**Rare earth element geochemistry in zircons from basaltic eucrites.** M. Kikuchi[1], A. Yamaguchi[1], K. Horie[1] and H. Hidaka[2], [1]National Institute of Polar Research, [2]Hiroshima University.

**Introduction:**

Howardite-Eucrite-Diogenite (HED) meteorites are widely believed to come from the asteroid 4 Vesta, characterized as the smallest terrestrial planet. Among HED meteorites, eucrites are thought to form the topmost part of the crust in their parent body, and therefore will provide hints to understand the mechanism of material evolution of terrestrial planet in the early solar system.

In this study, we noted the rare earth element (REE) abundance in zircons ($ZrSiO_4$) from basaltic eucrites. Zircon tends to incorporate trace elements useful as geochemical tracer and has general resistance to chemical and physical breakdown. These features result in keeping geochemical information, such as formation processes and thermal history. Especially, quantitative treatment of Ce and Eu abundances in REE pattern of zircon has been recognized as an indicator of oxygen fugacity during crystallization.

The purpose of this study is to understand the formation processes of various eucrite zircons from quantitative analyses of major elements and *in-situ* REE isotopic analyses.

**Sample and analytical method:**

Six basaltic eucrites (Y-792510, Y-82082, Y-75011, A-881467, Juvinas, Stannern) were used in this study. Each sample was cut and mounted in a resin disk of 2.5 cm diameter. The surface of the sample was polished with diamond paste.

Before *in-situ* isotopic analyses, mineral observations and quantitative analyses of the polished sections were carried out using an electron probe micro-analyzer (EPMA: JEOL JXA-8200).

A sensitive high resolution ion microprobe (SHRIMP II) was used for *in-situ* isotopic analyses in this study. For the REE measurements, we checked both of the energy filter method and high-resolution method to avoid the isobaric interferences of the oxide and unknown species onto atomic REE ion peak. In energy filter method, the analytical spot was about 20 μm at the minimum. On the other hand, in the high-resolution method, it was about 5μm. Because most of eucrite zircons have a diameter of less than 10 μm, we used the high-resolution method set to higher than 8800 ($M/\Delta M$ at 1% of peak height) in this study. The masses of $^{96}$Zr, $^{139}$La, $^{140}$Ce, $^{141}$Pr, $^{143}$Nd, $^{146}$Nd, $^{147}$Sm, $^{149}$Sm, $^{151}$Eu, $^{153}$Eu, $^{155}$Gd, $^{157}$Gd, $^{159}$Tb, $^{161}$Dy, $^{163}$Dy, $^{165}$Ho, $^{166}$Er, $^{167}$Er, $^{169}$Tm, $^{172}$Yb, $^{175}$Lu, $^{178}$Hf and $^{180}$Hf were scanned for the REE isotopic analyses. For calculation of REE concentration, 91500 was used as a standard material. In addition, SL13 was also used to check an agreement between our data and reference values.

**Results and discussion:**

The quantitative analyses of major elements in zircon revealed that Ti content in eucrite zircon is higher than that of terrestrial zircon. In addition, Ti content in zircons found in Stannern is slightly higher than the other eucrite zircons. It has been reported that Ti content in zircons is related with the temperature during crystallization [1]. The difference of Ti contents in zircons among eucrites could indicate the different temperature of magmas which formed each eucrite zircon. The range of variation of Zr/Hf ratio in analyzed zircons is different among eucrites. The zircons from Y-792510 have the smallest variation of Zr/Hf (36.5-46.4). On the other hand, the zircons from Stannern have the largest variation of Zr/Hf (25.0-66.8). This result suggests that the zircon in Y-792510 might have been formed by more chemically homogeneous melt than the melt which formed the Stannern zircon.

The zircons (> 10 μm) from Y-792510, Y-82082, A-881467 and Stannern were analyzed. The HREE abundance of zircons from Y-792510, Y-82082 and A-881467 are relatively agreement (Lu content = 1000 × C1 chondrite). On the other hand, zircons from Stannern show wide variation of HREE abundance (Lu content = 1000-10000 × C1 chondrite) (Fig. 1). The variation in zircons from Stannern could be resulted from relatively chemically heterogeneous magma. In this study, all zircons show distinctive negative Eu anomaly and, except for zircons from Y-82082, positive Ce anomaly. The REE abundances in zircons from A-881467 and Stannern have been reported in previous works and shown strong Eu depletions but no Ce anomaly [2, 3]. The positive Ce anomaly observed in this study might be due to (1) problem of analytical method, or (2) magma which formed the zircon under higher oxygen fugacity.

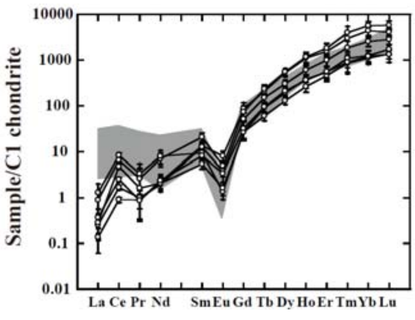


Fig. 1 REE patterns of six zircons from Stannern. Shadow zone shows the previous data from [3].

**References:**

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