Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19464

# Elastic thermobarometry: a novel approach to constrain entrapment P-T conditions of subduction fluid event

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Fluid inclusions in metamorphic rocks allow the understanding of fluid-mediated processes in fossil subduction-zones providing essential contributions to the nature of geochemical cycling in present day subduction zones. Besides entrapment of this fluid, crystals can also be simultaneously encapsulated during host mineral growth. Textural evidence suggest that this process occurred in garnet from granulite of the Cabo Ortegal Complex (Spain). We present results combining quartz-in-garnet and zircon-in-garnet elastic Raman geothermobarometry with Ti-in-quartz thermometry. The studied quartz (Fig. 1a) and zircon (Fig. 1b) inclusions occur within garnet, together with rutile and multiphase fluid inclusions. Hence, the application of elastic thermobarometry to quartz and zircon inclusions in these rocks provides the opportunity to estimate P-T environment of fluid entrapment. The remnant elastic inclusion pressure at room conditions for both mineral inclusions (on average 0.51 ± 0.04 GPa and 0.72 ± 0.05 GPa for the quartz and zircon inclusions, respectively) confirms the crystallization within the same growth-stage of garnet. Intersection of the entrapment isomekes is at P-T space: 1.8 ± 0.2 GPa and 880 ± 70 °C. Isopleths calculated from Ti-in-quartz thermometer on inclusion quartz assign fairly the same entrapment P-T conditions [1], that is 1.8 ± 0.2 GPa and 860 ± 70 °C (Fig. 1c). Besides, we applied two different reference materials (natural and synthetic) for zircon-in-garnet elastic thermobarometry and compared them using independent Ti-in-quartz trace element thermometry.

Our findings indicate that elastic thermobarometry on mineral inclusions provide a reliable constraint on trapping P-T conditions of coexisting fluid inclusions thus offers an excellent tool to obtain entrapment conditions of inclusions that cannot be re-homogenized and/or experienced partial $H_2O$ loss during exhumation.

This research was supported by the NKFIH_FK research fund nr. 132418; the MTA FI Lendület FluidsByDepth grant (LP2022-2/2022) to Márta Berkesi and ÚNKP-22-4 New National Excellence Program of the Ministry for Culture and Innovation from the source of the National Research, Development and Innovation Fund.

**Fig. 1.** Entrapment conditions of coexisting quartz and zircon inclusions (a-b) marked by the intersection of their isomeke compared to isopleth of Ti concentration in quartz inclusions (c).

References:

[1] Spránitz et al. under review; Lithos