

Development of an ultra high precision stable isotopic analysis of Sr by DS-TIMS technique

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Stable isotope fractionation is a frequently used geochemical tool to trace geological and geochemical processes, to estimate the temperature of the process, to discriminate the geological source of the material and to constrain marine elemental budgets (e.g. Hoefs, 2004). Application of the stable isotope fractionation of heavy elements, such as Fe, Zn, Cu and Sr to geology or environmental science is limited compared with the "traditional" light gaseous elements, such as H, C, O and N. One of the reasons for this is that the analytical precision is not small enough compared with the typical isotopic variability among geological and environmental samples. For example, the typical analytical uncertainty of $\delta^{88}\text{Sr}$ measured by MC-ICP-MS is around 0.05 to 0.1 permil, while the typical isotopic variability is about 1 per mil and about 3 permil for geological and meteorite samples, respectively (Ohno et al., 2008; Moynier et al., 2010; Charlier et al., 2012). To discuss the sub-permil order stable isotopic difference in nature, improvement of the analytical precision is required.

We are developing a technique for ultra high precision stable isotopic analysis of Sr by double spike thermal ionization mass spectrometry (DS-TIMS) using Thermo Finnigan Triton at Kochi Core Center. DS-TIMS has advantages over MC-ICP-MS technique in sensitivity and higher analytical precision for measuring isotope ratios of elements with low first ionization potential, including Sr. We will discuss the current state of the analytical precision and accuracy as well as the sources of analytical error that may affect the analytical results.

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