573.
- 1959, Phase relations in the system  $Al_2O_3-H_2O$  at high pressures and temperatures: *ibid.*, v. 257, p. 563–573.
- KRACEK, F. C., NEUVONEN, J. J., and BURLEY, G., 1951, A thermodynamic study of the stability of jadeite: *Washington Acad. Sci. Jour.*, v. 41, p. 373–383.
- MACDONALD, G. J. F., 1955, Gibbs free energy of water at elevated temperatures and pressures, with applications to the brucite-periclase equilibrium: *Jour. Geology*, v. 63, p. 244–252.
- ROBERTSON, E. C., BIRCH, F., and MACDONALD, G. J. F., 1957, Experimental determination of jadeite stability relations to 25,000 bars: *Am. Jour. Sci.*, v. 255, p. 115–137.

