

Sodic pyroxene and sodic amphibole as potential micro-analytical reference material for Li isotopes

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Two large pegmatitic crystals of sodic pyroxene (aegirine) and sodic amphibole (arfvedsonite) from the aegaitic igneous Ilímaussaq Complex, South Greenland are suitable reference materials for in-situ Li isotope analyses.

Li concentrations [Li] and isotope compositions ($\delta^7\text{Li}$) determined by SIMS and micro-drilled material analyzed by MC-ICP-MS generally agree within analytical uncertainty. The arfvedsonite crystal is homogeneous with [Li] = 639 ± 51 $\mu\text{g/g}$ (2σ , $n = 69$, MC-ICP-MS and SIMS results) and a mean $\delta^7\text{Li}$ of $+0.7 \pm 1.2$ ‰ (2σ , $n = 10$, via MC-ICP-MS) or -0.5 ± 1.1 ‰ (2σ , $n = 23$, via SIMS). Accordingly, we propose adopting of $\delta^7\text{Li} = 0$ ‰ for this crystal.

The aegirine crystal shows strongly developed sector zoning, which is a common feature of aegirines. Using qualitative element mapping techniques (EPMA), the homogeneous core of the crystal is easily distinguished from the outermost sectors of the crystals. The core has mean [Li] of 50.5 ± 3.6 $\mu\text{g/g}$ (2σ , $n = 33$) as determined by SIMS, whereas the seven micro-drilled regions measured by solution MC-ICP-MS returned slightly lower concentrations, between 41 and 46 $\mu\text{g/g}$. The $\delta^7\text{Li}$ of the core determined by SIMS (-3.4 ± 1.6 ‰, 2σ , $n = 5$) is in excellent agreement with the MC-ICP-MS data (-3.7 ± 1.2 ‰, 2σ , $n = 7$).

A limited quantity of these two crystals will be available upon request.