

LEW85313 HOWARDITE: CLUES TO THE DIOGENITE-CUMULATE EUCRITE CONNECTION? J. L. Berkley, Dept. of Geosciences, SUNY, College at Fredonia, NY 14063

LEW85313, previously described as a diogenite (1), is a complex polymict breccia dominated by a "large" (min. 5mm dia.), texturally coherent diogenite lithic clast. Other clasts include a monomict, cumulate eucrite breccia (1.1mm dia.), a finely brecciated, polymict eucrite, and other, more exotic components (too numerous to describe). Lithic clasts reside in a matrix breccia primarily consisting of angular plagioclase and pyroxene fragments (most showing exsolution textures; fig. 1) with minor Fe-rich olivine, silica, sulfides, Cr-spinel, ilmenite, and shock-melt glass. LEW85313,8 is similar in many respects to ALHA78006 (2), although differences are noted below.

#### Diogenite clast

This is ostensibly a typical diogenite, primarily composed of hypersthene (mg=71, Wo=2.3) with blebby augite lamellae (mg=82, Wo=45; fig. 2). One pigeonite grain was analyzed (mg=67, Wo=13.5; fig. 2), but no olivine. Unlike other known diogenites in which feldspar is a rare accessory, this clast contains relatively abundant plagioclase (An=95) as irregularly distributed patches, presumably of postcumulus origin. Hyp. composition falls intermediate in 78006 diogenitic pyroxene range established by (2) (fig. 2), but Cr-Al values in the 85313 diogenite clast are the lowest among known diogenites - compared to extremely high Cr-Al in 78006 pyroxene (fig. 3).

#### Monomict eucrite

This clast is a gabbroic breccia with restricted mineral compositions suggesting a monomict character. It originally contained two primary pyroxenes (as in fig. 1B), pig. and augite. Both pyroxenes show exsolution; inversion of pig. to an opx host plus (001) augite lamellae, and development of pig. lamellae parallel to (001) in an augite host (fig. 2). These pyroxenes are far more FeO-rich than known cumulate eucrites, and lie in the FeO-rich range of 78006 eucritic pyroxene (fig. 2). Plagioclase (An=94) is only slightly more Ab-rich than diogenite plagioclase (above), but shows a lower mg value (0.24 vs 0.32) consistent with respective pyroxene compositions. Its two-pyroxene mode suggests a high-Ca parent liquid compared to other eucrites.

#### Polymict eucrite

This tiny clast (0.6mm dia.) is a finely brecciated mixture of several eucrite compositions, although one pyroxene composition predominates (fig. 2). Analyzed pyroxenes are all inverted pig. with opx ranging from mg=71-34, the latter being the most common. The common pyroxene composition lies in the mid range of 78006 eucritic compositions and is more MgO-rich than pyroxene in the monomict clast (above). Plagioclase composition range is An=92-99.

#### Monomineralic breccia clasts

Monomineralic fragments consist of mostly plagioclase and pyroxene, largest grains being about 0.5mm dia. Most plagioclase (An=92-98; av. 94) occurs as maskylenite, rarely as twinned grains (one of which displays augite exsolution lamellae). Pyroxene grains show a variety of exsolution styles from complex with multiple lamellae generations and orientations, to simple lamellar exsolution (fig. 1). Juvinus-type, zoned pyroxenes do not occur - or have so far eluded detection. Compositions show a range comparable to 78006 eucritic pyroxene (fig. 2). Diogenite pyroxene compositions range from mg=75-71, and are less abundant than eucritic grains.

#### Discussion

Abundance of eucrite breccia clasts indicates an origin by repeated impacts. Sampled materials represent a wide - and relatively deep - depth

band within the parent body as suggested by varying pyroxene host-lamellae tie-line lengths (fig. 2) and wide variety of exsolution textures (simple, complex, annealed; fig. 1). Evidence of surface or hypabyssal crystallization (eg. zoned grains, uninverted pig.) is lacking. Although no direct petrogenetic link between lithic clasts was established here (see fig. 3), the plagioclase-rich diogenite clast may represent a transitional cumulate layer to overlying cumulate eucrites (as observed in terrestrial, minor layered sills). Similar plagioclase compositions between diogenite/eucrite clasts are consistent with this hypothesis.

References

- (1) Ant. Met. Newslett. (1986), 9(3), p.22.
- (2) Takeda, H. et al. (1980), Mem. Nat. Inst. Polar Res. 17, 119-144.
- (3) Harlow, G. et al. (1979), EPSL 43, 173-181.

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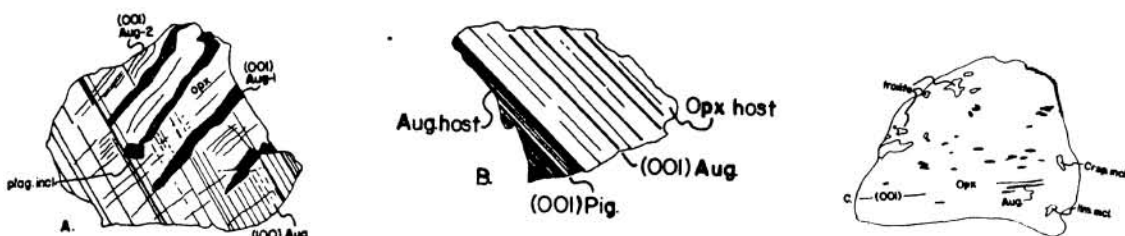


Fig. 1: Examples of exsolution textures

Fig. 2: Px quadrilateral. Data for M=Moama, sdm=Serra de Mage, M=Moore Co. from (3). ALHA78006 data from (2).

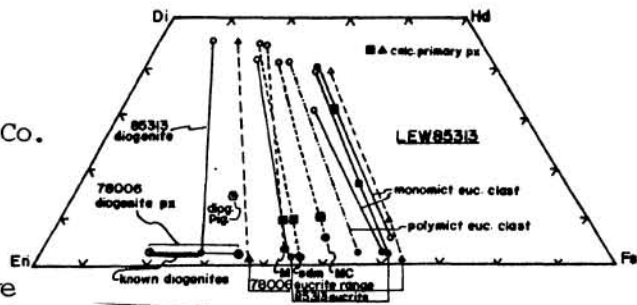


Fig. 3: Cr vs Al in diogenite and eucrite low-Ca pyroxene. Comparative data as above; other Ant. diogenite data from Berkley, J., LPS XVIII(1986).

