

Diffusive fractionation of lithium isotopes in polycrystalline olivine

V HOMOLOVA* AND E B WATSON

Department of Earth and Environmental Sciences, Rensselaer Polytechnic Institute, Troy, NY 12180, USA
(*correspondence: homolv@rpi.edu)

Diffusive fractionation of Li isotopes has recently been reported in silicate melts, aqueous fluids and single crystals [1, 2, 3]. Here, we present an experimental study which investigates diffusive fractionation of Li isotopes in polycrystalline olivine. The experimental procedure consists of annealing oxide powders in an iron capsule at 1.4 GPa and 1250°C for 48 hours. The annealing step produces a synthetic rock comprising olivine (Fo90) plus 15 wt% pyroxene (En92), with grains 50 - 75µm in diameter. The capsule is then sectioned, polished and juxtaposed to a spodumene powder, which acts as the Li source. The diffusion couples were held at 1.4 GPa and 700 - 1000°C for 12 - 120 hours. Li abundances and isotopic ($7\text{Li}/6\text{Li}$) profiles were analyzed using LA-ICP-MS.

Maximum lithium abundances measured near the Li source in the olivine and pyroxene reach ~550 and ~700 ppm, respectively. Li abundances decrease as a function of distance from the source to the background Li concentration of ~3 ppm. Preliminary data suggest an effective diffusivity of Li in polycrystalline olivine plus pyroxene of $\sim 5\text{E}-13\text{m}^2/\text{s}$ at the highest temperature investigated. In both olivine and pyroxene, $7\text{Li}/6\text{Li}$ ratios decrease linearly or in a concave down fashion for the entirety of the diffusion profile before abruptly jumping back up to the initial isotopic ratio of the synthetic rock. This decrease in $7\text{Li}/6\text{Li}$ along the diffusion profile is similar to previous studies investigating diffusive fractionation of Li isotopes and suggests a higher diffusivity of 6Li relative to 7Li . The shape of the isotopic profile may be replicated well with a model previously developed by [3] for Li diffusion with reaction in single crystal olivine, in which Li simultaneously diffuses via two different mechanisms. Application of the data to diffusive transport of Li in the upper mantle will be discussed. Experiments at higher temperature and utilizing alternate Li sources are underway.

[1] Richter *et al* (2003) *GCA* **67** 3905 - 3923 [2] Richter *et al* (2006) *GCA* **70** 277 - 289 [3] Dohmen *et al* (2010) *GCA* **74** 274 - 292

Abrupt variations of Indian and East Asian summer monsoons during the last deglacial stadial and interstadial

B. HONG^{1*}, Y.T. HONG¹, M. UCHIDA², Y. SHIBATA²
AND Y.X. ZHU¹

¹Institute of Geochemistry, Chinese Academy of Sciences, Guiyang 550002, China (*correspondence: hongbing@vip.skleg.cn)

²National Institute for Environmental Studies, Onogawa 16-2, Tsukuba, Ibaraki 305-0053, Japan

The recent study comparing marine and terrestrial palaeoclimate records from South Asia suggests that during the deglaciation the ISM fluctuated widely, with weaker monsoons during colder episodes, such as the Younger Dryas (YD), and stronger monsoons during warmer episodes, such as the Bølling-Allerød (BA) [1]. However, this study does not cover the palaeoclimate records from some East Asian regions influenced by the Indian Summer Monsoon (ISM), such as the Tibetan Plateau and its adjacent regions, and it does not include the activity of the East Asian Summer Monsoon (EASM). Another study on global climate evolution during the last deglaciation briefly discusses the behaviours of the ISM and EASM during the transient period and mainly focuses on the results of a few stalagmite ^{18}O records from the southern Chinese mainland [2]. To complement these studies, we present a continuous peat cellulose $\delta^{13}\text{C}$ record of ISM covering the past 15000 years. By comparing this record with a variety of other monsoon proxy records, especially with the EASM proxy records published in recent years, we attempt to clarify the abrupt variation, phase relationship, and possible forcing mechanisms of two Asian monsoons during the last deglaciation.

[1] Tiwari *et al* (2011) *J Geol Res* 1-12. [2] Clark *et al* (2012) *PNAS* 109, E1134-E1142.