In situ Li isotope analyses of silicates by femtosecond-LA-MC-ICP-MS

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In situ analyses of Li isotope ratios of silicates have usually been performed by secondary ion mass spectrometry (SIMS), revealing – *inter alia* – significant Li isotopic zoning of major minerals (opx, cpx, olivine) in mantle xenoliths and basaltic rocks (e.g. [1]). However, Li isotope analyses by SIMS can be affected by composition-dependent matrix effects (e.g. [2]). Here, we tested the suitability of *in situ* Li isotope analyses of silicates by femtosecond-LA-MC-ICP-MS. This technique has been proven to be capable of high-precision *in situ* isotope analyses of Si, Fe, Mg and Cu without apparent laser-induced isotopic fractionation (e.g. [3-5]).

We analyzed a series of silicate reference glasses of variable compositions (komatiitic, basaltic, dioritic, andesitic) as well as a chemically zoned mantle olivine with low Li concentrations (5-20 ppm) using a NeptunePlus™ MC-ICP-MS that is connected to a Solstice™ femtosecond-laser ablation-system. The well-characterized basaltic USGS reference glass BCR-2G was used as the bracketing standard to determine δ^7Li values of the samples relative to L-SVEC.

The findings of our analyses of the silicate reference glasses indicate that Li isotope measurements by fs-LA-MC-ICP-MS yield accurate results, i.e. Li isotope compositions determined with our technique are identical to those determined using conventional solution-based MC-ICP-MS [6]. The external reproducibility of our Li isotope analyses is similar to that of SIMS analyses (1-2‰, based on 4-6 individual analyses of each glass). Our preliminary Li isotope analyses on olivine reveal a significant difference in Li isotope composition between the rim and the core of the crystal of ≈ 17‰, indicating a diffusion origin for the observed chemical and isotopic zoning of Li. These preliminary findings show that *in situ* Li isotope analyses by fs-LA-MC-ICP-MS are a promising tool to trace Li isotope variations in silicates (e.g. chemically zoned crystals) without the need to correct for composition-dependent matrix effects.

[1] Jeffcoate et al. (2007) *GCA* **71**, 202-218. [2] Bell et al. (2009) *ChemGeol* **258**, 5-16. [3] Chmeleff et al. (2008) *ChemGeol* **249**, 155-166. [4] Oeser et al. (2014) *GGR* **38**, 311-328. [5] Lazarov & Horn (2015) *Goldschmidt Abstracts*, this volume. [6] Jochum et al. (2006) *G^3* **7**, Q02008.