MINERALOGY OF NEW LITHIC CLASTS IN POLYMICT EUCRITES AND POSSIBLE CRYSTALLIZATION OF DIOGENITE FROM A EUCRITIC MELT. Hiroshi Takeda and Tohru Aoyama, Mineralogical Inst., Faculty of Science, University of Tokyo, Hongo, Tokyo 113, Japan.

During our study of variability of clast types within a large polymict eucrite, we found some clasts which have not been reported previously. Some characteristic lithic and mineral clasts have been used to identify the pairing of the Antarctic polymict eucrites (1,2). Such study is important to test a hypothesis that some Antarctic meteorites are different from non-Antarctic ones because of their very old terrestrial ages. Some Antarctic meteorites might have been derived from a portion of the parent body never sampled previously. We studied large polished thin sections (PTS) sampled from different portions of large polymict eucrites, Elephant Moraine (EET) 83228, 83227 and 79006 and Yamato 792769 by the mineralogical techniques. One large chemically zoned pyroxene clast found has a core more magnesian than the diogenitic orthopyroxenes. This finding implies close genetic link between howardites, eucrites, diogenites (HED) meteorites because howarditic orthopyroxenes more magnesian than diogenitic ones may be crystallized from a eucritic magma.

Petrology of EET79006 and EET83227 have been reported previously (3,4), but some lithic clasts found in the new PTSs are different from them. One dominant clast type of the EET polymict eucrites, which is rather rare in the Yamato suites is the ordinary eucrite clast. This type of eucrite is common in the non-Antarctic meteorite collections, and was classified as the Juvinas (JV) type. They show coarse-grained texture with exsolved pigeonite of the uniform host composition. The chemical compositions of the pigeonite in such clasts (OE in Fig. 1a,b) differ from one clast to another but within the range of the known JV-type monomict eucrites of the non-Antarctic collections. The OE-type clasts are fairly common in three EET polymict eucrites. When they are brecciated and the boundaries are merged into the matrix, they look like a metamorphosed polymict eucrite such as EET79004 and 79011 described by Delaney et al. (2).

One large low-Ca pyroxene (DE) clast 1.9 x 0.63 mm in EET83227,16 has a core composition more magnesian than the diogenitic orthopyroxenes. The highest mg number (=Mg/Mg + Fe) is over 80. Okulewicz and Delaney (4) reported diogenitic orthopyroxene in EET83212 and 83227, but unlike diogenitic pyroxenes this crystal is zoned from mg = 80 to 50 (Fig. 1b), indicating rapid growth from the basaltic magma. Although the pyroxene shows Fe enrichment towards the rim, there is found no plagioclase as in common eucrites. This trend is consistent with no enrichment of Ca towards the rim. This fact implies that they are crystallized in an early stage, before the enrichment of Ca in the melt.

The most Mg-rich core composition found in the pristine basaltic clasts of the Y75011,84-type eucrite is $Ca_5Mg_{68}Fe_{27}$ found in Y75015,20 (1). Because the bulk composition of the basalt is eucritic, this composition has been the most Mg-rich pyroxene comparable to the common diogenites, which is to be crystallized from the eucritic partial melt. More Mg-rich orthopyroxenes have been commonly found in the howardites. This fact has been taken as the evidence that the crystal fractionation model from the eucritic partial melt is not supported to account for the one step fractionation. The finding of the Mg-rich pyroxene comparable to that in howardites, gives the support for the presence of eucritic melt which will crystallize the

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howarditic pyroxenes. The evidence that there are common basaltic lava on the same parent body is supported by our finding of the Pasamonte-type zoning trend (1) in the subophitic basaltic clast in EET83227,16 (Fig. 1c). Such clast has not been found in EET79006 by Simon and Papike (3). The most Mg-rich core composition gives mg = 76, implying that the same melt may have crystallized the DE clast.

Many models have been proposed to account for the genetic link among the HED achondrites (e.g. 5, 6). Three main conditions to make a choice between serial melting (5) and shallow magma ocean (6) models were: (a) the liquid that crystallized diogenites is not represented in the HED meteorites; (b) pyroxene/olivine cotectic line should not be at the quartz-side of the pyroxene-plagioclase line in the olivine-plagioclase-quartz pseudo-ternary liquid diagram for the crystal fractionation model; (c) fractionation did not proceed beyond the peritectic point where the clustering of ordinary eucrites are observed. The new architecture of the Ol-Pl-Qtz diagram by Longhi and Pan (7) are in favor of the magma ocean model for conditions (b) and (c). Our finding of the zoned magnesian pyroxene gives a support for this model also for (a).

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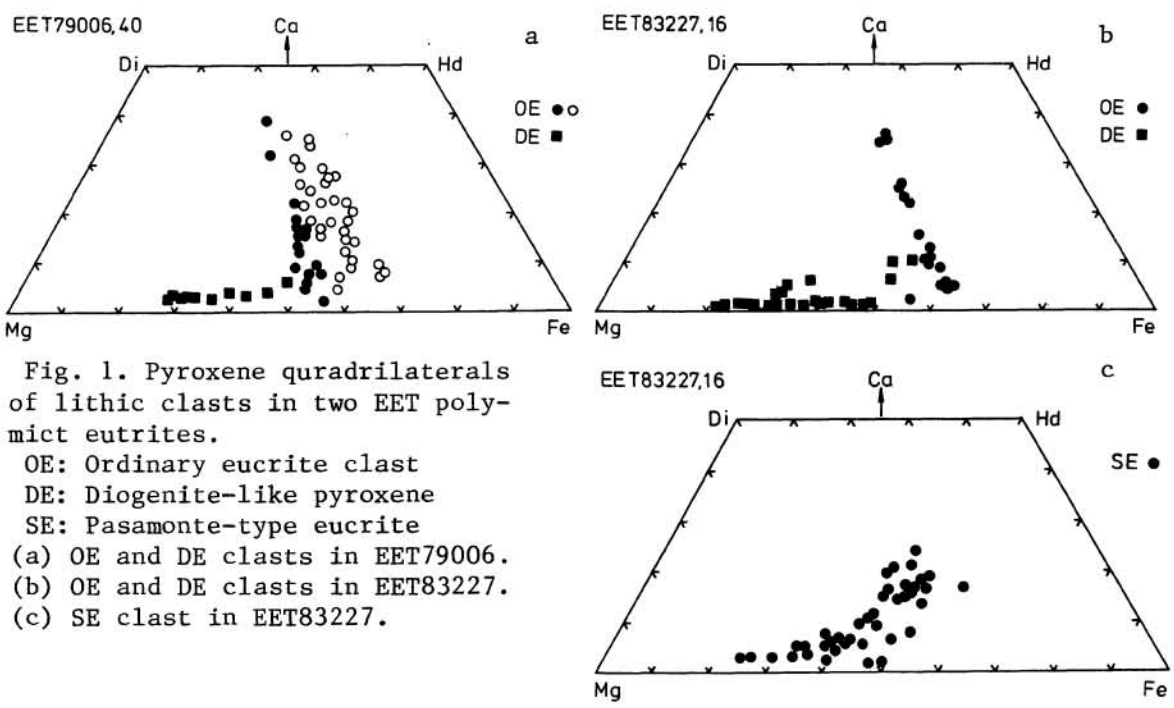

Fig. 1. Pyroxene quradrilaterals of lithic clasts in two EET polymict eutrites.
OE: Ordinary eucrite clast
DE: Diogenite-like pyroxene
SE: Pasamonte-type eucrite
(a) OE and DE clasts in EET79006.
(b) OE and DE clasts in EET83227.
(c) SE clast in EET83227.