

72705

Impact Melt Breccia
St. 2, 2.39 g
INTRODUCTION

72705 is a vesicular impact melt that is probably a fine-grained variant of the common Apollo 17 LKFM composition such as forms Boulders 2 and 3 at the sample station. It contains two conspicuous white clasts, the investigated one of which is a cataclasized troctolitic anorthosite with flame-textured plagioclases.

72705 was picked from the soil collected with the the second rake sample from Station 2, on the southeast rim of Nansen crater. 72705 was described as a miscellaneous sample in LSIC

Apollo 17 (1973), consisting of "one-half crushed anorthosite and one-half black glass. The glass is highly dust-coated." According to Keil et al. (1974), 72705 is 1.6 x 1.0 x 0.7 cm, and medium dark gray (N4). It is subangular (Fig. 1) and coherent, with a few non-penetrative fractures, about 1 % small vugs, and no zap pits. Matrix material (less than 1 mm grain size) appeared to be a devitrified glass and was estimated as 90⁰10 of the sample; the remainder appeared as white plagioclase clasts up to 3 nun across. The two white clasts became more conspicuous on breaking the sample.

PETROGRAPHY

72705 has a fine-grained mainly crystalline melt matrix that consists dominantly of plagioclase, pyroxene, some olivine, and cryptocrystalline or possibly glassy interstitial material. It contains conspicuous spherical vesicles, and is clast-rich (Fig. 2). The groundmass appears similar to that of 76035, one of the finest-grained of the Apollo 17 LKFM samples, except that the olivine microphenocrysts in 72705 are not so well developed. Warren and Wasson (1979), however, described the matrix as cataclastic,

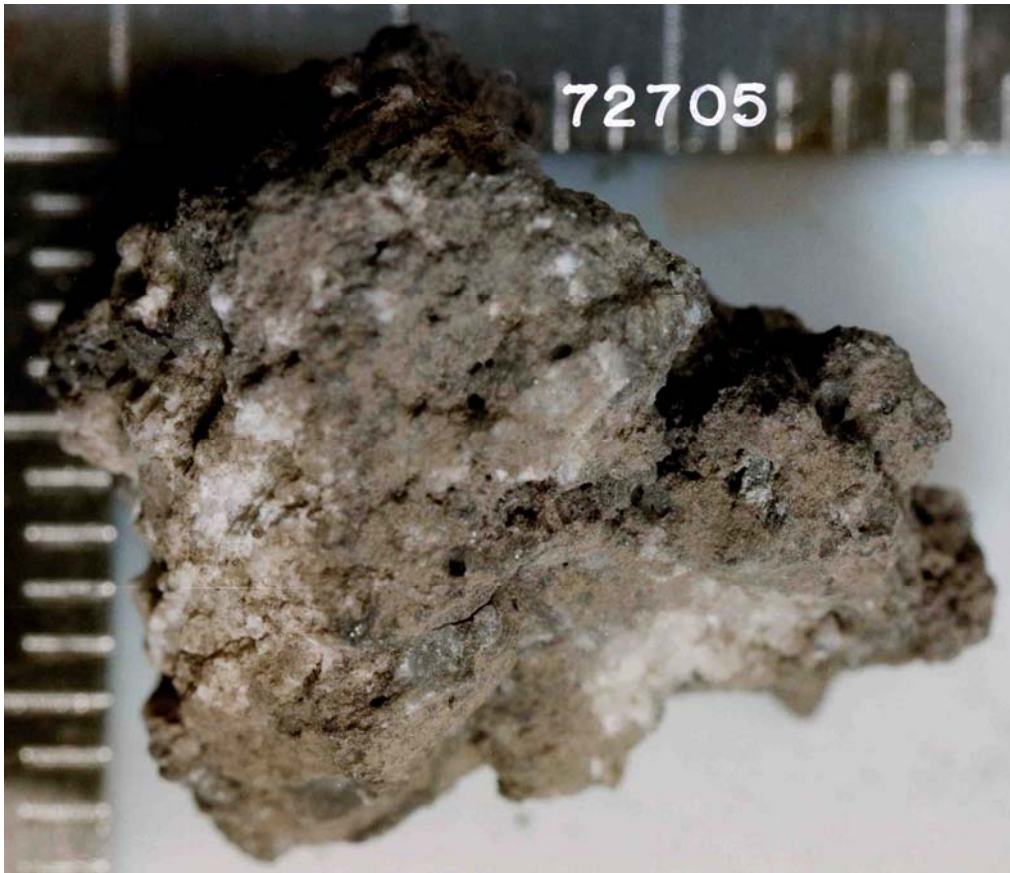


Figure 1: Sample 72705. S-73-33444. Smallest scale divisions in millimeters.

