THE MINERALOGICAL MAGAZINE

AND

JOURNAL OF

THE MINERALOGICAL SOCIETY

No. 215 December, 1951 Vol. XXIX

Studies in felspar equilibria at the Geophysical Laboratory, Washington.

By O. F. TUTTLE.

[Abstract of lecture, May 16, 1951.]

EVIDENCE for the existence of four series of alkali-felspars has been obtained from X-ray studies of over forty analysed felspars.[1] Optical studies confirm these findings, but suggest that transitional forms may occur. The four series are: high-sanidine–high-albite; sanidine–high-albite; orthoclase–low-albite; microcline–low-albite. High-sanidine has the optic axial plane parallel to (010) in the potash-rich members, whereas it is perpendicular to (010) in sanidine.

Synthetic felspars crystallized at the liquidus and natural felspars heated for prolonged periods at high temperatures belong to the high-sanidine high-albite series. The variation of optical properties of sanidinized potash-rich felspars studied by Edmondson Spencer[2] has been found to extend, with no evidence of a discontinuity, through the soda-rich compositions to high-albite. Prolonged heating of the synthetic material below the solvus (i.e. below 660° C. for compositions near $Ab_{50}Or_{50}$) results in unmixing into two phases, giving a synthetic cryptoperthite.

Nearly all alkali-felspar phenocrysts from extrusive rocks fall into the sanidine–high-albite series, together with felspars from certain high-temperature pegmatites. X-ray studies of these felspars show that most specimens have unmixed to a submicroscopic perthite composed of nearly pure potash-felspar (sanidine) and pure albite. These cryptoperthites can be homogenized by heating for a short time at 900° C. Most of the specimens examined are optically monoclinic before heating.

[1] N. L. Bowen and O. F. Tuttle, unpublished. [cf. M.A. 11–325, 327.]

[2] E. Spencer, The potash-soda-felspars. I. Thermal stability. Min. Mag., 1937, vol. 24, pp. 453–494.

This optically monoclinic character of a cryptoperthite composed of triclinic albite and monoclinic sanidine is apparently due to submicroscopic twinning of the albite phase, as has been established by C. Oftedahl[1] for cryptoperthites composed of orthoclase and low-albite. Homogenization of these cryptoperthites with compositions between Ab_{67} and Ab_{100} causes them to become optically triclinic, whereas compositions between Ab_{57} and Ab_0 remain monoclinic.

The orthoclase–albite series was recognized and described in detail by Edmondson Spencer (loc. cit.). These are also unmixed, in this case to orthoclase and low-albite. X-ray and optical studies of heat-treated material suggest that compositions rich in potash can be readily homogenized with little change in optical properties, but compositions near $Ab_{50}Or_{50}$ resist homogenization and it appears that such specimens must be sanidinized before they will become homogeneous.

The microcline–albite series is less well known as only five analysed specimens are available for study. In all cases submicroscopic albite is present which can be 'dissolved' on heating at 900° C. for a short time.

[1] C. Oftedahl, Studies on the igneous rock complex of the Oslo region. IX. The feldspars. Skrifter Norske Vidensk.-Akad. Oslo, I. Mat.-Naturv. Kl., [1949], for 1948, no. 3, 71 pp. [M.A. **11**–11.]