Stable isotope geochemistry of Ce and Nd using multiple collector-inductively coupled plasma-mass spectrometry

Takeshi Ohno[1]; Takafumi Hirata[1]

[1] Earth and Planetary Sci., TITech

Variations in the isotopic composition of light elements such as H, C, N, O or S have been well studied and now the stable isotope geochemistry using light elements became an essential part of geochemistry and contributed significantly to resolve various problems in Earth and planetary and environmental sciences. Several attempts to search isotopic variations in heavier elements were made in order to extend the utility and versatility of stable isotope geochemistry. However, precise and reliable isotopic analysis for heaver elements has been retarded because of the analytical difficulty mainly due to high ionization potential. Recently developed new mass spectrometric technique using inductively coupled plasma as an ion source has provided remarkable progress in stable isotope geochemistry using heavier elements such as Fe, Cu, Zn, Mo and Tl (Beard et al., 1999; Marechal et al., 1999; Zhu et al., 2000; Baring et al., 2001; Rehkamper et al., 2002). These pioneering studies have encouraged us to investigate isotopic variations of other elements that have not reported yet but could be more interesting.

In this study, we measured Ce and Nd isotopic compositions of several geochemical samples to test the possible isotopic variation in nature. To achieve precise and accurate isotopic measurements on 142Ce/140Ce, 146Nd/145Nd and 146Nd/144Nd, isobaric interferences and matrix elements must be chemically eliminated by means of ion extraction chromatography. In order to detect the small isotopic fractionation, mass discrimination effects on Ce and Nd isotopes were externally corrected by Sm. The resulting precisions of measurements for the 142Ce/140Ce and 146Nd/145Nd were better than 0.01% (2SD). In this presentation, Ce and Nd isotopic data on several geochemical materials and possible mechanism of isotopic fractionation will be discussed. We believe that the study of natural isotopic variation using rare earth elements has a potentially significant influence in geochemical research fields.