Experimental evaluation of the quartz-in-garnet elastic thermobarometer up to 3 GPa

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Garnet crystals with quartz inclusions were crystallized from oxide starting materials in piston cylinder apparatuses at pressures from 0.5 to 3 GPa and temperatures ranging from 700 to 800°C to study how entrapment conditions affect remnant pressures of quartz inclusions used for quartz-in-garnet (QuiG) elastic thermobarometry.

Figure 1. Transmitted light photograph of a garnet crystal containing quartz inclusions grown in an experiment performed at 2.0 GPa and 800°C. At room conditions, average inclusion pressure is 0.82 GPa. Garnet is 100 μm across. Photo is a composite of five stacked images.

The experimental quartz inclusions have pressures ranging from -0.351 to 1.247 GPa that span the range of values observed for quartz inclusions in garnets from natural rocks. Quartz inclusion pressures were used to model *P–T* conditions at which the inclusions were trapped. The accuracy of QuiG thermobarometry was evaluated by considering the differences between pressures measured during experiments and calculated entrapment pressures. Results demonstrate that Raman measurements performed at room temperature can be used without corrections to estimate garnet crystallization pressures that are <10% different from pressures measured during the experiments.