In-situ lithium isotope geochemistry for a veined jadeitite from the New Idria serpentinite body, California: New insights for slab-derived fluid

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Lithium has two stable isotopes: ^{6}Li and ^{7}Li and highly mobile in slab-derived fluids. Behavior of the slab-derived fluids has thus been constrained using the isotopic compositions of Li in the subduction-related metamorphic rocks [1, 2]. We investigated a veined jadeitite from the New Idria serpentinite body, California, for which the veins are regarded as direct precipitates from slab-derived fluids. We applied *in-situ* measurement of Li concentrations and $\delta^{7}Li$ using a laser ablation MC-ICPMS. This method enabled determinations of millimeter- to submillimeter-scale isotopic variations in the veins and in the host rocks allowing immediate observations on fluid–rock interactions. Multiple-stage jadeite veins and their hosts showed a wide $\delta^{7}Li$ variation from –11.7 to +6.7‰ with Li concentration ranging from 4 to 68 μg/g, and systematic distributions. Individual veins formed in different generations also showed a wide isotopic variation as large as ~14‰. Those isotopic and compositional variations within/among veins can readily be explained by variable mixing between the host matrix and the infiltrated fluids. The fluid compositions were estimated to be between +6.7 and +12.3‰ based on the $\delta^{7}Li$ values of the jadeites in the veins which were supposed to be unmodified by the interactions with their host matrices. The estimated fluid composition is consistent with those inferred for the slab-derived fluids proposed by the previous studies. The New Idria jadeitite provides evidence for the presence of high $\delta^{7}Li$ fluids in the mantle wedge at the forearc depth. Our study also demonstrates that the high $\delta^{7}Li$ composition of the slab-derived fluids are easily modified by the interactions with surrounding rocks along their pathways.

[1] Marschall *et al*. (2007). *Earth and Planetary Science Letters* **262**, 563-580. [2] Simons *et al*. (2010). *Geochimica et Cosmochimica Acta* **74**, 3621-3641.