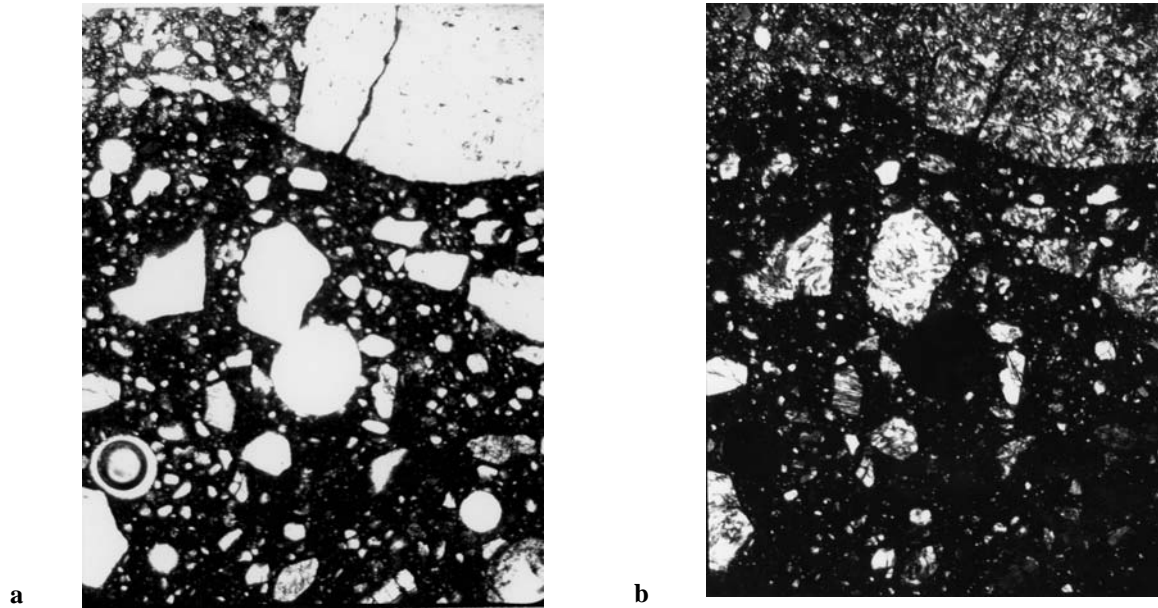


Figure 2: Photomicrograph of 72705,4, showing vesicular dark groundmass and flame-textured plagioclase in clast A. Width of field about 1 mm. a) plane-transmitted light. b) crossed polarizers.

inconsistent with Warren (1979), who had described it as granulitic.

The mineral clasts include both very rounded and very angular varieties. Warren and Wasson (1979) analyzed silicate mineral fragments, and found them all to be olivines and plagioclases with compositions identical with those in the white lithic clast they analyzed (Fig. 3 and below). Nearly all of the plagioclases also have a flame-texture identical with those in the lithic clast.

72705 was investigated mainly because of its white clasts. Two were identified on breaking the sample, and labeled A and B. Thin sections show only matrix and clast A. Part of clast A is shown in Fig. 2. It consists mainly of plagioclase, which has a flame-texture normally assumed to be indicative of devitrified maskelynite, and some olivine. The clast was cataclased, leaving plagioclase relics up to 2 mm across. Both cataclasis and maskelynitization occurred prior to breakup of the clast and its

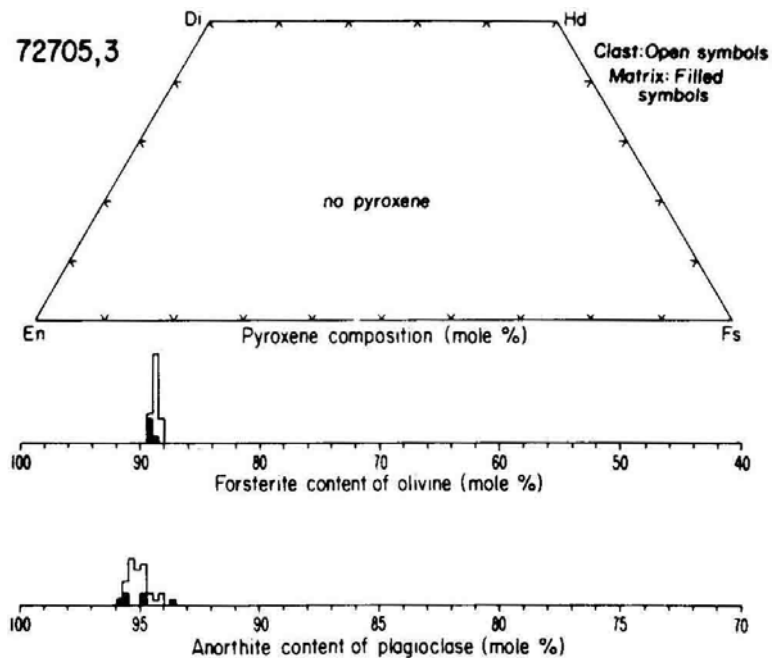


Figure 3: Microprobe analyses of minerals in clast A and the matrix of 72705 (Warren and Wasson, 1979).

