

Eu isotope fractionation in highly altered mafic volcanic rocks

SEUNG-GU LEE¹, SHUANGSHUANG CHEN², TAEJONG LEE¹, SUNG HI CHOI³, HYEONCHEOL KIM¹, UNG SAN AHN⁴ AND SEUNG RYEOL LEE¹

¹Korea Institute of Geoscience and Mineral Resources

²Sun Yat-sen University

³Chungnam National University

⁴Jeju Special Self-Governing Province World Heritage Office

Eu is one of rare earth elements and has two stable isotopes (¹⁵¹Eu and ¹⁵³Eu). Recently, several groups reported a method that Eu isotope ratio can determine precisely by MC-ICP-MS using Sm or Nd internal standard [1-4]. In addition, the possibility of Eu isotope fractionation in igneous rocks has recently begun to be reported [5-8]. Particularly, Lee et al.[6] showed that Eu isotope fractionation has a correlation with Eu anomaly in chondrite-normalized REE pattern, and interpreted that Eu isotope fractionation was produced during magma differentiation. By the way, Hu et al.[7] proposed a possibility that Eu isotope fractionation is likely to be produced by a reaction with hydrothermal solution during magma differentiation. LOI concentration in mafic alkali volcanic rocks can be a useful indicator of volcanic rock alteration or calcitization of mafic minerals [9]. It means that hydrothermally altered igneous volcanic rocks with high LOI concentration may have large variation in Eu stable isotope ratio. Therefore, we checked Eu isotope ratio for various kinds of mafic volcanic rocks from sub-alkaline basaltic rocks to highly altered alkali basaltic rocks to imply the geological origin and geochemical implications of Eu isotope fractionation. As a result, we observed large Eu isotope fractionation in highly altered alkali basaltic rocks, which indicates that Eu isotope fractionation can be produced by hydrothermal reaction besides magma differentiation. In this conference, based on the results mentioned above, we discuss Eu isotope fractionation for various kinds of mafic volcanic rocks to clarify the geological origin and geochemical implications of Eu isotope ratio variation in Earth system.

[1] Lee and Tanaka (2019) *Spectrochim. Acta Part B* 156, 42-50; [2] Lee and Tanaka (2021a) *Inter. Jour. Mass Spec.* 469, 116668; [3] Nicol et al. (2023) *Jour. Anal. Atom. Spec.* 38, 1261-1274; [4] Wu et al. (2024) *Anal. Chem.*, 96, 15102-15107; [5] Lee and Tanaka (2021b) *Geochem. Jour.* 55, e9-e17; [6] Lee et al. (2023) *Geosci. Jour.* 27/3, 271-284. [7] Hu et al. (2023) *Geochim. Comochim. Acta*, 348, 323-339; [8] Schauble (2023) *Geochem. Jour.* 57/4, 118-133; [9] Pandarinath et al. (2024) *Geochemistry*, 83/4, 126200.