72735

Impact Melt Breccia (High-K)
St. 2, 51.1 g

INTRODUCTION

72735 is a fine-grained clastbearing impact melt. Its chemistry differs from the common low-K Fra Mauro melts that dominate the Apollo 17 highlands samples in having much higher K and other incompatible element contents, and a lower Mg/Fe. It also contains more clastic material than most of the local rake impact melt samples.

Of the four samples of the second rake sample from Station 2, on the southeast rim of Nansen crater, 72735 was the only one described as a green-gray breccia by LSIC 17 (1973). 72735 is 4.2 x 3.5 x 3.0 cm and medium dark gray (N4) (Keil et al., 1974). It is subrounded and coherent, with a few non-penetrative fractures (Fig. 1). It has a few zap pits on all sides, and about 5% vugs. Matrix material (mainly less than 100 microns grain size) was estimated to compose 94% of the rock (Keil et al., 1974), with the clasts mainly appearing to be plagioclase. LSIC 17 (1973) estimated clasts about l mm across as less than 1 % of the rock.

PETROGRAPHY

72735 is a crystallized impact melt containing lithic and mineral clasts (Fig. 2, Table 1). Warner et al. (1977 b,c;19780 described 72735 as a microgranular-micropoikilitic matrix breccia, similar to 72549 but with mafics almost wholly pyroxene. They distinguished 72735 with 72558 as a high-K KREEP breccia (however, see 72558 CHEMISTRY) on the basis of the high K_20 (0.89%) evident in the defocused beam analysis (Table 2; confirmed by the INAA analysis, Table 3). However, apart from the lack of olivine, there are several other differences from most other local impact melts; the overall appearance is like some of the Boulder 1, Station 2 samples. The grain size is finer than that of the other supposed high-K breccia 72558. The modal data (Table 1) shows a low proportion of melt groundmass (73%), and the clast population is dominated by lithic clasts, unlike most melts. Microprobe analyses (Warner et al., 1978f) are shown in Figure 3; the matrix pyroxenes are more iron-rich than those in other melts, and more varied in composition. There is an interstitial K-rich phase. Engelhardt (1979) tabulated ilmenite paragenetic features, inferring that ilmenite crystallization followed that of pyroxene.

