og omvendt. De geologiske forhold tyder meget sterkt på at omdannelsen av asken til bentonitt fant sted like etter avsetningen eller muligens nesten samtidig med avsetningen. «Bentonittiseringen» må altså ha funnet sted som en reaksjon mellom aske og havvann, ofte på grundt vann, og reaksjonen er en devitrifisering av ganske bestemt type, ledsaget av enten utlutning av alkalier (det vanligste) eller av K- eller Na-metasomatose (sjeldnere). Selve prosessene er lite forstått, men det syns ikke urimelig å foreslå en lignende Na-metasomatose for de askeregn som nu fremtrer som orogene kvartskeratofyrer.

Chr. Oftedahl

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Note on the equilibrium between plagioclase and epidote

By

OLAV H. J. CHRISTIE.

New data concerning the exsolution of plagioclases appear to modify the equilibrium curve between plagioclase and epidote.

P. ESKOLA (1914) and J. H. L. VOGT (1927) contended that if sufficient water is present for the formation of epidote, plagioclase and epidote are unstable together. T. F. W. BARTH (1928 and 1936), T. STRAND (1942), I. ROSENQVIST (1942) and J. A. W. BUGGE (1943) have discussed the equilibrium between plagioclase and epidote, and H. RAMBERG (1944) proposed a tentative diagram for the stability relations between these two minerals. Ramberg's diagram was based on empirical data, and because of experimental difficulties the system has not been experimentally examined.

According to the diagram (Fig. 1) a plagioclase of composition X_2 would be stable under moderate water pressure at temperature T_1. At temperature T_2 epidote will form and take some CaO, Al_2O_3 and SiO_2 from the plagioclase. The plagioclase therefore will be enriched in Na_2O. The minerals in equilibrium at T_2 would be epidote of composition X_1 and plagioclase of composition X_3 provided sufficient

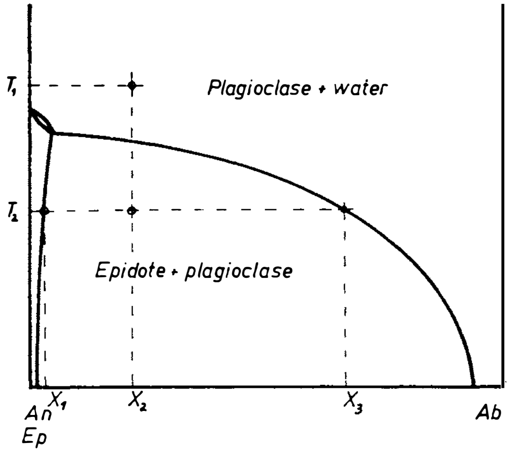

Fig. 1. Equilibrium curve between plagioclase and epidote slightly modified after Ramberg (1943). This diagram is an approximation, because the reaction plagioclase + water = epidote is stoichiometrically not quite correct.

water is present for the formation of epidote. Thus the An content of the plagioclase in equilibrium with epidote under moderate water pressure would decrease with decreasing temperature.

Plagioclases consisting of lamellae of different composition were called peristerites by O. B. BØGGILD (1924). S. CHAO and W. H. TAYLOR (1940) suggested that some intermediate low temperature plagioclases consist og lamellae of An rich and An poor plagioclases and thus are peristerites. W. F. COLE, H. SØRUM and W. H. TAYLOR (1951) studied the structure of plagioclases and showed that low temperature plagioclases ranging from An_{30} to An_{72} in bulk composition form mechanical mixtures of An rich and An poor components.

