

## Lithium isotopic measurement by ICP multi-collector mass spectrometry

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To reveal the material cycle in the Earth interior, lithium isotopic ratio is the powerful tracer of the altered oceanic crust. The Li isotopic compositions of igneous rocks, however, are documented very scarce for the delicate Li purification. Li isotopic ratios measured by MC-ICP-MS are lesser affected from other coexistent ion than those of TIMS. This means that we can analyze Li isotopic ratios precisely without delicate Li purification and separation. We developed analytical method for Li isotopic ratios of igneous rocks using MC-ICP-MS. The reproducibility of 100ppb Li solution is 5 permil (1 sigma). Then consumption is 40ng Li. Our  $d7\text{Li}$  values of the standard rocks of Japanese Geological Survey agree with those by Moriguti and Nakamura (1998) within analytical errors.

To reveal the material cycle in the Earth interior, lithium isotopic ratio is a powerful tracer of the altered oceanic crust. Both lithium isotopes,  $7\text{Li}$  and  $6\text{Li}$ , are stable. Therefore, the Li isotopic ratio is constant regardless of age. In addition, it does not need account for the elemental differentiation of the mother and daughter species during subduction process.

The Li isotopic compositions of igneous rocks, however, are documented very scarce. Currently, the Li isotopic ratios have been analyzed by the thermal ionization mass spectrometry (TIMS). TIMS-analysis demands the delicate technique of the lithium purification and separation from other elements. The complete separation and purification of lithium is very difficult, because lithium has the similar cation exchange coefficient with the sodium, one of major element of igneous rocks. Moriguti and Nakamura (1998) adopted multi-stage column separation for the complete purification and separation, and succeeded the precise lithium isotopic analysis.

On the other hand, Li isotopic ratios measured by ICP multi-collector mass spectrometry (MC-ICP-MS) are lesser affected from other coexistent ion than those of TIMS. This means that we can analyze Li isotopic ratios precisely without delicate Li purification and separation. Furthermore, the Li amount consumed by MC-ICP-MS analysis is under 1/6 of that by TIMS, in the case of similar precision. Therefore, MC-ICP-MS can analyze Li isotopic ratios in Li-poor sample such as meteorite and mantle materials.

Li isotopic analysis by MC-ICP-MS has already developed by Tomascak et al. (1999). Referred to this paper, we developed analytical method for Li isotopic ratios of igneous rocks using IsoProbe (Micromass Co.), a new MC-ICP-MS, installed to Earthquake Research Institute, University of Tokyo. The reproducibility of 100ppb Li solution is 5 permil (1 sigma). Then consumption is 40ng Li. These reproducibility and consumption is similar to Tomascak et al. (1999). It is new point that our analytical system can measure not only Li isotopic ratios but also Sr and Nd isotopic ratios, together.

In addition, we tested that our analytical system can measure accurate Li isotopic ratios in igneous rock using the LSVEC Li standard (0) and the major elements in basalt. The artificial mixture of Li and other elements (Fe, Mg, Ca, Al, Na, K, Ti, P, V, and Mn) is in the proportion of typical basaltic rock.

There are four causes that make the measured  $d7\text{Li}$  values shift.

- 1) Effect of the Li blank and the coexistent ion derived from resin and solvent in use.
- 2) Effect of the coexistent ion derived from samples (incomplete separation).
- 3) Isotopic fractionation due to lack of leading Li fraction.
- 4) Isotopic fractionation due to lack of tailing Li fraction.

Among these causes, only No.4 (isotopic fractionation due to lack of tailing Li fraction) makes the measured  $d7\text{Li}$  value increases. Contrary to this, another causes (No.1-No.3) make the measured  $d7\text{Li}$  value decrease.

The tests certify that our analytical system can measure accurate Li isotopic ratio in igneous rock. Furthermore, we measured  $d7\text{Li}$  values in JA1, JB2, and JB3, the standard rocks of Japanese Geological Survey. Our  $d7\text{Li}$  values agree with those by Moriguti and Nakamura (1998) within analytical errors.