# Chlorine incorporation in lizardite and antigorite : mobility in subduction zones

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Chlorine shows a strong enrichment in primitive arc magmas, as demonstrated by numerous analyses of melt inclusions. This enrichement is believed to reflect devolatilization of the slab. Chlorine is mainly present in shallow reservoirs, and its transportation at depth is poorly estimated. Recycled in subduction zones, serpentinites are prominent actors of geochemical cycles from the surface toward the inner Earth. Serpentinites can incorporate significant amount of chlorine when they form in oceanic seafloor environments or in shallow subduction [Kendrich et al, 2013]. In subduction zones, serpentinites can subsist down to great depths before dehydration. The extent to which chlorine incorporated in serpentinites can be transported to deep reservoirs or be recycled through arc magmatism is currently unknown. To try and understand the behavior of chlorine in serpentinites and its fate during the successive steps of dehydration, we performed an experimental study to evaluate the chlorine content that can be incorporated in the two main serpentine minerals : lizardite (the flat, low grade variety) that form oceanic serpentinites and antigorite (the modulated, high grade variety) that is the main phase in serpentinites in subduction zones. We have equilibriated pure lizardite and pure antigorite with chlorine-enriched solutions (various NaCl concentrations) for long duration (>100 days) in gold capsules loaded in cold seal vessels. We also synthetized pure lizardite by loading the gold capsules with grounded glass with serpentine stoechiometry + NaCl-dopped solution. Chlorine content in run products was measured by nuclear microprobe and electron microprobe. These experimental results were confronted to chlorine contents in natural samples. In addition to data from the litterature, we also collected samples from alpine serpentinites where the prograde reaction lizardite > antigorite is observed. We show here that lizardite and antigorite incorporate different amount of chlorine. Also, chlorine content in lizardite strongly depends on the process of enrichement (equilibration with a NaCl-dopped fluid or direct syntheses). These results provide strong arguments to discuss the mobility of chlorine in the lizardite / antigorite system in subduction zone.

*Kendrich et al. (2013) EPSL, 365:86-96.*