



Mantle-fluid interaction in suprasubduction continental slab: evidences from crystal-chemistry of hydrous phases in the Ulten Zone peridotites (Eastern Italian Alps)

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Slices of ultramafic rocks can be incorporated during the subduction into the descending slab and they may preserve the mantle – wedge interaction effects. Hydrous phases generally found in peridotitic rocks enclosed in orogenic belt are clear evidence of the variable melt/fluid proportion interaction between slab and mantle wedge. Ulten Zone represents a mantle-wedge portions that were incorporated into a subducting continental (granulitic gneisses and migmatites) slab during the Variscan orogeny. Recently a geochemical study (Scambelluri et al. 2006) showed the complex interaction between the peridotites and fluid/ melt from subducting crustal reservoir. This work deals with the crystal-chemistry features of amphiboles and phlogopites found in spinel to garnet wedge peridotites from Ulten Zone (Eastern Italian Alps, Italy). The aim is to constrain the origin of the metasomatic agents and the thermophysical parameters during the mantle-fluid interaction (T , P , f_{H_2} , f_{O_2}) through a detailed crystal-chemical analysis of these phases.

Amphiboles and phlogopites selected from amphibole-bearing mylonic peridotites: pargasites are ubiquitous in the peridotite samples, whereas phlogopites represent enriched bands at the contact between peridotite and crustal rocks and/or websteritic veins. The samples were studied following a multi-methodological approach: single-crystal XRD, EPMA, SIMS and Mössbauer spectroscopy. The refined crystals (data collected on a single-crystal 4-circles XCALIBUR diffractometer with CCD detector) were analysed by EPMA for major elements and by SIMS for volatile and light

elements. The $\text{Fe}^{3+}/\text{Fe}^{2+}$ ratio was measured by Mössbauer spectroscopy.

Crystal-chemical data, such as a partial $\text{KAl} = [\text{Si}]$ substitution in phlogopites and cation distributions in amphiboles, suggest that both these phases have a high-pressure origin. Both pargasites and phlogopites have a near stoichiometric value of the H_2O content, with only a limited substitution by F, Cl and O^{2-} . The measured H content combined with crystallographic data, suggests that Fe-oxy substitution, together with Ti-oxy reaction, is involved for both phases, but Ba-oxy reaction is also proposed to account for dehydrogenation values for phlogopites. In both hydrous phases, contents of B ($4 \div 8$ ppm for amph and 4 ppm for phl), Li ($1.5 \div 4.0$ ppm in amph and $35 \div 80$ ppm in phl) and LILE are higher than that of the Primitive Mantle, reflecting a clear crustal signature. Moreover these elements partition in different way in these hydrous silicates: Li, K, Ba concentrate in phlogopites whereas B prefers amphiboles. Crystal chemical data of amphiboles allow us to determine the f_{H_2} . Since the oxidation/dehydrogenation reactions for these minerals are described by the Fe-oxy and Ti-oxy reactions, the f_{H_2} can be calculated following the Popp et al. (2006)'s equation, with the H and $\text{Fe}^{2+}/\text{Fe}^{3+}$ measured data and assuming $P = 2.7$ GPa and $T = 850^\circ\text{C}$ as formation condition (Nimis & Morten, 2000). The resulting $\log f_{\text{H}_2}$ is about 5 log unit, suggesting reduction conditions during metasomatic event.

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