

## The temperature and pressure dependence of Ni partitioning between olivine and MgO-rich silicate melt

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Melting of the Hawaiian plume occurs at high T and P (e.g., ~1600°C, 4 GPa [1]), and so it is important that Ni partitioning data are obtained at these conditions to test competing hypothesis for the high Ni contents of Hawaiian olivines. Available data for  $D_{Ni}$  ( $NiO^o/NiO^{liq}$ ) are, however, dominated by the results of 1-atm experiments where T and  $MgO^{liq}$  are strongly correlated, making it difficult to separate the effects of liquid composition from that of T on  $D_{Ni}$ . Indeed, most simple parameterizations of  $D_{Ni}$  rely on  $MgO^{liq}$  as the principal independent variable [2, 3]. This approach, although adequate for many applications, is problematic for addressing Ni partitioning in the mantle because liquids with the same MgO content can coexist with olivine over a range of P and T. We studied Ni partitioning in olivine-liquid pairs at near constant  $MgO^{liq}$  over a significant P-T range in order to separate the effects of P, T, and liquid composition on  $D_{Ni}$ .

We conducted experiments on MORB+olivine at 1 atm (1400°C) and 1-3 GPa (1450-1550°C). For the high-P experiments, we avoided Ni loss to the Pt+graphite double-capsule assembly by packing a chip of MORB glass in olivine powder and first sintering the charge at subsolidus conditions (relative to the glass), effectively creating an impermeable inner olivine crucible. In the high-T portion of the experiments, T was adjusted at each P to keep the  $MgO^{liq}$  value in the range of 17-19 wt. %, so all the measured  $D_{Ni}$  values are for essentially constant liquid composition. In our experiments, for ca. constant  $MgO^{liq}$ ,  $D_{Ni}$  ranges from 3.8 to 5.0 (by wt.), decreasing by ~0.5/100°C from 1400-1550°C. This is comparable to predictions from MELTS. Although both P and T vary in our experiments, calculations using MELTS suggest that the effect of increasing P on  $D_{Ni}$  is small, slightly increasing  $D_{Ni}$  over the P and T ranges we have studied; consequently, the isobaric T dependence is likely slightly larger than suggested by our measurements. Using  $D_{Ni}$ s from our experiments, melt equilibrated with mantle olivine (0.35 wt. % NiO) at 4 GPa could crystallize olivine with up to ~0.5 wt. % NiO at 1 atm.

[1] Putirka (2005) *G<sup>3</sup>* **6**. [2] Hart *et al.* (1978) *ESPL* **40**, 203-219. [3] Kinzler *et al.* (1990) *GCA* **54**, 1255-1265.

## Sorption of Pb and desferrioxamine to montmorillonite

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The microbial siderophore DFO-B has been shown to affect dissolution of and metal sorption to iron and manganese oxides and clays. Haack *et al.* [1] showed using a combination of spectroscopy (FTIR) and diffractometry (XRD) that DFO-B sorbs within the interlamellar spacing of montmorillonite. Here, we investigated how Pb (II) and DFO-B affect one another's sorption to montmorillonite. Sorption experiments were run in 0.1 M NaClO<sub>4</sub> and 0.06 M NaClO<sub>4</sub> over a range of pH values (3-7.5). As shown below, DFO-B and Pb affect one another's sorption to montmorillonite over a wide pH range. FTIR and XRD analysis suggest that Pb and DFO-B are coadsorbed in the interlamellar region under some pH conditions; FTIR-ATR and EXAFS analysis are ongoing.

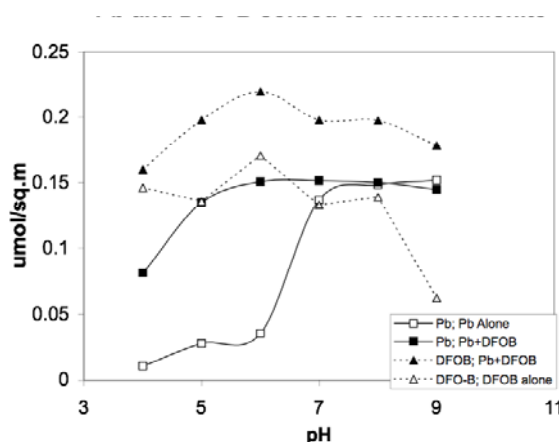


Figure 1: Pb and DFO-B sorber to Montmorillonite

[1] Haack *et al.*, 2008, *GCA* **72**: 3381-3397