

Potential Reference Materials for In Situ Lithium Isotope Determination

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Lithium (Li) is the lightest metal and third element on the periodic table, including two stable isotopes: ${}^7\text{Li}$ and ${}^6\text{Li}$ with natural abundances of 92.48% and 7.52%, respectively. Lithium isotope has been used as an important non-traditional isotope tracer with extensive applications in Earth Science (Chan et al. 1988, James et al. 2000).

Multi-collector inductively coupled plasma mass spectrometry (MC-ICP-MS) has become the most important tool for lithium stable isotope analysis because of its high precision. However, it only obtains the bulk result. Laser Ablation MC-ICP-MS (LA-MC-ICP-MS) technique, with its minimal sample requirements, enhanced spatial resolution, and high throughput, having an important role in in situ analysis. In this study, we aim to develop two matrix matched lithium isotope reference materials for lepidolite and spodumene by employing LA-MC-ICP-MS for in situ analyses of Li isotope. 50g of natural lepidolite and 80g of spodumene were ground into ultra-fine mineral powders ($d_{50} < 12\mu\text{m}$) and sintered them into a polishable and mechanically resistant target using fast hot-pressing. The sintered lepidolite (LPD1908) and spodumene (SPO0732) were cut into 2-5 mm small pieces, some of which were random picked out for LA-MC-ICP-MS analysis. The homogeneity of $\delta^7\text{Li}$ was assessed using LA-MC-ICP-MS at $65\mu\text{m}$ scale. The precision (2SD) of $\delta^7\text{Li}$ values for sintered lepidolite (LPD1908) and spodumene (SPO0732) better than 0.51‰ and 0.43‰, respectively, demonstrating homogeneous lithium isotopic composition. Consequently, the results suggest that LPD1908 and SPO0732 can be potential reference materials for routine Li isotope measurement of natural lepidolite and spodumene unknowns.

References:

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