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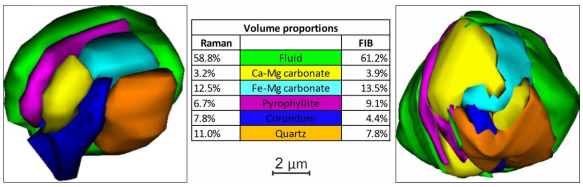

Raman imaging of multiphase fluid inclusions: a case study from the Cabo Ortegal Complex, Spain

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Deep fluids in subduction zones and high-grade metamorphic environments are commonly aqueous and carbonic and thus solute-rich in many cases. Once these fluids are trapped as inclusions by the host mineral (e.g., garnet), the post-entrapment cooling would facilitate crystallization of intergrowing solids, generally consisting of carbonates and silicates. This will result in solid-rich inclusions at room conditions with some residual fluid phase. Generally the average size of these multiphase fluid inclusions (hereafter referred to be as MFI) is around 10 microns, therefore, the solid and fluid phase compositions as well as their volume proportions determination is precluded. Moreover, given the high-pressure conditions at entrapment for the MFI, homogenization experiments also failed.

In this study, we performed 3D Raman imaging on MFI, found in granulites and eclogites of the Cabo Ortegal Complex (NW Spain), latter representing a former subduction zone environment. Since these MFI host complex mineral assemblages and their homogenization is impossible, they are a great target to demonstrate this method (Figure 1). In our work we present methodological background and recommend solutions to collect reliable volumetric data of inclusions in 3D with Raman spectroscopy. We aim to elaborate how both optical and Raman scattering properties of the phases inside the inclusions can affect the Raman images. The effect of such properties is essential to understand as accurately as possible, as their incorrect use might result in over- or underestimation of phase volume properties. Considering this, as an independent control Raman 3D models, we compared to FIB-SEM slicing (EDS during FIB exposure) on the previously Raman mapped MFI, that allowed us to optimize some parameters on Raman spectroscopy data evaluation and make mass balance calculation.

This study provides information on the chemistry and nature of fluids present in a subduction environment, and these results can be used as valuable input data for pseudosection modelling of such metamorphic environments (Spránitz et al., this conference).

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