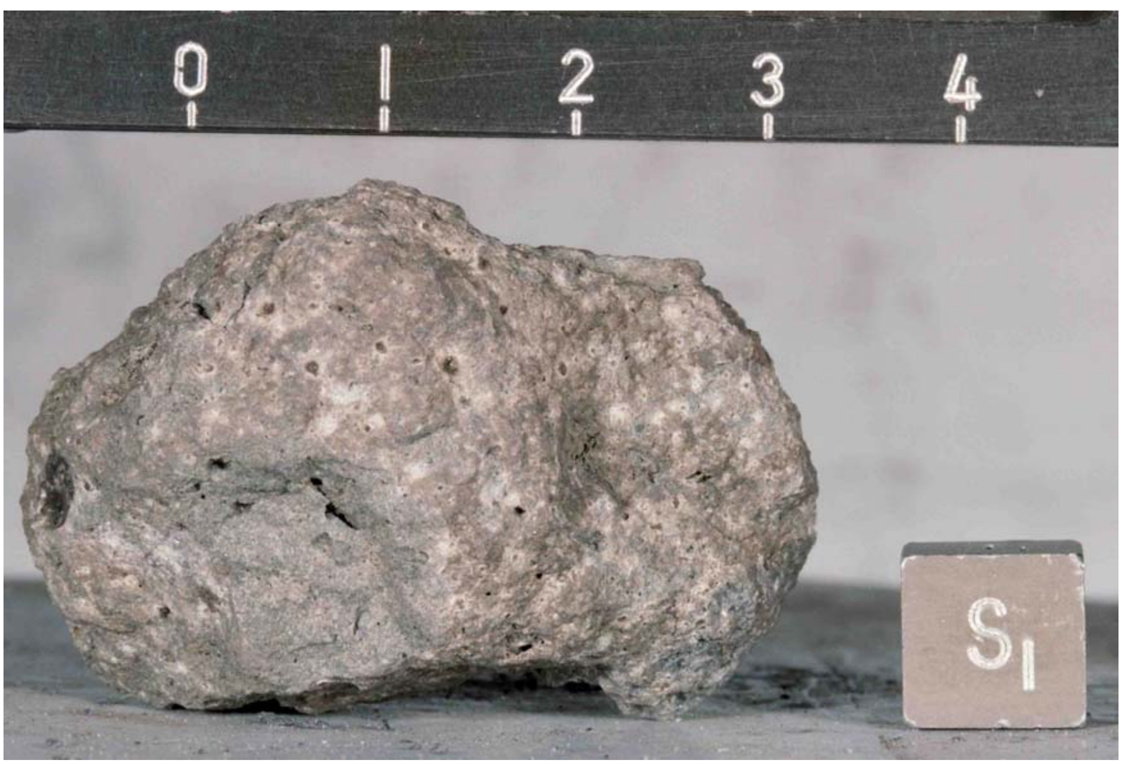

Figure 1: Sample 72735. Scale divisions in centimeters. S-73-19444.

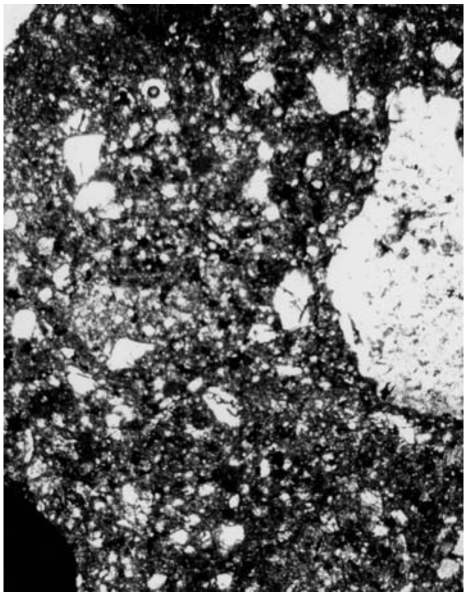

Figure 2: Photomicrograph of 72735,12, showing general groundmass, mineral clasts, and a lithic fragment. Plane light, width of field about 1 mm.

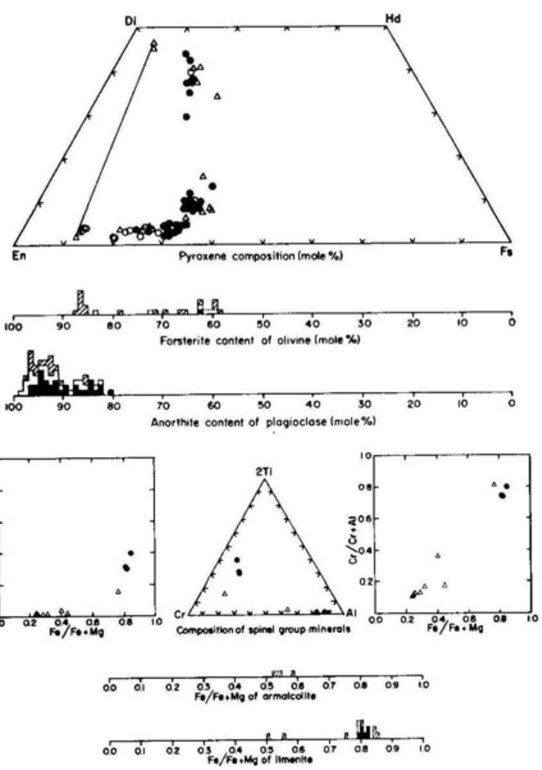

Figure 3: Microprobe analyses of minerals in 72735 (Warner et al., 1978f). Filled symbols = matrix phases. In histograms, open symbols = mineral clasts and cross-hatched = minerals in lithic clasts. In other diagrams, open circles = mineral clasts and open triangles = minerals in lithic clasts.

The mineral and lithic clasts almost exclusively appear to be derived from coarse-grained feldspathic rocks. Some of the larger ones include trocolitic varieties. Warner et al. (1977b) described and depicted two troctolitic clasts larger than 1 mm as being the only two highlands feldspathic clasts in their Apollo 17 melt samples to have preserved an original igneous texture. One has a cumulate texture, with olivines ($F0_{86-87}$) poikilitically enclosed by plagioclase (An_{92}), with trace pink spinel, ilmenite, and chromite. The other is basically of basaltic texture, with olivines similar to the first described clast but smaller plagioclases (An_{91-96}), and pyroxenes as well as several trace phases. Microprobe analyses of the phases in these clasts are shown in Fig. 3. Bulk compositions determined by defocused beam microprobe analyses (Warner et al., 1977b) indicate that they are of picritic composition.