Careful examinations by F. LAVES (1954) indicate another low temperature exsolution field between An_5 and An_{17}. L. GAY and J. L. SMITH (1955) confirmed this and extend the exsolution field to An_5 — An_{23}

Thus there would seem to be two exsolution fields in the sub solidus area of the plagioclases. A plagioclase of composition Y_0 (Fig. 2) will split up to form two plagioclases of composition Y_1 and Y_2 respectively, when heated under dry conditions for a long time at the temperature T_3. Because the separation of a given plagioclase into two plagioclase phases of different Na/Ca ration involves diffusion not only of Na and Ca, but also of Al and Si, the formation of peristerites is very slow at lower temperatures. (J. GOLDSMITH, 1952). Below a certain temperature diffusion of Al and Si within the plagioclase would be so slow that the formation of peristerites is negligible even in geological time. Nevertheless, plagioclases within the exsolution field are unstable phases exhibiting higher free energy than do the stable phases (peristerites) and therefore possessing higher chemical reactivity. If one of the peristerite members reacts to form new minerals, the exsolution probably would be faciliated.

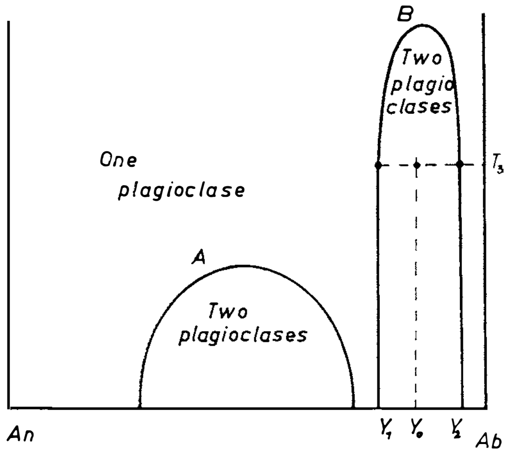

Fig. 2. Exsolution fields at subsolidus temperatures for plagioclases. Curve A after Cole, Sørum and Taylor (1951) curve B after Gay and Smith (1955). Temperature scale unknown.

The phase diagram fig. 3 is based upon these considerations. At moderate water pressure and a given temperature T_5 a plagioclase of composition Z_0 should split into epidote of composition Z_1 and plagioclase of composition Z_2. This plagioclase (Z_2) is unstable and splits up into Z_2 and Z_4 plagioclase, following curve B of fig. 2. However, under the present conditions, the plagioclase Z_3 is not stable in contact with epidote but breaks up into Z_1 epidote and Z_4 plagioclase. Not until the composition Z_4 is reached, will the plagioclase become stable. Thus the final product is Z_1 epidote Z_4 plagioclase. The equilibrium curve between plagioclase and epidote is therefore the full line ABC of figure 3.

Epidote in contact with plagioclase containing between 5 and 23 per cent An would seem to represent unstable phases (composition

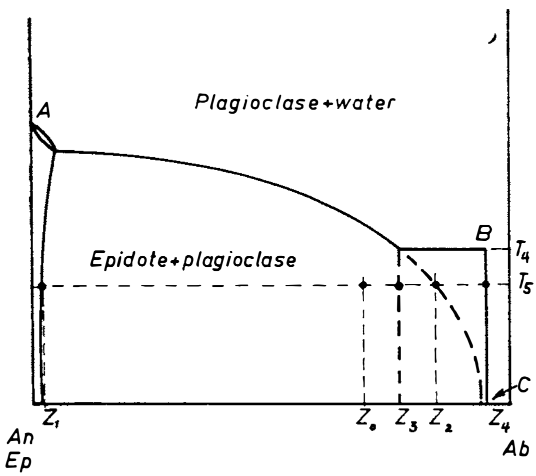

Fig. 3. Equilibrium curve between plagioclase and epidote. The exsolution area corresponding to B in fig. 2 is between Z_3 and Z_4.

between Z_3 and Z_4, temperature below T_4 of figure 3). Therefore, with our present knowledge of the subsolidus relations of the plagioclases, we can not use the equilibrium between plagioclase and epidote as a general geolgical thermometer.

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Crystallization experiments with alkali olivine basaltic glass from Egersund.

By

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Some dikes of alkali olivine basaltic dolerite from the Egersund area contain glass as a border zone. This glass was heated partly dry, partly under controlled water pressure. The dry heating was made in nichrome