

Precise measurement of Sm isotopes by TIMS using double spike technique

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We have developed a method that allows precise determination of Sm stable isotopic ratios by use of TIMS and double spike technique. Double spike technique has the advantage in rigorously correcting the instrumental mass fractionation and thus measuring the small naturally occurred isotope variations in terrestrial and extraterrestrial materials.

Analytical conditions of the double spike technique such as spike composition, denominator isotope and mathematical formulation to solve the double spike problem are optimized by means of error propagation calculation [1, 2]. Tracers used in this study are ¹⁵⁰Sm and ¹⁵⁴Sm (¹⁵⁴Sm/¹⁵⁰Sm = 3.8044).

Repeated measurement is carried out for an in-house Sm isotopic standard prepared from Johnson Matthey Sm oxide reagent to test the precision of this method. Isotopic measurements of Sm are conducted at NU using VG Sector 54 with 7 Faraday detectors. All isotopes are measured relative to ¹⁵⁰Sm. The external standard deviation in delta ⁱSm (i =144, 147, 148, 149, 152 and 154) in 10 individual measurements is ± 0.06 ‰ per atomic mass unit (2SD) for all of the isotopes. Variation of 0.084 ‰ per atomic mass unit of Sm isotopes in natural samples is clearly resolvable with this method.

Our preliminary examination of 6 GSJ reference samples, including basalt, rhyolite and granite, show no variation of the Sm isotope ratios from the standards while GSJ reference sample JDo-1 (dolomite) shows a hint of heavy-isotope enriched fractionation.

References

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- [2] Galer S.J.G. (1999) *Chem. Geol.* **157**, 255-274.