PETROGENETIC RELATIONSHIPS AMONG EUCRITE CLASTS IN LEW85313 HOWARDITE. J. L. Berkley, Dept. of Geosciences, SUNY College at Fredonia, NY 14063

LEW85313 is a complex polymict breccia (1) composed of diogenite and eucrite lithic clasts and single crystals, displaying a variety of exsolution textures. LEW85313,8 pts is dominated by a single, 5mm feldspar-rich diogenite fragment; in contrast, LEW85313,22 contains fewer, and smaller, diogenite clasts, but numerous well-preserved, plutonic eucrite clasts including one layered cumulate (E6 below). Bulk compositions of some of these eucrite clasts were calculated using weighted averages of electron microprobe analyses of principal silicate minerals. Modes were determined by using Tracor Northern's Image Processing Program (IPP) to digitally analyze backscattered electron images.

Petrographic descriptions: Eucrite clasts

E6-cumulate: Composed of highly zoned, unexsolved pigeonite (core:Wo8,En63) and plag. (An92). Elongate grains with high aspect ratios (up to 0.6 mm long) define a prominant foliation. Plagioclase and probably some pigeonite are cumulus grains. Fine grain interstitial areas contain FeS, silica, ilmenite, and FeO-rich augite (Wo38,En23).

E7-ophitic microgabbro: Composed of unexsolved pigeonite (Wo9,En50) and plag. (An96) up to 0.2 mm long. Minor fayalite occurs apparently "replacing" pyroxene and as tiny veins in pyroxene. May represent interior of a thick flow.

S1-"simplectite": Fine-grained, variolitic intergrowth of pigeonite (Wo16,En39), plag. (An97), and silica. May represent eutectoid composition (see below).

S2-ophitic microgabbro: Similar to E7 above but finer grained (longest plag. grains = 0.06 mm). Pyroxene is inverted pigeonite (host=Wo4,En55; lam.=Wo42,En39); plag. composition is An95.

S3-"aplite" cutting microgabbro: Displays two size fractions with equigranular textures: fine area (comp. shown in figs.) 25 micron dia. orthopyroxene (Wo4,En36), and K-rich plagioclase feldspar (An73,Ab4,Or23), and coarse area with augite showing exsolution (host:Wo35,En31; lam.:Wo3,En36) and plag. (An92). Max. grain dia. equals 0.2 mm. The fine area may represent an aplite-like vein intruding the coarser material.

Discussion

Most clast compositions cluster near the "A" peritectic minimum in the Ol-saturation field (Fig. 1) as for monomict eucrites plotted by (2). However S1 (pl-px-si simplectite) shows pronounced silica-enrichment and plots firmly in the pig.-plag. field. This could be attributed to pig.-plag. fractionation from a parent like S2 (most MgO-rich of gabbroic clasts) and, in fact, mixing calculations show that S1 can be derived from an S2 parent by 7% fractionation of a 40:60 px/plag. mixture. However, S1 plots in the "peritectic basalts" field of (3), not the "evolved basalts" field in terms of An-En, and S1 contains less bulk $Na_2O$ compared to S2 precluding a direct parent-daughter relationship. The presence of significant modal silica (5-10%) would normally suggest evolution by crystal fractionation from an original composition near A (Fig. 1), however, high An content in plag. (An97) indicates limited crystal fractionation. A derivation at a melting minimum other than A (lower T) must be considered.

The other clearly "evolved" clast, the fine-grained "aplite" in S3, plots toward Fa from Juvinus in Fig. 1 and otherwise plots in the "evolved" field of (3) and contains enriched bulk Na and Fe compared to all other samples. It can be derived from S2 by 10% fractionation of 40:60 plag./pig. This may be fortuitous, however, as bulk S3 "aplite" plots in the Ol-Plg field of Fig. 1. The cumulate clast, E6, plots in the cumulate field of (3) and otherwise shows indications of being the most "primitive" clast with, for example, the highest Cr and Mg/Fe. Bulk Na is anomolously high, however, highest among all clasts at 0.38 wt.%.

Bulk CaO/Al2O3 (Fig. 2) for samples is near-chondritic or somewhat sub-chondritic compared to CI. Samples plot on a linear trend that eventually intersects the anorthite composition off Fig. 2. This suggests a primary origin by relatively high degrees of partial melting ( 20%) from a chondritic source as calculated for monomict eucrites by (4). Barring later fractionation effects, different positions along the Ca/Al trend suggest origin by differing degrees of partial melting from similar source materials. Note, however, that S1 (simplectite) lies removed from the other clasts with the highest Ca and Al (but lowest CaO/Al2O3 ratio). S1 also contains the lowest bulk FeO/MnO (30.0; highest is 33.6 in S3 "aplite"), and lowest Na of all clasts. This indicates that the S1 source area may have been mineralogically, or at least chemically distinct from that which generated other clast compositions. A more constrained explanation of this and other problems posed by LEW85313 clasts must await clast separation and precise trace element and isotopic analysis.

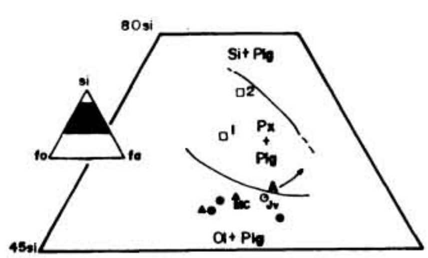


Fig.1.Pseudo-ternary system Si-Fo-Fa after (2). Closed circles=non-cum. eucrites, this study;triangles=cum. eucrites incl. Moore Co.(MC); Jv=Juvinus; open squares=Si:1=5%Qz,2=10%Qz in mode.

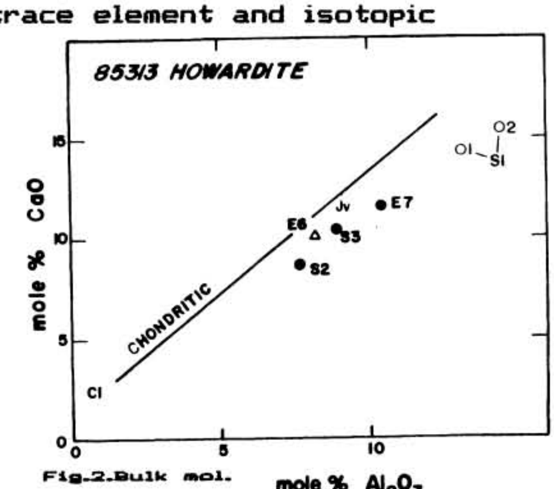


Fig.2.Bulk mol. CaO vs Al2O3. Symbols as in Fig. 1.

(1) Berkley, J. L. (1988) LPSC XIX, 63-64. (2) Stolper, E. (1977) GCA 41, 587-611. (3) Delaney, J. S. et al. (1981) LPSC XII, 211-213. (4) Jones, J. H. (1984) GCA 48, 641-648.