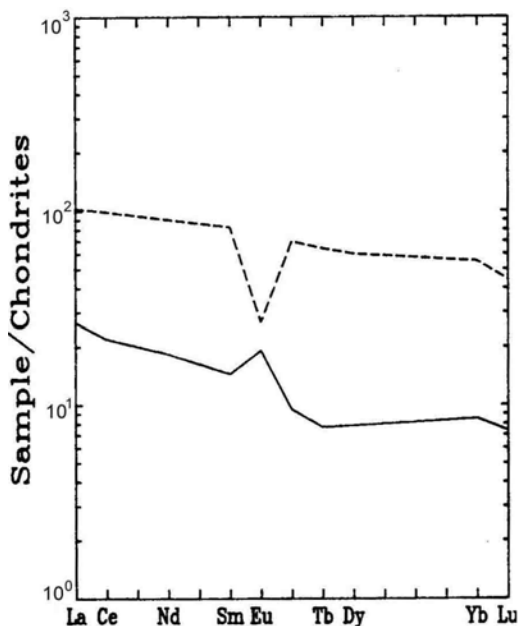


Figure 4: Chondrite-normalized rare earths in clast A (72705,1, solid line), with typical Apollo 17 LKFM (dashed line) for comparison.

immersion in the melt, which left the clast with a fragmental porous interior and a baked and sintered border against the melt. Clast A was described by Warren (1979) and Warren and Wasson (1979) who identified the cataclasis as preceding maskelynitization. They found that the clast was about 2/3 plagioclase and 1/3 olivine, with each phase of very restricted composition (about An₉₅, Fo₈₉; Fig. 3). They found no pyroxene, but that a trace of Cr-spinel is present. They interpreted clast A as essentially a pristine igneous lithology that had been cataclasized.

CHEMISTRY

A chemical analysis of clast A, made on a 75 mg subsample, is reproduced in Table 1, with the rare earth elements plotted in Fig. 4. No analysis has been made of the melt groundmass of 72705. Clast A is normatively a troctolite (61% feldspar, 38% olivine, in good agreement with the mode, given the small size of both the thin section and the analyzed split). It is free of

meteoritic siderophile contamination, and its rare earth element pattern is fractionated compared with KREEP; thus the sample is considered to be a pristine igneous lithology by Warren (1979) and Warren and Wasson (1979). Its mineral chemistry is like that of troctolite 76535.

PROCESSING

The sample was not chipped until 1978, when it was investigated for its white material rather than its dark matrix. 72705 was broken to reveal two white clasts (A and 13). A small chip of pure class A (,1) was used for chemical analysis and for a tiny thin section; a chip (2) consisting of matrix and a little of clast A was used to make thin sections ,3 and ,4. Clast A probably had an original mass of about 0.5 g. The remainder of clast A occurs with matrix in ,0 (0.97 g). Clast B occurs with matrix in ,5 (1.1 g).

Table 1: Chemical analysis of clast A in 72705.

| | |
|--------------------------------|---------|
| Split | ,1* |
| wt% | |
| SiO ₂ | 42.2 |
| TiO ₂ | |
| Al ₂ O ₃ | 23.8 |
| Cr ₂ O ₃ | 0.134 |
| FeO | 4.0 |
| MnO | 0.040 |
| MgO | 16.8 |
| CaO | 12.6 |
| Na ₂ O | 0.305 |
| K ₂ O | 0.064 |
| P ₂ O ₅ | |
| ppm | |
| Sc | 2.6 |
| V | |
| Co | 25 |
| Ni | 18 |
| Rb | |
| Sr | 16(a) |
| Y | |
| Zr | 190 |
| Nb | |
| Hf | 1.6 |
| Ba | 170 |
| Th | 0.32 |
| U | 0.12 |
| Ce | |
| Ta | 0.062 |
| Pb | |
| La | 8.8 |
| Ce | 19.3 |
| Pr | |
| Nd | 11 |
| Sm | 2.62 |
| Bu | 1.32 |
| Gd | |
| Tb | 0.36 |
| Dy | |
| Ho | |
| Er | |
| Tm | |
| Yb | 1.7 |
| Lu | 0.25 |
| Li | |
| Be | |
| B | |
| C | |
| N | |
| S | |
| F | |
| Cl | |
| Br | |
| Cu | |
| Zn | 1.9 |
| ppb | |
| Au | 0.170 |
| Ir | 0.016 |
| I | |
| At | |
| Cn | 3400(a) |
| Ce | 11 |
| As | |
| Se | |
| Mo | |
| Tc | |
| Ru | |
| Rh | |
| Pd | |
| Ag | |
| Cd | 3.0 |
| In | 1.3 |
| Sa | |
| Sb | |
| Te | |
| W | |
| Re | |
| Os | |
| Pt | |
| Hg | |
| Tl | |
| Bi | (1) |

References and methods:
 1) Warren (1979), Warren and Wasson (1979);
 DNAA, RNAA, microprobe fused bead; except
 (a) updated by Warren and Kallemeyn (1984).
 Notes: * incorrectly labelled as 72075,1
 on one data line in Warren (1979).