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SPECIAL COLLECTION: APATITE: A COMMON MINERAL, UNCOMMONLY VERSATILE

Barometric constraints based on apatite inclusions in garnet

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ABSTRACT

Compiled volumetric data for fluor-, chlor-, and hydroxyl-apatite has been fitted to a pressure-volume-temperature (*P*-*V*-*T*) equation of state for volume calculation at elevated *P* and *T*. The regressions were used to assess the potential of apatite inclusions in garnet for thermobarometric applications, according to the pressurization of inclusions resulting from elastic differences between the inclusion and host minerals. Isomeke contours (lines in pressure temperature space, representing permissible entrapment conditions that yield a given inclusion pressure) were calculated and show that apatite inclusions in garnet are a particularly useful barometer, owing to the large differences in the bulk moduli and similar thermal expansivities between apatite and garnet. Heating experiments were conducted on fluorapatite inclusions in andraditic garnets from the Casting Copper skarn, Nevada, to assess the variation in measured inclusion pressure with heating relative to that predicted with isotropic elastic theory. Negligible departures between theoretical and measured pressurization suggests no significant correction is needed for applying room-*T* inclusion pressure measurements for barometry constraints.

Keywords: Apatite, garnet, pressure, heating, Raman spectroscopy