

## Adsorption of oxyanions on schwertmannite and its post-adsorption behavior

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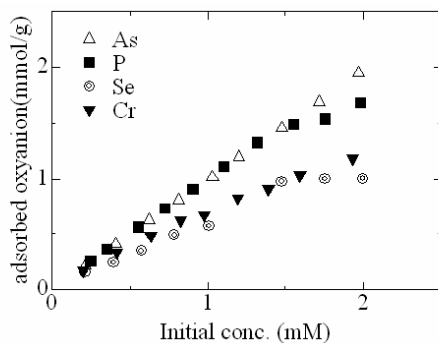
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Understanding of toxic trace metal behavior in the natural environment is important in predicting the long-term effects of human activities. Particularly, the behavior of toxic oxyanions is complex for the prediction. Iron hydroxides have been considered to play an important role for the behavior in nature. In this context, adsorption of toxic oxyanion on schwertmannite (major natural iron hydroxide in acidic condition) and its post-adsorption behavior were extensively investigated.

Synthesized schwertmannite was used in the adsorption experiments for Se, Cr, As, P at room temperature and pH 3.9. The concentration of the reactive fluid for the experiments ranged from 0.0mM-2.0mM. Aging experiments at 50°C were conducted for the schwertmannite exchanged original sulfates with the above oxyanions. The zeta-potential of schwertmannites with various oxyanions were also measured.

From the results of adsorption experiments, As and P selectivity on schwertmannite was higher than Cr and Se and much amount of As and P adsorbed on schwertmannite (Fig.1). XRD patterns of the samples with various oxyanions after aging experiments showed the schwertmannite with oxyanions with higher selectivity such as As and P was more stable than that with other oxyanions. The schwertmannite with lower selectivity was easily transformed to goethite. The result of zeta-potential measurements suggested that inner-sphere complex would be formed for As and P and outer-sphere complex for Cr and Se with schwertmannite surface. Consequently, inner-sphere complexation with oxyanions would retard the transformation of schwertmannite (metastable phase) to goethite (stable phase).



**Figure 1:** Adsorbed amount of oxyanion on schwertmannite as a function of initial concentration

## Effect of volatiles in the partial melting in Earth's asthenosphere

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### Introduction and experimental procedure

Existence of partial melting in the asthenosphere is currently a matter of debate (i.e., Faul and Jackson, 2005). A recent study by Hirano *et al.* (2006) showed a natural evidence for an asthenosphere-derived magmatism on 140Ma old Pacific plate. The newly found alkalic basalts are less than 1Ma old and show remarkable vesicularity even erupted at 5500 m water depth which indicates high concentration of CO<sub>2</sub> present in the magma. In order to understand the nature of melts present in the asthenosphere, we performed a series of melting experiments on a parental alkalic picritic magma found on the Pacific plate near the Japan Trench [JPT-1 (18.4 wt% of MgO and 2.3 wt% of K<sub>2</sub>O) and JPT-1\* (~1 wt% each of CO<sub>2</sub> and H<sub>2</sub>O were added to the JPT-1)]. Experiments were also carried out using a mixture of a natural undepleted peridotite (KLB-1) and a wet alkalic picrite JPT-1\* (97:3 in weight ratio). Two types of double capsules (Pt/graphite and Pt/Re) were used and the experiments were conducted at 1300–1500°C and 2.7–3.3 GPa for 40–120 hours using piston-cylinder apparatuses. Experiments are also in progress at pressures >5.0 GPa using multi-anvil apparatuses.

### Results and discussion

At 3.0 GPa, dry alkalic picrite (JPT-1) has the liquidus T of 1450°C, whereas, at same pressure, the liquidus of the wet JPT-1\* lies at ~1400°C and is multiply saturated with an assemblage of olivine+cpx+garnet. Although the dry solidus of the peridotite (KLB-1) is >1500°C at 3.0 GPa, K<sub>2</sub>O-rich partial melts were observed in the run products between 1350 and 1500°C. In experiments using starting material (KLB-1+JPT-1\*), cpx is the only phase (as quenched crystals) which represents the location of the partial melt. At ≤1350°C, K resides in isolated granules (most probably phlogopite), whereas at >1450°C, K is more widely distributed in interstitial quenched melt, between the cpx dendrites.

Our experimental results and the findings of Hirano *et al.* (2006) reinforce the partial melting model for the asthenosphere (Wyllie, 1988). Considering a short horizontal thermal gradient within the asthenosphere (Priestley and McKenzie, 2006) and small amounts of K<sub>2</sub>O, H<sub>2</sub>O and CO<sub>2</sub> are present, partial melt must be present ubiquitously under the oceanic plate.

### References

- Faul U.H. and Jackson I. (2005), *Earth Planet. Sci. Lett.* **234** 119-134;
- Hirano *et al.* (2006), *Science* **313** 1426-1428;
- Wyllie P.J. (1988), *Rev. Geophys.* **26** 370-404;
- Priestley K. and McKenzie D. (2006), *Earth Planet. Sci. Lett.*, **244** 285-301.