Geophysical Research Abstracts
Vol. 19, EGU2017-3214, 2017
EGU General Assembly 2017

Subduction-related metasomatism in French Massif Central: evidence from secondary orthopyroxene in mantle xenoliths.

Christiane Wagner
Sorbonne Universités, UPMC, Univ Paris 06, CNRS, ISTeP, Paris, France (christiane.wagner_raffin@upmc.fr)

Peridotite xenoliths from the French Massif Central (FMC) have undergone a complex mantle metasomatic history by percolation of various melts/ fluids from alkali basaltic to carbonatite composition. This contribution argues for the imprint of another type of metasomatism related to subduction-derived melts/fluids.
The samples come from the Mont Coupet strombolian volcano, Devès, FMC. They are fresh protogranular spinel lherzolites, with no infiltration of the host basanitic magma, but with evidences of alkali and carbonate-related metasomatism discussed elsewhere [1-3]. This study focuses on secondary orthopyroxene (opx2). It occurs +/- minor secondary clinopyroxene (cpx2) in cross-cutting thin (10 μm-20 μm) veinlets, and also as discontinuous patches developed after primary clinopyroxene (cpx1) at the contact with primary olivine (ol1). Opx2 crystals do not form fibrous radial aggregates. Rare small (<1 μm) rounded chloroapatite is included in opx2 after cpx1. Small (2 μm) pores are observed throughout the veins, at the contact with ol1, along sub-grained boundaries between opx2 and cpx2 in the veinlets, and between opx2 and cpx1.
The primary minerals crosscut by the veinlets do not show any compositional zoning and the different elements show sharp profiles between opx 2 and primary minerals. Compared to primary opx, opx2 are characterized by a lower content in $Al2O_3$ (1.7-2.5 wt. %) / 3.2-4.0 wt. %). They are slightly MgO (XMg = 90-91/ 89-90) and CaO richer (0.5 wt. % / 0.3 wt. %), and contain slightly less $Cr2O_3$ (<0.2 wt. % / 0.2-0.3wt. %) and TiO_2 (<0.06 wt. % / 0.06-0.14 wt. %), although there is some crossover between the two data sets. Na2O contents (<0.05 wt. %) are comparable. Cpx2 and opx2 from the veinlets are in equilibrium (XMg = 90-92). Al and Ti contents in cpx2 exclude any influence of percolation of the host magma. Moreover, their high Al6/Al4 ratio points to an equilibration at higher pressure than igneous cpx, close to that of cpx1.
These data are compared with data on opx2 in mantle xenoliths, mostly observed in the mantle wedge above active or inactive subduction zones ([4] and references therein), as well as experimental data [5, 6]. These metasomatic opx2 are characterized by lower Al, Ca and Cr than opx1, as observed in Mont Coupet. Together with the presence of pores and of chloroapatite, the compositional characteristics of our samples are interpreted as the signature of Si-rich and Cl-bearing metasomatic fluids. They are similar to slab-derived fluids and may be in relation to the subduction event occurring during the Variscan orogeny, a possibility envisaged by [3] from recent Li isotopic studies.

[1] Wagner, Goldschmidt Conf., 2015; [2] Wagner & Deloule, EGU, 2016; [3] Gu, PhD Thesis, Nancy, France, 2016; [4] Benard & Ionov, J. Petrol., 2013; [5] Perchuk & Yapaskurt, Geoch. Intern., 2013; [6] Grant et al, Am. Mineral., 2016.