^{146}Sm-^{142}Nd Whole-rock Isochron Age of Basaltic Eucrites

SAYA KAGAMI[1*], TETSUYA YOKOYAMA[1], TOMOHIRO USUI[1]

[1] Tokyo Institute of Technology, Tokyo 152-8550, Japan
(*kagami.s.ab@m.titech.ac.jp)

Eucrites are considered to derive from the crust of asteroid 4-Vesta's crust. They are petrographically classified into basaltic and cumulate eucrites. Determination of precise ages for eucrites will constrain the period of igneous activity and the subsequent thermal metamorphism of Vesta. The Sm-Nd dating is one of the most suitable approaches for investigating the timing of crust formation. Bouvier et al. [1] revealed that the variation of Sm/Nd ratios for basaltic eucrites was several times smaller than the entire range of Sm/Nd ratios for all eucrites, making it difficult for obtaining the precise ^{146}Sm-^{142}Nd isochron age for bulk aliquots of basaltic eucrites.

In this study, we determine the ^{146}Sm-^{142}Nd age for five basaltic eucrites. The samples were decomposed with HF, $HClO_4$, and HNO_3. After the sample digestion, ~10% of the solution was removed and mixed with the ^{149}Sm- and ^{145}Nd-enriched spikes to precisely determine the Sm/Nd ratios by ID-ICP-MS [2]. The remainder of the sample solution was used to determine ^{142}Nd/^{144}Nd ratios by TIMS with the dynamic multicollection method [3]. The Nd was separated from major elements, Ce, and Sm by a three-step column chemistry procedure.

The whole-rock isochron of basaltic eucrites yielded the ^{146}Sm-^{142}Nd age of 4559^{+41}_{-57} Ma. Although the errors of the isochron are relatively large, the whole-rock ^{146}Sm-^{142}Nd age of basaltic eucrites is indistinguishable from that of cumulate eucrites obtained previously (4556^{+30}_{-37} Ma). This implies that the whole-rock Sm-Nd isochron ages for basaltic and cumulate eucrites most likely represent the timing of global differentiation of the silicate part of Vesta. It is important to note that the timing of global silicate differentiation is nearly contemporaneous to the timing of metal-silicate segregation in Vestadeduced from the age obtained by the ^{182}Hf-^{182}W systematics [4]. The result supports an idea that eucrites formed by equilibrium and fractional crystallization of silicate part of Vesta immediately after a magma ocean.

[1] Bouvier, A. et al. (2015) *Meteoritics & Planet. Sci., 50,* 1896–1911. [2] Kagami, S. and Yokoyama, T. (2015) *Goldschmidt,* Abstract #3177. [3] Fukai, R. et al. (2015) *Goldschmidt,* Abstract #4031. [4] Kleine, T. et al. (2004) *GCA*, 68 2935–2946.