



Stability of oxidized iron species and the redox budget of slab-derived fluids

Carmen Sanchez-Valle (1), Denis Testemale (2), Camelia Borca (3), and Daniel Grolimund (3)

(1) University of Münster, Institute for Mineralogy, Münster, Germany (sanchezm@uni-muenster.de), (2) Institute Neel, CNRS, Grenoble, France (denis.testemale@neel.cnrs.fr), (3) Paul Scherrer Institute, PSI-SLS, Villigen, Switzerland (camelia.borca@psi.ch)

The high oxidation state of subduction zone magmas compared to magmas from other locations might result from the influx of oxidized fluid from the subducted oceanic plate into the mantle wedge. However, the nature of the chemical agent(s) and the mechanism responsible for the transfer of the oxidized signature from the slab to the mantle wedge remains poorly understood. In this contribution, we will discuss the oxidizing capacity of slab-derived fluids in the light of experimental results of the solubility and speciation of iron in high-pressure fluids that mimic the slab flux.

Iron-bearing mineral assemblages were equilibrated with chlorinated aqueous fluids and hydrous granitic melts at different oxygen fugacities relevant for the present day crust/mantle. The distribution and stability of oxidized iron species were monitored up to 2.5 GPa and 800 C by XANES measurements in diamond anvil cells. The results illustrate the role of coordination chemistry involving halogen and polymerized species in the stability of oxidized iron in the fluids. The concentration of Fe³⁺ in the fluids progressively decreases as temperature increases, regardless of fluid composition and pressure. This implies that the fluid capacity to transport Fe³⁺ at high temperature may be limited, even at the redox conditions relevant for the present day crust and mantle. With the new experimental results, we place constraints on the oxidizing capacity of Fe-bearing metasomatic fluids and discuss the transfer of the oxidizing signature and the conditions for the genesis of oxidized arc magmas.