66075 FRAGMENTAL POLYMICT BRECCIA 347 g

INTRODUCTION: 66075 is a coherent, light gray breccia (Fig. 1) with a significant regolith component. Dark and light clasts are more or less equal in abundance. 66075 was collected from the rim of a small, unnamed crater. Zap pits saturate the "lunar top" surface but are absent from unexposed surfaces.

FIGURE 1. S-72-40610B.

PETROLOGY: A petrographic description is given by Quick et al. (1978). This rock is a clastic breccia with a seriate grain size distribution and a diverse clast population (Fig. 2). 10-20% of the rock is composed of clasts >4 mm with the remainder smaller clasts and matrix (Quick et al., 1978). Lithic fragments predominate over mineral and glass fragments; mineral compositions are given in Figure 3.

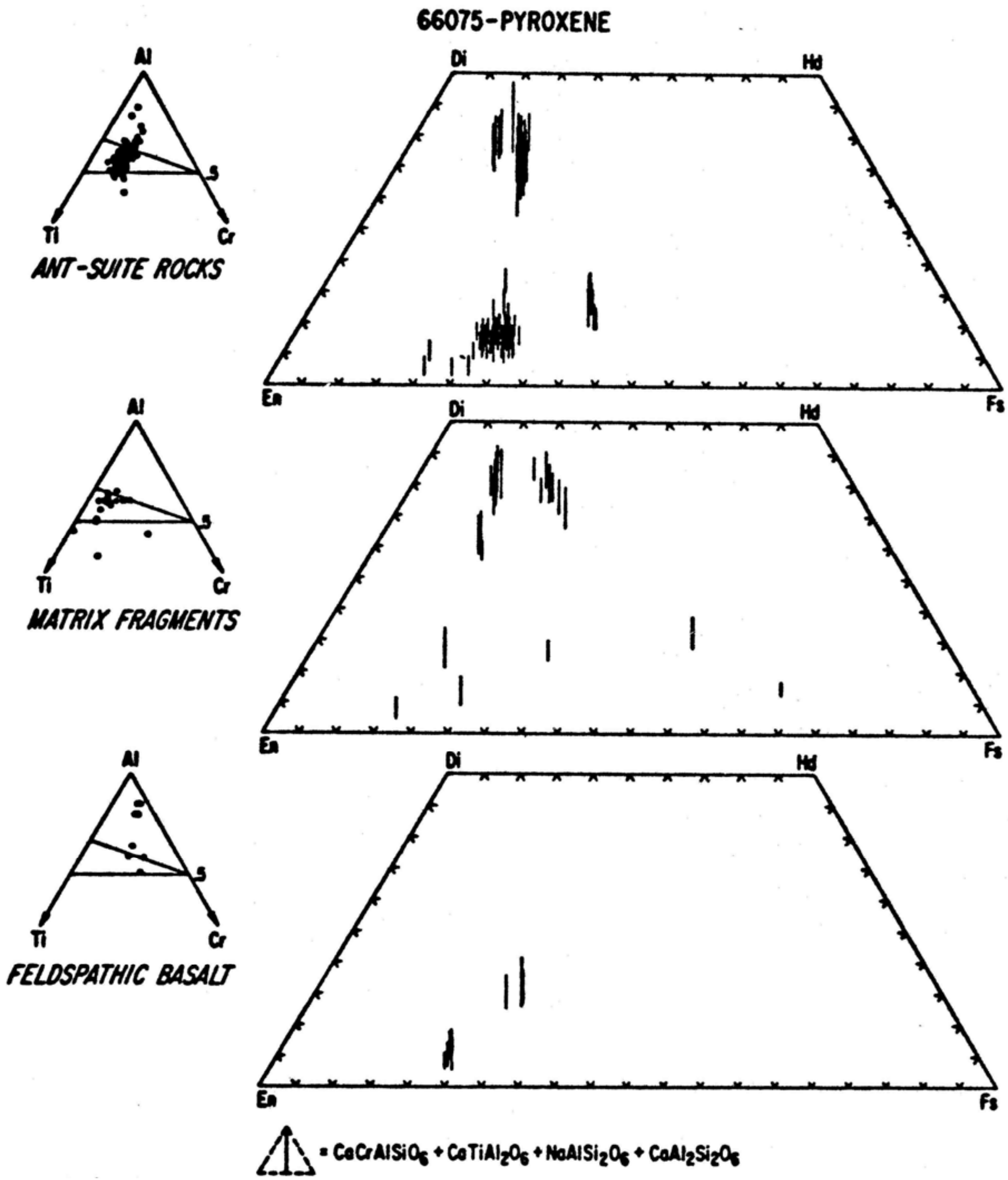
FIGURE 2. a) 66075,62. General view, ppl. Width 2 mm.
b) 66075,65. Dark clast, ppl. Width 0.5 mm.

