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Eu isotope fractionation in the granitoids derived from crustal material and granitoids derived from mantle material

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Variation of Europium (Eu) concentration in igneous rocks (i.e., Eu anomaly based on the chondrite normalized REE patterns) provides us a valuable information to understand the evolution history of igneous rocks. Eu anomaly in igneous rocks is derived from feldspar crystallization during magmatic differentiation. Eu has two stable isotopes (^{151}Eu and ^{153}Eu). Recently, Lee and Tanaka [1, 2] developed a method to precisely determine Eu isotope ratio by MC-ICP-MS using Sm internal standard (combined standard-sample bracketing and internal normalization, C-SSBIN). The authors [3] also reported that highly fractionated igneous rocks such as A-type granite and rhyolite with Eu large negative anomaly have relatively large Eu isotope fractionation (enrichment of ^{151}Eu lighter isotope). Magma of these highly fractionated igneous rocks are produced by melting of a source materials under crustal environment. In addition, Lee et al. [4] reported that anorthosite with Eu large positive anomaly was enriched in ^{153}Eu heavier isotope. Source magma of anrothosites were derived from mantle or lower crust. In this study, we supposed that trend of Eu isotope fractionation between the granitoids derived from mantle material and the granitoids derived from crustal materials is different. In order to confirm this idea, we compared Eu isotope ratios and the distribution of rare earth elements of the granitic rocks derived from crustal material and mantle materials. As a result, our data showed that the granite derived from mantle materials had both a positive Eu anomaly and geochemical features such as enriched in ^{153}Eu like anorthosite or depleted in ^{153}Eu like gabbro. This is different trend from granitoids derived from crustal materials. Therefore, in this conference, we will discuss a geochemical implication of Eu isotope fractionation between two granitoids derived from crustal material and mantle materials.

[1] Lee & Tanaka, T. (2019), *Spectrochim. Acta Part B* **156**, 42–50. [2] Lee & Tanaka (2021), Int. J. Mass Spec. 469, 116668, [3] Lee & Tanaka (2021), Geochem. J., 55/6, e9-e17. [4] Lee et al. (2022) 15 October 2022, PREPRINT (Version 2) available at EarthArXiv, https://doi.org/ 10.31223/X5QQ05