



Redox processes and the role of carbon-bearing volatiles from the slab-mantle interface to the mantle wedge

Simone Tumati (1) and Nadia Malaspina (2)

(1) University of Milan, Italy (simone.tumati@unimi.it), (2) University of Milan-Bicocca, Italy (nadia.malaspina@unimib.it)

The valence of carbon is governed by the oxidation state of the host system. The subducted oceanic lithosphere contains considerable amounts of iron so that Fe^{3+}/Fe^{2+} equilibria in mineral assemblages are able to buffer the fO_2 and the valence of carbon. Alternatively, carbon itself can be a carrier of redox budget when transferred from the slab to the mantle, prompting the oxidation of the sub-arc mantle. Also, the oxidation of sedimentary carbonaceous matter to CO_2 in the slab could consume the available redox budget. Therefore, the correct use of intensive and extensive variables to define the slab-to-mantle redox budget by C-bearing fluids is of primary importance when considering different fluid/rock ratios. Fluid-mediated processes at the slab–mantle interface can be investigated also experimentally. The presence of CO_2 (or CH_4 at highly reduced conditions) in aqueous COH fluids in peridotitic systems affects the positions of carbonation/decarbonation reactions and of the solidus. Some methods to produce and analyse COH fluid-saturated experiments in model systems are introduced, together with the measurement of experimental COH fluids composition in terms of volatiles and dissolved solutes. The role of COH fluids in the stability of hydrous and carbonate minerals is discussed comparing experimental results with thermodynamic models.