

Public Abstract

First Name:Mark

Middle Name:L.

Last Name:Grzovic

Adviser's First Name:Peter

Adviser's Last Name:Nabelek

Co-Adviser's First Name:

Co-Adviser's Last Name:

Graduation Term:SP 2013

Department:Geology

Degree:MS

Title:Composition of Magmatic Fluids in the Harney Peak Granite, Black Hills, South Dakota

Magmatic fluids can strongly affect magma differentiation and element mobility within igneous systems. Fluid inclusions, trapped bubbles of fluids in minerals, provide a way to directly measure the composition of magmatic fluids. In the Harney Peak granite-pegmatite (HPG) system in Black Hills, SD, fluid inclusions in quartz were analyzed using microthermometry and laser ablation (LA) ICP-MS to determine the chemical composition of the magmatic fluids. The HPG is a composite pluton with a core that consists of sills and dikes with biotite as the dominant ferromagnesian mineral, and a perimeter where tourmaline is the dominant ferromagnesian mineral. Samples were collected from three locations within the HPG system: from the core, the perimeter, and from a tourmaline-poor pegmatite, called the "new" pegmatite. Results indicate that aqueous fluids in tourmaline- and biotite-bearing granites contained significant concentrations of Na, K, and Li, but little or no B. Many inclusions of these fluids have depressed eutectic and freezing point depression temperatures in comparison with the binary NaCl-H<sub>2</sub>O system. In contrast, fluids in the "new" pegmatite contained relatively little Na, but abundant Li, K, and especially B. These inclusions have elevated eutectic and freezing point depression temperatures. The data provides strong evidence that in the tourmaline-bearing granites, B was retained in the magma and ultimately in tourmaline, whereas in the "new" pegmatite, B was scavenged from the magma by the low salinity fluid and caused tourmaline growth in its wall rocks. This study provides direct evidence that reported Li enrichments in the aureole of the HPG were caused by metasomatism by fluids emanating from the HPG.