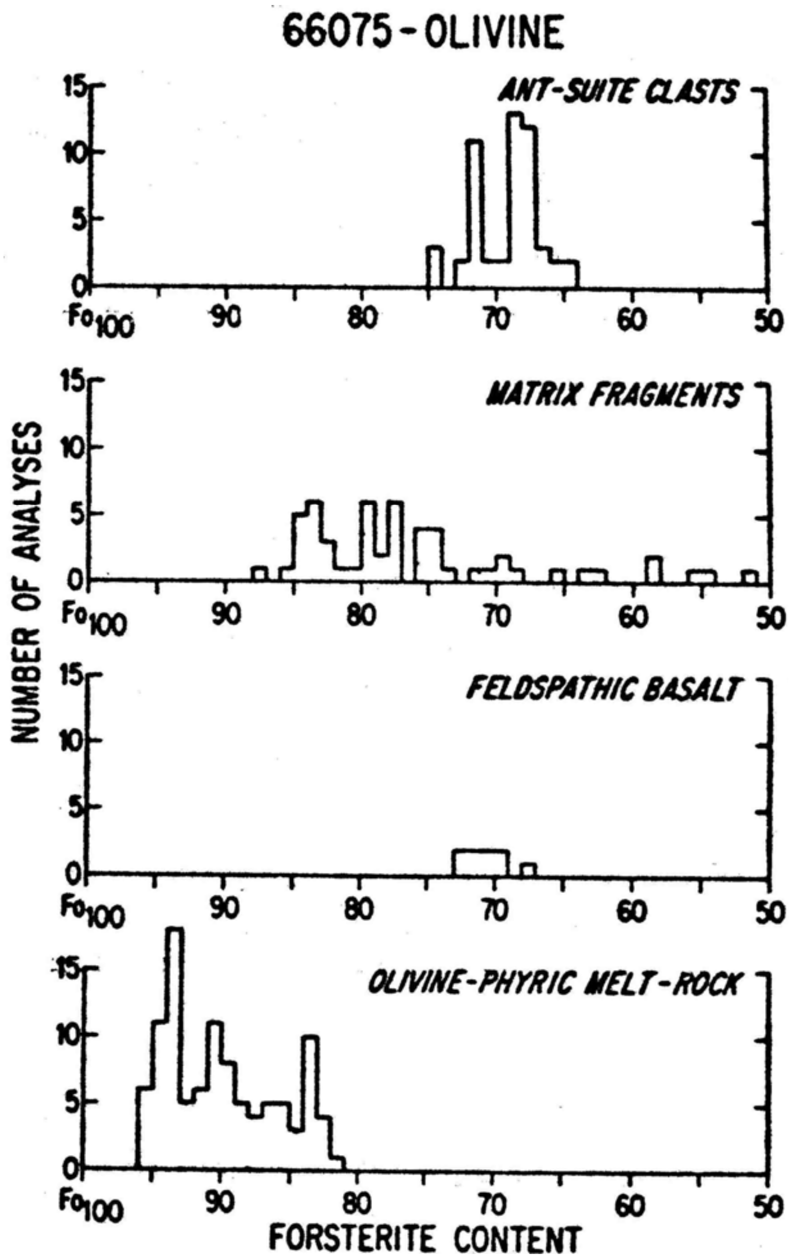
Most of the lithic fragments are varieties of impact melt: vitric to aphanitic matrix breccia, poikilitic breccia, intergranular basaltic impact melt, and plagioclase and olivine vitrophyres (Fig. 2). Xenocrysts or xenoliths are present in most, but not all, of these clasts. The poikilitic fragments (the "hornfels" clasts of Quick et al., 1978) generally have a very fine-grained texture, with poorly developed oikocrysts. Most of the impact melt fragments are rounded and not deformed by shock.

