Element absorption and release during serpentine reactions: element cycles in subduction zones.

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We investigated the behaviour of Ni during serpentine reactions *in-situ* at the high *P/T* conditions of subduction zones (0.2-5 GPa and 300-1000 °C). Ni is after iron an important transition metal hosted by serpentine (up to 3000 ppm). It remains also debated if Ni is mobilized in hydrous fluid released during serpentine dehydration and how it partitions in newly formed phases during the transition from lizardite to antigorite (±brucite) and serpentine breakdown to olivine + enstatite.

Here, we present first results on the behaviour of Ni during three serpentine reactions: (1) serpentine formation (0.2 GPa and 300 °C) (2) lizardite-antigorite transition (2 GPa 400 °C) and (3) serpentine breakdown (up to 8 GPa and 1100 °C). In order to track the concentrations and local coordination environments (i.e., speciation) of Ni in the fluid and solid phases, we have developed a new setup at the ESRF beamline BM23. We conducted high P/T X-ray diffraction, X-ray fluorescence and XANES experiments using a resistively heated diamond-anvil cell equipped with an original diamond-anvil design adequate for fluorescence detection in backscattered geometry and low Ni concentrations (i.e., ~1000 ppm for XANES). Serpentine formation experiments were performed using Ni-doped fluids loaded with a Ni-free forsterite crystal. For serpentine phase transition reactions, a synthetic Ni- lizardite was loaded with a Ni-free fluid. Quenched samples were analysed with EMPA, SEM and further TEM measurments are forseen.

Our results reveal that (1) Ni strongly partition into the newly formed serpentine; (2) the Ni-lizardite to antigorite transition is accompained by the formation of Ni-free brucite, which results in an slight increase of Ni in antigorite; (3) Ni-antigorite breakdown takes place at around 720 °C and 4.4 GPa indicating an increased stability compared to iron-bearing antigorite.