Growth-zoned chromian spinel in rodingite: Evidence for Cr mobility in hydrothermal solution

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We found growth-zoned chromian spinel in a rodingite within the layered gabbro section of the northern Oman ophiolite (Wadi Fizh). The chromian spinel coexists with Ca-rich plagioclase (An; 97-100), diopside (Mg#; 0.87-0.97), uvarovite, titanite, gismondite and chlorite (Cr_2O_3; up to 2.3 wt%). It shows a high Cr# (= Cr/(Cr+Al) atomic ratio), around 0.8, and is different from mantle spinels (in chromitites and peridotites) in the Oman ophiolite (Cr#<0.75). The procursory gabbro is rather wvolved in chemistry, and free from chromian spinel. The rodingite spinel increases Fe3+ from the core to the rim (up to >YFe=0.3). The spinel characteristically shows euhedral and skeltal shapes (Fig. 1). The spinel and uvarovite mostly occur as independent grains, which means the former does not serve as the source of Cr for the latter. The spinel and uvarovite, which enclose euhedral grains of plagioclase, chlorite and pumpellyite, show concentric and oscillatory chemical zoning (Fig. 1).

The petrological characteristics strongly indicate that the spinel and uvarovite in the Wadi Fizh rodingite were independently precipitated from hydrothermal solutions involved in rodingitization of gabbros at low pressure condition (near Moho). This suggest that the Cr was mobile in the aqueous solution at low pressure condition (<0.3 GPa). Chromium was possibly supplied from the underlying mantle via high-temperature solution, which was possibly involved in precipitation of diopsidites (Python *et al*., 2007).

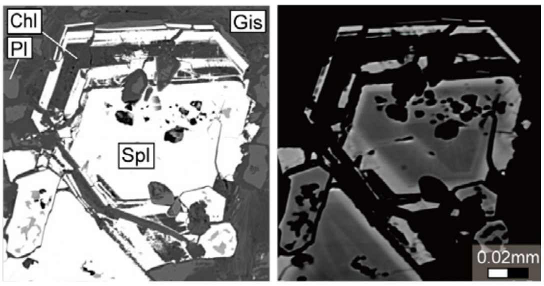

Figure 1: Composite images of spinels. Abbrreviations: spl=spinel, pl=plagioclase, chl=chlorite, gis=gismondite.

[1] Python *et al*. (2007) EPSL **255**, 289-305.

Biogenic Mn oxide formation at pH 5.5 and 7 by new Mn-oxidizing bacteria from a former U mining site

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Uranium mining near Ronneburg, Germany resulted in widespread environmental contamination with acid mine drainage (AMD) and high concentrations of heavy metals and radionuclides. Natural attenuation of heavy metals is occurring at this site in Mn oxide rich soils and sediments ranging in pH from 5 to 7. While microorganisms readily oxidize Mn(II) and precipitate Mn oxides at pH ~7 under oxic conditions, few studies describe Mn(II)-oxidizing bacteria (MOB) at pH ~5 and/or in the presence of heavy metals. In this study we (1) isolated MOB from the contaminated Ronneburg area at pH 5.5 and 7 and (2) evaluated the biological formation of Mn oxides. We isolated nine MOB strains at pH 7 (members of the *Proteobacteria*, *Actinobacteria, Bacteroidetes*, and *Firmicutes* phyla) and a single isolate at pH 5.5 (Oxalobacteraceae isolate AB_14, within the *β-Proteobacteria*). While LA-ICP-MS showed that all isolates accumulated Mn and Fe in their biomass, the Oxalobacteraceae isolate AB_14 had higher intensities of Mn and Fe peaks. Preliminary FTIR analysis indicated that all isolates formed precipitates, which showed absorption bands that were characteristic for birnessite. This, the first known report of any organism capable of Mn oxidation at low pH, demonstrated that MOB can be involved in the natural attenuation of both moderately acidic and neutral pH soils and sediments via the formation of biogenic Mn oxides. Future work will fully evaluate the minerals formed in this process as well as their interactions with contaminating heavy metals and radionuclides.