Coarser-grained granoblastic lithic fragments tend to be more angular than the impact melt clasts discussed above, and have textures indicative of subsolidus annealing (Fig. 2). Granoblastic anorthosite, gabbroic and noritic anorthosite, and troctolite were recognized by Quick et al. (1978). Mafic minerals tend to occur as small (<50 µm), anhedral grains interstitial to larger (<500 µm), anhedral plagioclase, though locally pyroxenes enclose equant plagioclases poikilitically. Most of the coarser-grained granoblastic fragments show shock-related features, such as undulose extinction and fracturing.

Beads and fragments of various types of glass are also present. Three compositional groups were recognized by Quick et al. (1978): high-Ti glass (1-3% TiO_2), low-Ti glass (<0.6% TiO_2) and rare high-K "granitic" glass (~6% K_2O and ~75% SiO_2) (Fig. 4). The low-Ti glass approximates local soil compositions whereas the high-Ti glass approximates the composition of most Apollo 16 poikilitic impact melts ("Fra Mauro basalt") (Table 1).

Mineral fragments are dominated by plagioclase with lesser amounts of olivine, pyroxene, pink spinel, troilite, and metal (Figs. 3 and 5).




66075 - OLIVINE
ANT-SUITE CLASTS
MATRIX FRAGMENTS
FELDSPATHIC BASALT
OLIVINE-PHYRIC MELT-ROCK
NUMBER OF ANALYSES
FORSTERITE CONTENT
Fo100
90
80
70
60
50
0
5
10
15

