

106-3: PARTITIONING OF STRONTIUM ISOTOPES IN FELDSPARS FROM A PROTEROZOIC SYENITIC MAGMA

Monday, 23 October 2017

08:40 AM - 08:55 AM

 *The Conference Center - Skagit 2*

The last rock to crystallize from the 1.305 Ga old Kiglapait magma in Labrador, Sample No. KI 4078, is an Mg-free ferrosyenite with 63.5% feldspar and 37.5 % mafic minerals including apatite based on the oxygen norm. The final crystallization temperature determined from melting experiments was 1,000°C at 3 kbar. The final feldspar was an azeotrope intercepted by a solvus from Or₂₁ to Or₅₂. Today this feldspar is exsolved into plagioclase (An_{16.3}Ab_{81.4}Or_{2.0}) and orthoclase (An₀Ab_{14.0}Or_{86.0}) phases as determined by EMPA on 300 grains each in grain mounts. The feldspars reached their present composition at a solvus temperature estimated at 730°C. We have separated plagioclase (PL) and orthoclase (OR) fractions in bromoform, washed them in acetone, and measured their isotopic compositions and concentrations of Rb and Sr by mass spectrometry. The ⁸⁷Sr/⁸⁶Sr ratio in the PL (Rb 2.85 ppm, Sr 341 ppm) is 0.707120 ±3; the same ratio in the OR (Rb 49.4 ppm, Sr 288 ppm) is 0.715524 ±3. The OR fraction of the feldspars is much higher in ⁸⁷Sr/⁸⁶Sr, much richer in parent Rb and lower in Sr than in the PL fraction. Moreover, the OR fraction is impure, containing 34% PL, so a corrected ratio would be even higher. Published experimental studies of Kiglapait feldspars and melts show an exponential increase of the partition coefficient for Sr in feldspar/liquid with decreasing An in feldspar and a linear correlation of that coefficient on the mole fraction of Or in the feldspar: a trend also shown by the partitioning of Ba, which reaches a concentration of 2% in the final feldspar. Published records of the Kiglapait 7/6 Sr isotope ratio in rock samples, plotted against magmatic evolution, show a strong positive correlation above the 90% solidified level, in company with sharp increases in K, Rb and Ba. The new discovery of intact mineralogical-isotopic partitioning raises interesting questions about when and how the separation occurred, with guesses ranging from the moment of exsolution to separations in the framework structure of the melt before exsolution.

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