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Hydrogen in spessartine-almandine garnets as a tracer of granitic pegmatite evolution

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ABSTRACT

The hydroxide contents of spessartine-almandine garnets from the Rutherford no. 2 (Virginia), Himalaya (California), and George Ashley Block (California) pegmatites were determined by infrared spectroscopy. The hydroxide content of garnet increases from the wall zone to the core zone of the Rutherford no. 2 and Himalaya pegmatites, consistent with increasing H_2O activity during pegmatite crystallization. However, the absolute OH contents differ by about two orders of magnitude for these two suites of garnets, possibly due to the elevated Ca content of the Rutherford no. 2 and the differences in the depth of emplacement. The garnets from the George Ashley Block show significant excursions from this correlation at the positions within the pegmatite where Kleck and Foord (1999) identified disruptions in major- and minor-element trends that they associated with re-injections of magma and subsequent flushing of the dike system. Ease of measurement as well as a relative amplified sensitivity compared to the Mn and Fe trends, make hydrogen an excellent tracer for the evolution of granitic pegmatites.