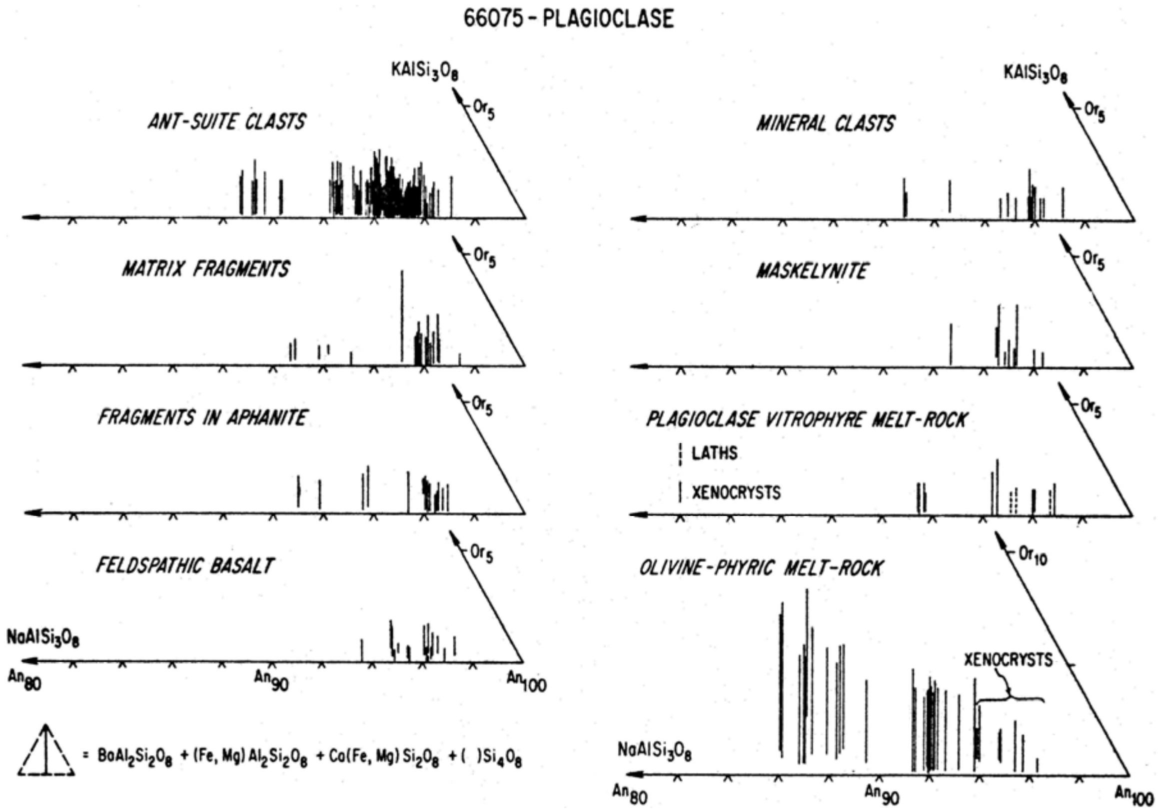
