

**REE CHARACTERISTICS OF AN IGNEOUS INCLUSION IN THE YAMATO-75097 L6 CHONDRITE:** Noritoshi Morikawa<sup>1</sup>, Keiji Misawa<sup>1</sup>, Noboru Nakamura<sup>1</sup> and Keizo Yanai<sup>2</sup>, <sup>1</sup>Department of Earth and Planetary Sciences, Kobe University, Nada, Kobe 657, <sup>2</sup>National Institute of Polar Research, 9-10, Kaga, Itabashi, Tokyo 173, Japan.

As a part of consortium studies of large igneous inclusions (a few cm in size) in three YAMATO ordinary chondrites (Y-75097 L6, Y-793241 L6 and Y-794046 H5)[1,2], we report here results of REE analyses for the troctolitic inclusion (olivine + plagioclase + chromite + chlor-apatite/merrillite) in Y-75097. The inclusion and host of Y-75097 were severely shocked and the Rb-Sr systematics was perturbed by a 460 Ma event which was defined by the K-Ar age [3,4, 5]. Olivines (Fa<sub>25</sub>) in both host and inclusion are equilibrated but plagioclase of the inclusion (An<sub>12-19</sub>) is partially equilibrated with that of the host (An<sub>12</sub>). The inclusion has the oxygen isotopic composition close to H-group while the host has that of L-group [6]. The REE abundances in the inclusion mantle are highly fractionated [7,8]. In this work, in order to investigate detailed REE distributions in the different parts of inclusion, precise isotope dilution analyses were carried out for specimens (#105) cut through the host/inclusion boundary to the inclusion core.

In Fig. 1, the specimen A sampled from the merrillite-rich core shows the highest and slightly light-REE enriched pattern (~20xO-chondrite) and a large negative Eu anomaly. This pattern reflects REE partitioning of phosphates and is complimentary to that of the merrillite-poor mantle which has a remarkable REE fractionation with middle REE depletion and a large positive Eu anomaly. The specimens B and C taken from middle parts of the inclusion show less fractionated but have the complimentary nature each other. Such REE features have been expected from the calculation of equilibrium REE partitioning between phosphate and other minerals (olivine and plagioclase) for the unfractionated REE in bulk inclusion [7]. However, it is worth noting that all specimens indicate light-REE enrichment relative to the middle REEs. Hence, the weighted mean REE abundances calculated for the bulk inclusion are slightly light-REE enriched (La=-2.8 and Lu=-1.5xO-chondritic). The REE model calculations of partial melting and fractional crystallization show that the REE patterns estimated for the melting residue or the crystallized solid with the mineral assemblage of 90% olivine + 9% plagioclase + 1% Phosphate are light-REE depleted and is different from the calculated bulk REE pattern (Fig. 1). This implies that the inclusion formed without solid/liquid separation resulting in REE fractionation. It is suggested that equilibrium REE partitioning was established during the early thermal metamorphism after the igneous formation. We suggest that the inclusion formed by melting and segregation of metal-sulfides from H-chondritic material with troctolitic composition but with grossly unfractionated REE abundances, and was then incorporated into the L-chondritic parent body and subjected to the early thermal metamorphism which eventually fractionated the REE significantly by solid/solid

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equilibrium partitioning and to a late impact event.

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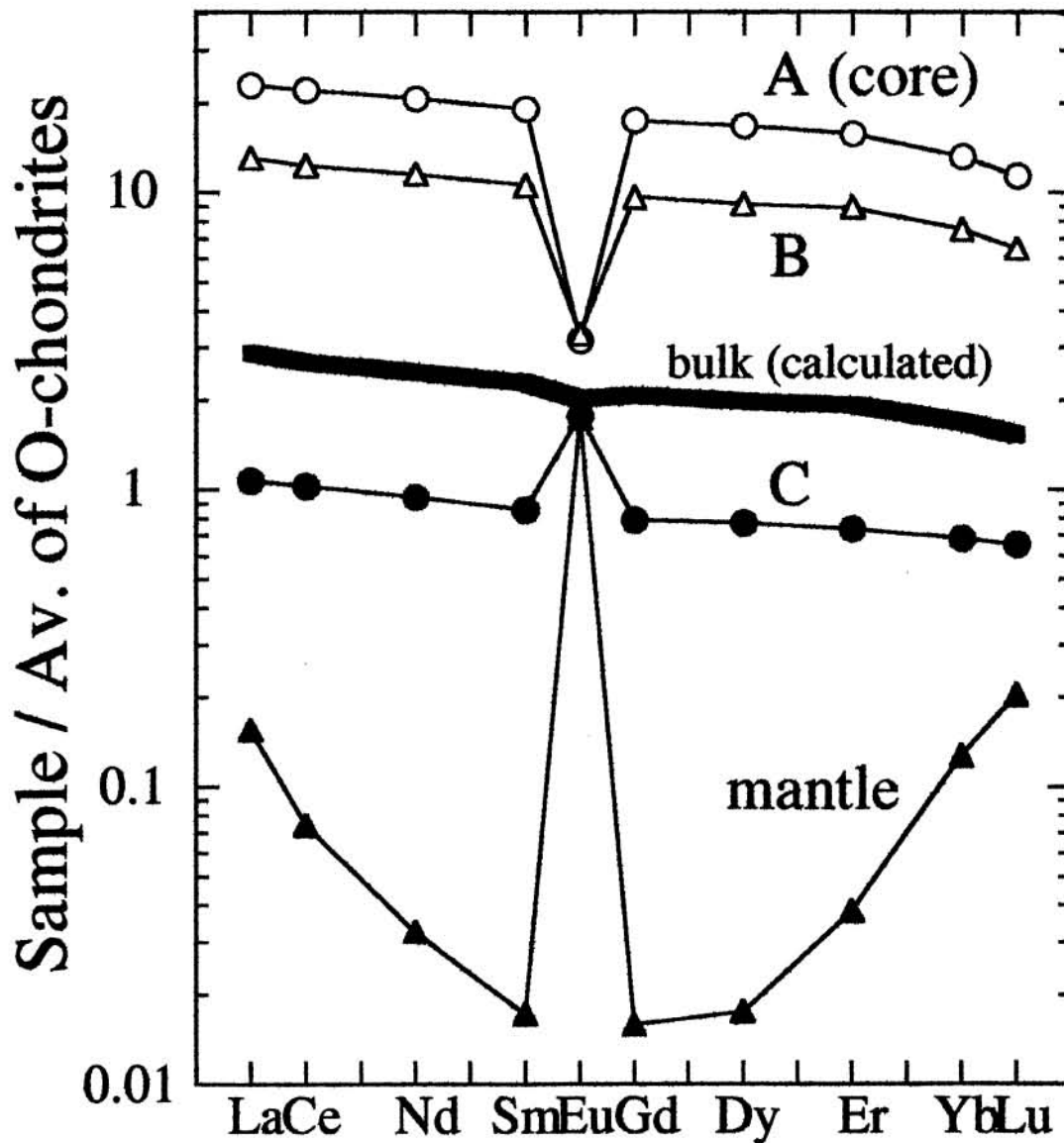


Fig. 1 Ordinary chondrite-normalized REE patterns for different parts of the troctolitic inclusion in the Y-75097 L6 chondrite.