CHEMISTRY

A chemical analysis of a 574 mg split by 1NAA is reproduced as Table 3. The major elements agree reasonably well with those of the defocused beam analysis (Table 2). 72735 is unlike all other impact melts from the Apollo 17 site in that it contains higher silica, lower titanic, and lower Mg/Fe, but most significantly higher K_2O and other incompatible element abundances. However, Murali et al (1977b) did not remark on the difference of 72735 from other melt samples. The rare earth element pattern is that of KREEP (Fig. 4). The U abundance is extremely high, and unusually so given the comparatively low Ni abundance.

Table 1: Modal analysis of 72735, 5 (Warner et al, 1977b).

	72735
Points counted	2827
Matrix	72.9
Mineral clasts	12.7
Lithic clasts	14.3
Mineral clasts	
Plagioclase	8.0
Olivine/pyroxene	4.7
Opaque oxide	tr
Metal/troilite	—
Other	—
Total	12.7
Lithic clasts	
ANT	10.6
Devitrified anorthosite	2.4
Breccia	1.3
Other	tr
Total	14.3
Percent of matrix (normalized to 100)	
Plagioclase	52.7
Olivine/pyroxene	42.2
Opaque oxide	1.2
Metal/troilite	0.3
Other	3.6

PROCESSING

The sample was chipped in one area to produce a few documented pieces in 1974. Six small chips were divided into ,2 and ,3.; and a larger chip (A) was taken adjacent to them. These remain unallocated. Two small chips were combined as ,1 and used for chemical analysis and to make thin section,12.

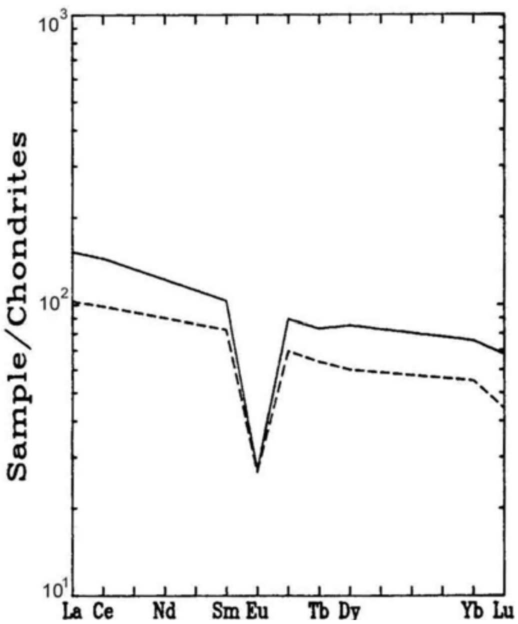

Figure 4: Plot of rare earth elements in 72735, 1 (solid line) with typical A17LKFM as represented by average Boulder 2 Station 2 samples (dashed line).

Table 2: Microprobe defocused beam analysis of matrix of 72735
(from Warner et al., 1977b).

	,12
wt %	
SiO_2	50.1
TiO_2	0.67
Al_2O_3	20.2
Cr_2O_3	0.18
FeO	7.9
MnO	0.12
MgO	8.1
CaO	11.5
Na_2O	0.68
K_2O	0.89
P2O5	0.32
Sum	100.7

Table 3: Chemical analysis of 72735,1

Split	,1
wt %	
SiO_2	
TiO_2	0.7
Al_2O_3	18.0
Cr_2O_3	0.184
FeO	9.3
MnO	0.12
MgO	9
CaO	10.2
Na_2O	0.54
K_2O	0.73
P_2O_5	
ppm	
Sc	16
V	40
Co	17
Ni	91
Rb	
Sr	
Y	
Zr	880
Nb	
Hf	23
Ba	560
Th	2.9
U	
Cs	
Ta	2.3
Pb	
La	50.2
Ce	127
Pr	
Nd	
Sm	18.7
Eu	1.87
Gd	
Tb	3.9
Dy	27
Ho	
Er	
Tm	
Yb	15.1
Lu	2.3
Li	
Be	
B	
C	
N	
S	
F	
Cl	
Br	
Cu	
Zn	
ppb	
Au	
Ir	110
	(1)

References and methods:
(1) Murali et al.(1977a); INAA