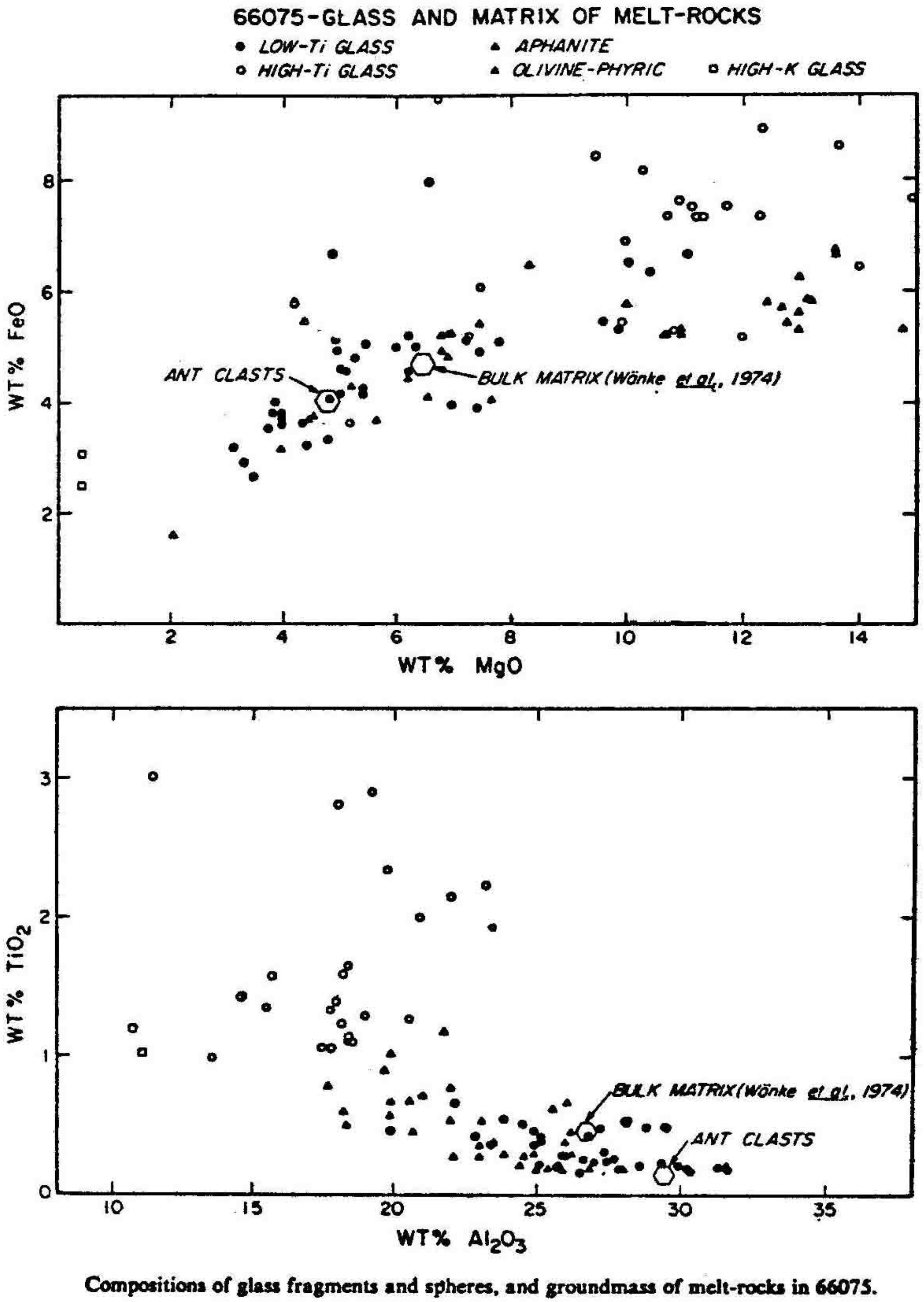


