1.2.P12

The behavior of lithium during leucogranite petrogenesis

J.E. DODDS AND P.I. NABELEK

Department of Geological Sciences, University of Missouri, Columbia, MO 65211, USA

The Black Hills of South Dakota, USA, contain abundant leucogranitic plutons and pegmatites that are late-stage products of the Proterozoic Trans-Hudson orogeny. These peraluminous granites and pegmatites have geochemical signatures that suggest provenance from the surrounding late Archean and early Proterozoic metapelites. The largest pluton, the Harney Peak Granite (HPG), is located in the southern, highest-grade portion of the metamorphic terrane.

The HPG has some isotopic and chemical heterogeneities. For example, $\delta^{18}O$ values range from approximately 11.5‰ in the biotite-bearing core to approximately 13.2‰ in the tourmaline-bearing periphery [1]. The $\delta^{18}O$ values of these two HPG suites are likely, in part, a result of two metapelitic sources for the magma. In addition, higher average concentrations of Li and B are found in the high-$\delta^{18}O$ granites. B concentrations are, on average, 80 ppm in the surrounding metasedimentary rocks [2]. B is found up to 12 ppm in the central HPG and up to several thousand ppm in the periphery. Li mimics this trend, but it is more abundant than B in the central HPG at >50 ppm. Peripheral Li concentrations can exceed ~85 ppm, but some samples do not exceed values obtained from the central suite.

Indeed, some anomalous Li and B values are found in these peripheral granites, likely due to the presence of adjacent rare-element pegmatites. These pegmatites contain complex borosilicates in addition to minerals which require Li in percent abundances. While the Li levels in much of the HPG can be attributed to incompatible behavior during partial melting of metapelites, the associated pegmatites contain percent Li abundances, which are difficult to explain by either partial melting of the metapelites or fractional crystallization of the HPG.

References

[1] Nabelek P.I., Russ-Nabelek C., and Haeussler G.T. (1992) *GCA* **56,** 403-417.

[2] Wilke M., Nabelek P.I., and Glascock M.D. (2002) *Am. Mineral.* **87,** 491-500.