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Thermodynamic Mixing Properties of Rubicline - Microcline Crystalline Solutions

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We have investigated a ten-member Rb-K feldspar solid solution series having an ordered Al-Si distribution. Rb-microcline, or rubicline, was synthesized through ion exchange of microcline in molten RbCl, resulting in Rb-feldspar containing approximately 92 mol % Rb. Powders of rubicline and microcline then were mixed in various molar proportions and chemically homogenized at elevated temperature. The "a" unit-cell dimensions of the resulting crystalline solutions are highly sensitive to Rb:K ratio and therefore useful as indicators of composition. Unit-cell volumes show positive symmetrical volumes of mixing across the series. Enthalpies of solution of the samples (20.1 wt % hydrofluoric acid, 50 °C, isoperibolic conditions) are nearly linear with composition, with the possibility that Rb-rich members have low-magnitude positive enthalpies of Rb-K mixing. It is interesting to compare the properties of ordered samples to disordered ones, but impossible to synthesize samples via RbCl ion exchange that are close to pure-Rb sanidine (as noted in an earlier study of Kovalskii & Kotelnikov, EMPG IX, 2002). However, we were able to synthesize pure Rb-sanidine via hydrothermal crystallization of a gel (Hamilton & Henderson, Mineralogical Magazine, 1968). Interestingly, the unit-cell volume of Rb-sanidine is less than that of rubicline (unlike comparable ordered-disordered K-Na feldspars), probably because in this system feldspars are near the limit to which their structures can expand. In spite of this, the Rb-sanidine sample gives an enthalpy of Al-Si disorder relative to rubicline that is comparable in magnitude to those of K-Na feldspars. We sincerely thank Andrey Kovalskii for helpful advice on ion-exchange synthesis of Rb-K feldspars.