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A SYNTHESIS OF BIKITAITE

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Abstract

Bikitaite has been synthesized from gels in the Li_2O-Al_2O_3-SiO_2-H_2O system at 2 kbar P_{H_2O}, at temperatures between 300 and 350°C.

Introduction

Bikitaite, $LiAlSi_2O_6.H_2O$, is a rare mineral of lithium pegmatites. Hurlbut (1957) first described it in association with fine grained granular aggregates of eucryptite and quartz in a lithium pegmatite at Bikita (Rhodesia). The eucryptite appears to replace petalite, and bikitaite is still later, for it is found in small fractures within the eucryptite and fills interstices between quartz and eucryptite grains. Petalite and lepidolite are the chief lithium minerals in this part of the dyke, but spodumene and amblygonite are also present. Good crystals of bikitaite associated with quartz and eucryptite were described from this locality by Hurlbut (1958). The only other recorded occurrence is in a largely unzoned, spodumene rich, pegmatite at King's Mountain, N. Carolina (Leavens, Hurlbut, and Nelen, 1968) where bikitaite and eucryptite occur as bladed single crystals intergrown with quartz, albite apatite, and fairfieldite in small veins in the pegmatite.

Appleman (1960) showed bikitaite has a zeolite structure. Phinney and Stewart (1961) found that natural bikitaite decomposed at 390°C under 1 to 4 kbar P_{H_2O} to eucryptite+petalite, but noted that β eucryptite and β spodumene solid solutions readily formed metastably. The only reported synthesis of bikitaite is by Hoss and Roy (1960) from lithium exchanged gmelinite at 250°C under 1kbar water pressure.

Experimental

The experiments described below synthesized bikitaite at temperatures between 300° and 350°C, with P_{H_2O} from 1 to 2.5 kbar, all within the stability field found for natural bikitaite by Phinney and Stewart (1961).

All the synthesis have been made in sealed gold capsules approximately 2 cms long×5 mm bore, in externally heated, cold seal test tube pressure vessels. Temperatures were measured at thermocouple wells in the vessels beside the charges and are considered accurate to ±10°C; pressures were measured on Bourdon gauges rated accurate to ±50 bars. In all runs the vessels were brought up to pressure cold, then heated to run temperature in about twenty minutes. Quenching by air blast cooled the vessels to below 100°C in less than one minute. All phase identifications were made by X-ray diffraction.

A variety of starting materials were used, as it seemed desirable to approach equilibrium along as many routes as possible in view of the importance of metastability effects noted by Phinney and Stewart (1961). However, at the low temperatures of the experiments