American Mineralogist, Volume 88, pages 547–555, 2003

Elastic strain enthalpies of exsolution: HF solution calorimetric experiments on alkali aluminosilicate and aluminogermanate feldspars

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ABSTRACT

A new series of aluminogermanate alkali feldspars has been synthesized as part of a study to investigate elastic strain energies in exsolved samples. Enthalpies of solution in 20.1 wt% hydrofluoric acid (HF) at 50 °C for chemically homogeneous unstrained members of this series can be expressed as a function of mole fraction K (N_{OrGe}): $-H_{soln}$ (kJ/mol) = 630.65 + 9.92 N_{OrGe} – 47.0 N^2_{OrGe} + 17.6 N^3_{OrGe}. The associated enthalpies of mixing, H_{ex} (kJ/mol) = 29.4 N_{OrGe} N^2_{AbGe} + 11.9 N_{AbGe} N^2_{OrGe} (where N_{AbGe} is mole fraction Na), reach maximum values of 5.4 kJ/mol at sodic compositions, similar in behavior to normal aluminosilicate analogs.

Enthalpies of elastic strain associated with exsolution have been determined via HF solution calorimetric experiments on several coherently exsolved samples of the aluminogermanate series and also on a normal Ge-free aluminosilicate alkali feldspar. These energies were found to be less than 2.0 kJ/mol, consistent with independent estimates by previous workers.