FIGURE 3. Mineral compositions, from Quick et al. (1978).

<u>CHEMISTRY</u>: Major and trace element analyses of the bulk rock are presented by Wanke et al. (1974, 1977), Boynton et al. (1975) and Garg and Ehmann (1976). Miller et al. (1974) give major elements and Wasson et al. (1975) report siderophiles and volatiles of the bulk rock. Moore and Lewis (1976) provide bulk N and C data.

Natural and cosmogenic radionuclide abundances in the whole rock were determined by Eldridge et al. (1973) and Clark and Keith (1973). Quick et al. (1978) report electron microprobe analyses of glass fragments and defocussed beam microprobe analyses of some impact melt fragments (Table 1).

The bulk rock has a major element composition very similar to the local soils (Table 1). REEs in the rock are slightly lower than most of the soils (Fig. 6). Wasson et al. (1975) note that 66075 is rich in volatiles and that Ge is especially enriched relative to other volatile elements.



Compositions of glass fragments and spheres, and groundmass of melt-rocks in 66075.

FIGURE 4. Glass compositions, from Quick et al. (1978).

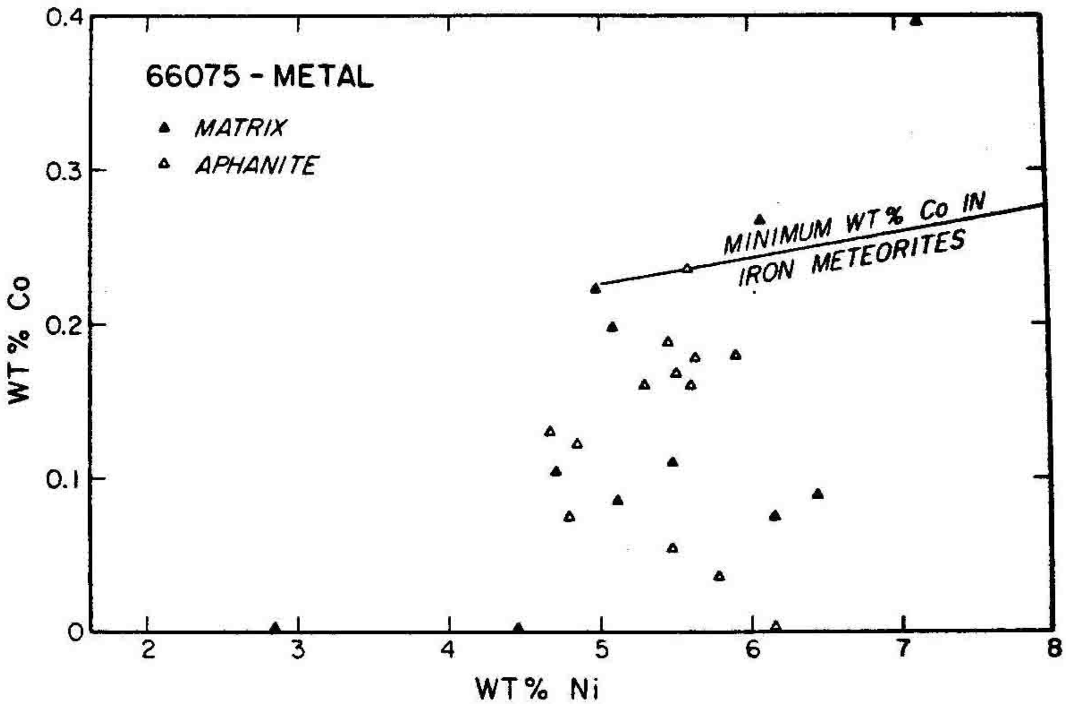


FIGURE 5. Metals, from Quick et al. (1978).

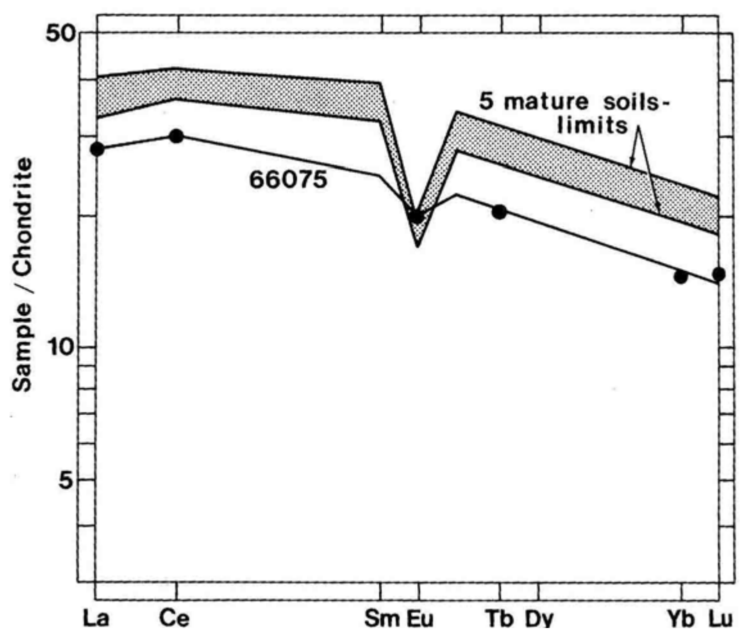


FIGURE 6. Rare earths, from Boynton et al. (1975).

TABLE 1. Summary chemistry of 66075.

	Bulk rock	Low-Ti glass	High-Ti glass	High-K glass	Olivine* vitrophyre	Aphanite*
SiO_2	45.4	45.59	49.06	75.38	46.9	45.9
TiO_2	0.45	0.34	1.58	1.10	0.6	0.4
Al_2O_3	27.3	27.02	18.30	10.87	20.0	24.7
Cr_2O_3	0.08	0.07	0.21	0.0	0.2	0.1
FeO	4.8	4.61	7.31	2.80	5.7	4.6
MnO	0.06	0.07	0.11	0.08	0.1	0.1
MgO	6.5	5.80	10.96	0.20	12.4	6.5
CaO	15.7	15.80	11.33	1.80	12.6	15.5
Na_2O	0.486	0.40	0.62	0.57	0.5	0.5
K_2O	0.095	0.07	0.39	6.19	0.2	0.1
P_2O_5	0.11	0.05	0.28	0.10	0.1	0.1
Sr	193					
La	10					
Lu	0.48					
Rb	2.1					
Sc	6.9					
Ni	280	~240	~160		<790	~800
Co	26					
Ir ppb	~8					
Au ppb	~6					
C	54					
N	28					
S						
Zn	9					
Cu	4.3					

