

## **Diffusion driven Li isotopic fractionation: preliminary constraints from thin film experiments**

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Stable isotope fractionation is known to be large at low temperatures but recently significant Li isotopes fractionation has been reported even for igneous processes. At present, experimentally derived data for isotope fractionation of lithium are available for a diffusion couple of basaltic and rhyolitic melts (Richter et al. 2003). Experimental data for diffusion driven Li isotope fractionation in solid state are still lacking. Li is of special interest due to the fact that it is one of the most mobile elements which is expected to produce large isotopic fractionation.

We investigate self-diffusion and chemical diffusion of Li in olivine and enstatite polycrystals. Starting materials for two different experimental settings are silicate thin films produced by the pulsed laser deposition technique at Ruhr University Bochum (Dohmen et al. 2002a). Thin films were annealed at atmospheric pressure. These thin films are analyzed by the SIMS apparatus at GFZ Potsdam using a depth scanning method in order to obtain a nanoscale spatial resolution.

Two experimental settings are used to investigate two different types of Li diffusion. The first experimental setting is designed to study grain boundary diffusion in olivine polycrystals. It consists of a polished forsterite substrate covered by a ~5 μm thick isotopically normal polycrystalline forsterite and a thinner Li doped polycrystalline forsterite layer. This experiment is used to determine the diffusion rate of Li isotopes in olivine aggregates.

In a second rim growth experiment we investigate chemical diffusion using polished quartz substrates covered by thin enstatite seed layers and thicker Li-doped polycrystalline forsterite (Milke et al. 2007). These rim growth experiments apply to observations made in mantle rocks where olivine, as the major host of Li, is replaced by pyroxenes which exhibit steep Li isotope gradients (Jeffcoate et al. 2007).

### References

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