Elemental and isotopic abundance of lithium in chondrle-composiong components from the Allende meteorite

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The Li abundance of silicate minerals and the Li isotopic compositions of olivines in six chondrules from the Allende CV3 meteorite were determined using secondary ion mass spectrometry. Olivines, feldspathic mesostases, and CPx-like mesostases in the chondrules are depleted in Li (mostly less than 0.1 ppm in olivine, and o.1-0.6 ppm in two mesostasis phases). In contrast, low-Ca pyroxene are enriched in Li (1-8 ppm), and na-bearing mesostases contain significant amount of Li (0.4-3.5 ppm) The matrix materials surrounding the investigated chondrules are generally enriched in Li (2.0 ppm on average). Delta7Li values in olivines range from -32 to +21 permil. The spatial distributions of the elemental and the isotopic compositionsof Li within/among individual chondrules exhibit no systematic structure, but are heterogeneous. Considering Li-diffusion in olivine, the distributions of Li in the olivines seem not to be disturbed during aqueous alteration and thermal metamorphism. Although mesostasis is thought to be the last phase to be crystallized, it is depleted in Li. During aqueous alteration on the Allende parent body, it seems that mesostasis was bleached of Li by aqueous fluids. The Li-enriched Na-bearing mesostasis was produced by the reaction between the pre-existed feldspathic mesostasis and Na-Cl-bearing fluids during the aqueous alteration.

It seems that aqueous fluids have escaped with alkali elements from the Allende chondrite region in the CV parent body, although some portion of Li is preserved in ferrous olivine in the matrix. The matrix precursors have reacted with Li-bearing fluids, because Li is the most compatible among alkali elements.