Na- and Fe- metasomatism and fulfilling of oligoclase in deformed amphibolite contacting to ultramafic rock of Oeyama Ophiolite

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Amphibolite and metagabbro in Oeyama ophiolite sometimes had suffered deformation and metamorphism during and/or before exhumation.

Metagabbroic rock body (MB) of Mamayama area trapped in ultramafic rock of Oeyama ophiolite complex in SW Japan is consisting of massive and fine-grained rocks. Petrography of MB was examined. These are characterized by population density of large amphibole grains and lineated orientation of oligoclase rich domains (ORD). Preferred orientation of amphibole crystal shape is well developed at the margin side of MB. These features may be due to deformation of amphibolite.

ORD is mainly consisted of fine grain Pl (X_{An}=0.2) together with porphylocalstic Epidote group minerals (Ep) and it is filled in grain boundary of amphibole. Ep is continuously enriched Zo composition toward rim side. Some Ep has higher REE composition in the core together with oscillatory zoning. These features seem to be product of metasomatism [1].

Larger Amphibole grain is Hlb (core)-Ts (rim) characterized by orientation of Rt and internal cracks. Act occurs in grain boundary or internal crack of amphibole. Fe and Na of core composition of amphibole are enriched toward margin side of MB. Variation of amphibole composition and zoning pattern are reasonably interpreted as results of element mobility from serpentinite and degree of development of subgrains. Al enrichment at the rim of amphibole together with Act is local equilibrate with intergranular fluid precipitates (640-580°C). Equilibrated composition of amphibole rim suggests that the chemical zoning is not due to growth processes.

Characteristics of mineral phase in this metagabbroic rock might have utterly been reset by deformation and fulfilling of ORD that are related with surrounding ultramafic rock.

[1] Franz & Liebscher (2004) *Reviews in Mineralogy & Geochemistry* **56**, 1–58.

Natural attenuation of heavy metals in groundwater by iron-cycling bacteria at a mining-impacted site

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Groundwater near Ronneburg, Germany is impacted by acid mine drainage, due to legacy uranium mining, resulting in extensive contamination of surroundings aquifers and creeks with U and heavy metals. Natural attenuation in the creek appears to be occurring via coupled microbial iron redox cycling and metal precipitation in sediments and bank soils. In order to understand the mechanisms of natural attenuation, this study aimed to (i) quantify iron redox cycling and its impact on heavy metals, (ii) cultivate heavy-metal tolerant iron-oxidizing (FeOB) and iron-reducing (FeRB) bacteria, and (iii) characterize the diversity of active *in situ* microbial communities. Iron-rich creek sediments and bank soils varied in pH from 5 to 6.4 and were enriched in precipitated and adsorbed uranium and other heavy metals. In creek sediments, iron-oxidation was predominantly abiotic; however, microaerophilic cultured FeOB were detected at an abundance of ~2 x 10^4 cells g^{-1} sediment. Enriched FeOB tolerated higher than *in situ* concentrations of heavy metals (30 mM Co, 20 mM Ni, and 1 mM Cd) and were closely related to the genera *Azospira, Dechlorosoma* and *Siderooxidans*. Preliminary work shows that biogenic Fe (III)-oxides are enriched in heavy metals. Rates of Fe (III)-reduction were low in creek bank soils, but increased when lactate was added. Biostimulation of Fe (III) reduction was associated with an increase in Co, Ni, Zn, and suprisingly, U concentrations. This suggests that there was a release of sorbed metals during reductive dissolution of Fe (III)-oxides and that, in contrast to U contaminated sites in the U.S., biostimulation of FeRB can lead to a release of U and a potential for migration of contaminants. The abundance of FeRB was ~10^4 cells g^{-1} soil and enriched FeRB could tolerate only micromolar concentrations of Ni, Zn, Cu, and Cd. Enriched metal-tolerant FeRB were related to members of the *Deltaproteobacteria* and *Firmicutes* and a Cu- and Cd-tolerant isolate was obtained that was closely related to *Desulfosporosinus lacus*. Characterization of the active and total microbial communities using cloning and sequencing approaches and isolation of metal-tolerant FeOB are on-going. Our data show that heavy metal tolerant FeOB play an important role in the natural attenuation of contaminants, likely via the coprecipitation of metals with Fe (III)-oxides.