

## The redox budget of crust-derived fluid phases: a snapshot of the slab-mantle interface

NADIA MALASPINA<sup>1</sup>

<sup>1</sup>Department of Earth and Environmental Sciences, Università degli Studi di Milano Bicocca, Piazza della Scienza 4 – 20126 Milano (Italy), [nadia.malaspina@unimib.it](mailto:nadia.malaspina@unimib.it)

The redox processes taking place in the portion of the mantle on top of the subducting slab are poorly investigated and the redox budget of crust-derived fluid phases is still poorly constrained. A case study of supra-subduction mantle affected by metasomatism from crust-derived fluid phases is the Maowu Ultramafic Complex (China) deriving from harzburgite precursors metasomatised at ~4 GPa, 750-800 °C by a silica- and incompatible trace element- rich fluid phase. This metasomatism produced poikilitic orthopyroxene and inclusion-rich garnet porphyroblasts. Solid multiphase primary micro-inclusions in garnet display negative crystal shapes and infilling minerals (spinel,  $\pm$ orthopyroxene, amphiboles, chlorite,  $\pm$ talc,  $\pm$ mica) occur with constant modal proportions, indicating that they derive from trapped solute-rich aqueous fluids. FT-IR hyper spectral imaging analyses and micro-Raman spectroscopy, together with X-Ray microtomography performed on single inclusions indicate that liquid water is still preserved at least in some inclusions.

To investigate the redox budget of these fluid phases, the Fe<sup>3+</sup> concentration of the micron-sized precipitates of the multiphase inclusions has been measured for the first time using EELS on a TEM. Results indicate that spinel contains up to 12% of Fe<sup>3+</sup>/ΣFe, amphibole about 30%, while the ratio in inclusion phases such as chlorite and phlogopite may reach 70%. The Fe<sup>3+</sup> fraction of the host garnet is equal to that measured in spinel as also confirmed by Flank Method EPMA measurements.

Forward modelling  $fO_2$  calculations indicate that the garnet orthopyroxenites record  $\Delta FMQ = -1.8 \div -1.5$ , resulting apparently more reduced with respect to metasomatised supra-subduction garnet-peridotites. On the other hand, oxygen mass balance, performed both on the Maowu hybrid orthopyroxenite and on metasomatised supra-subduction garnet peridotites, indicate that the excess of oxygen ( $nO_2$ ) is the same (10 mol m<sup>-3</sup>). An oxygen mass balance of the crust-derived fluids also indicates that the fluid precipitates are more oxidised than the host rock, reaching up to 400 mol m<sup>-3</sup> of  $nO_2$ . This suggests that even after their interaction with the metasomatic orthopyroxenites, the residual fluid phases could be potentially carrier of oxidised components when escaping the slab-mantle interface.