

Multiple fluid migration events evidenced in pyroxenites of the Cabo Ortegal Complex (NW-Spain)

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Metamorphic rocks of exhumed high pressure terranes, such as the Cabo Ortegal Complex (COC), preserve direct evidences of fluid-rock interactions during subduction zone processes. Ultramafic rocks of the COC are mainly composed of harzburgites with abundant layers of pyroxenites, which are thought to have been formed in subarc lithospheric mantle depth, afterwards introduced into a Variscan subduction channel [1]. Our study aims to characterize secondary fluid inclusions in these rocks, which provides an insight into fluid migration during retrograde reactions and serpentinization in a subduction channel.

Pyroxenites in this study were sampled from both main mantle sections of the COC (i.e. Herbeira and Limo Massif) and show various degrees of amphibolization and serpentinization. Clinopyroxene, amphibole and garnet host several types of secondary inclusions, which were trapped before and during serpentinization, based on petrography, microthermometry and Raman spectroscopy. More than three type of secondary fluid inclusions predate antigorite veins and are composed of carbonates and volatiles such as methane and nitrogen. They are 1-8 μm sized showing elongated or negative crystal shape. Raman imaging showed that carbonates generally fill more than 50-60 vol. % of the inclusion volume. Relative concentration of CH_4 and N_2 are consistent within each type of the inclusions, however, shows variations between them (CH_4 10-85 mol. %, N_2 15-90 mol. %). The most abundant type of secondary fluid inclusions are texturally associated with serpentine veins. These inclusions are characterized by an irregular, ratty shape with variable sizes (1-40 μm). They are liquid-rich aqueous two phase inclusions at room temperature with CH_4 in the vapor phase.

Our results imply that migration of metamorphic fluids occurred at several stages during retrograde evolution of the COC. In addition, we point to the CH_4 -rich aqueous inclusions as direct records of a pervasive serpentinizing fluid released within the subduction channel.

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[1] Tilhac *et al.* (2016) *J Petrol* **57**, 1921-1954.