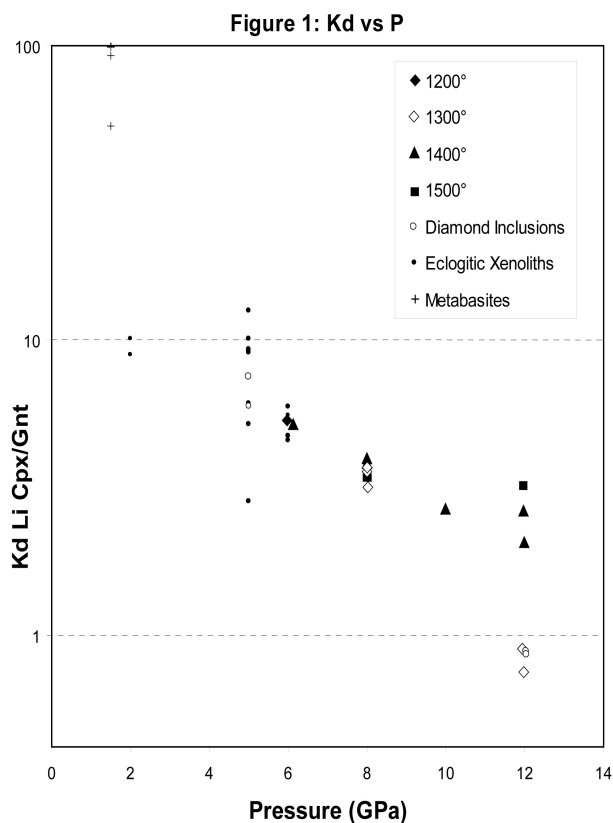


Li as a barometer for biminerallitic eclogites

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Seitz *et al.* (2003) suggested that the partitioning of Li between garnet and clinopyroxene is pressure dependent and may serve as a barometer for eclogites. This suggestion was based on the analysis of natural rocks, the fact that Li is a faithful follower of Mg into octahedral site positions and that only garnets with a majoritic component have Mg^{VI}. We can assume a coupled substitution with P and carried out high pressure experiments in CMAS + Li₃PO₄. The experiments were carried out from 6 - 12 GPa, 1200 -1500° using starting materials with varying Li contents to check for compliance with Henry's law. The run products were analyzed by EPMA and SIMS. The results are shown in Figure 1.



Conclusion

Henry's Law is fulfilled for Li partitioning between garnet and cpx in the concentration range of 1 - 0.01 wt% Li. The partitioning of Li is dependant mostly on pressure and less so on T (see above figure). Further experiments are needed to reach a better constraint on the pressure, T dependance of the Li-partitioning and achieve a functioning barometer.

References

Seitz, H.-M., Brey, G.P., Stachel T. and Harris, JW, (2003), *Chemical Geology*, **201**, 307-318.

Removal of uranium, arsenic and phosphorus from aqueous solutions using steel slag

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The European iron and steel industry produces annually ca. 45 million tons of metallurgical slag, of which 37% and 41% are utilized in cement production and road construction, respectively. Over the past ten years, much research has been devoted to potential environmental applications of slags due to their favorable adsorptive properties. We have investigated the uptake of U, As and P by steel slag from aqueous solutions using samples obtained from the Rautaruukki Co., Raahe, Finland. Mineralogically, the solid material is mainly made up of compounds of CaO, FeO and SiO₂. The behavior of the above-mentioned elements was investigated in 24-hour laboratory batch experiments with the initial concentrations of 2–250 mg/L for U, 0.5–60 mg/L for As and 20–500 mg/L for P. Long-term column experiments are also currently in progress in order to study the maximum phosphorus sorption capacity of steel slag. Phosphorus in equilibrated solutions was determined spectrophotometrically and U and As were analysed using ICP-MS.

Uranium showed practically a complete partitioning into the solid phase; for example, with a maximum starting U concentration of 250 mg/L and a liquid/solid (L/S) ratio of 100, only 0.05–0.06 mg/L was left in solution, corresponding to a solid/liquid distribution coefficient in the range of 4–5 x 10⁵. In the batch experiments with initial phosphorus contents of 60–100 mg/L and L/S ratios of 450–500, the sorption capacity of steel slag was mostly in the range of 25–33 g/kg and the sorption percentage 70–96%. In the column experiments on relatively coarse-grained slag (1–4 mm), the sorption efficiency declined to 80% when the slag had achieved a P concentration of 5.1–7.3 g/kg, while in the experimental columns containing fine-grained slag (<1 mm), which are still running, the phosphorus sorption has remained perfect (>99%) after retention of up to 12.4 g/kg of P. In common with U and P, arsenic had a pronounced sorption affinity to steel slag. In all batch experiments conducted so far with a L/S ratio of 1000 or less, the sorption percentage was higher than 92%.

Due to leaching of Ca from steel slag, the mechanism of P and As removal is mainly by precipitation of hydrous calcium phosphates and calcium arsenates, respectively, as confirmed with SEM. The mechanism of U sorption is not yet established but it seems that calcium also plays an important role in this case. In summary, our experimental study shows that steel slag can serve as an excellent sorbent for U, As and P from aqueous solutions.