Oxides in wt.%; others in ppm except as noted.
*Defocussed beam analyses

RADIOGENIC ISOTOPES AND GEOCHRONOLOGY: Rb-Sr, Sm-Nd and U-Pb data are given by Oberli et al. (1978, 1979) (Table 2). The U-Pb whole rock data are highly discordant but fall along a linear 3.9-4.5 b.y. "cataclysm array" (Fig. 7). An internal isochron from whole rock, acid soluble Pb and leached residue splits yields an age of 3.83 (+ 0.10, -0.05) b.y. (Fig. 8). Oberli et al. (1979) interpret these data to suggest a two stage U-Pb history with an inherited Pb fraction which evolved from 4.47-3.83 b.y. and a radiogenic component produced by the in situ decay of U since 3.83 b.y. ago.

TABLE 2. Rb-Sr and Sm-Nd data for 66075,11 (Oberli et al., 1979).

Rb (ppm)	Sr (ppm)*	$^{87}Sr/^{86}Sr$ measured	T_{BABI} (b.y.)
2.25	185	0.70112±5	4.24±0.10

Sm (ppm)	Nd (ppm)**	$^{143}Nd/^{144}Nd$	T_{JUV} (b.y.)	T_{CHUR} (b.y.)
5.50	19.5	0.511073±23	4.53±0.02	4.81±0.19

*Calc. from ^{88}Sr value
**Calc. from ^{144}Nd value

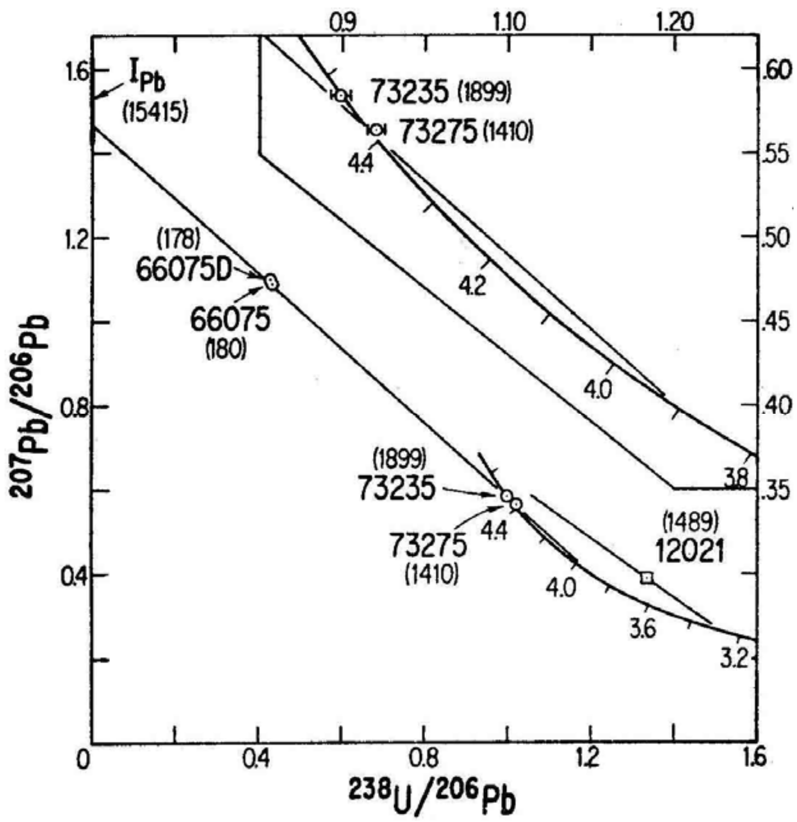


FIGURE 7. U-Pb evolution diagram,
from Oberli et al. (1978).

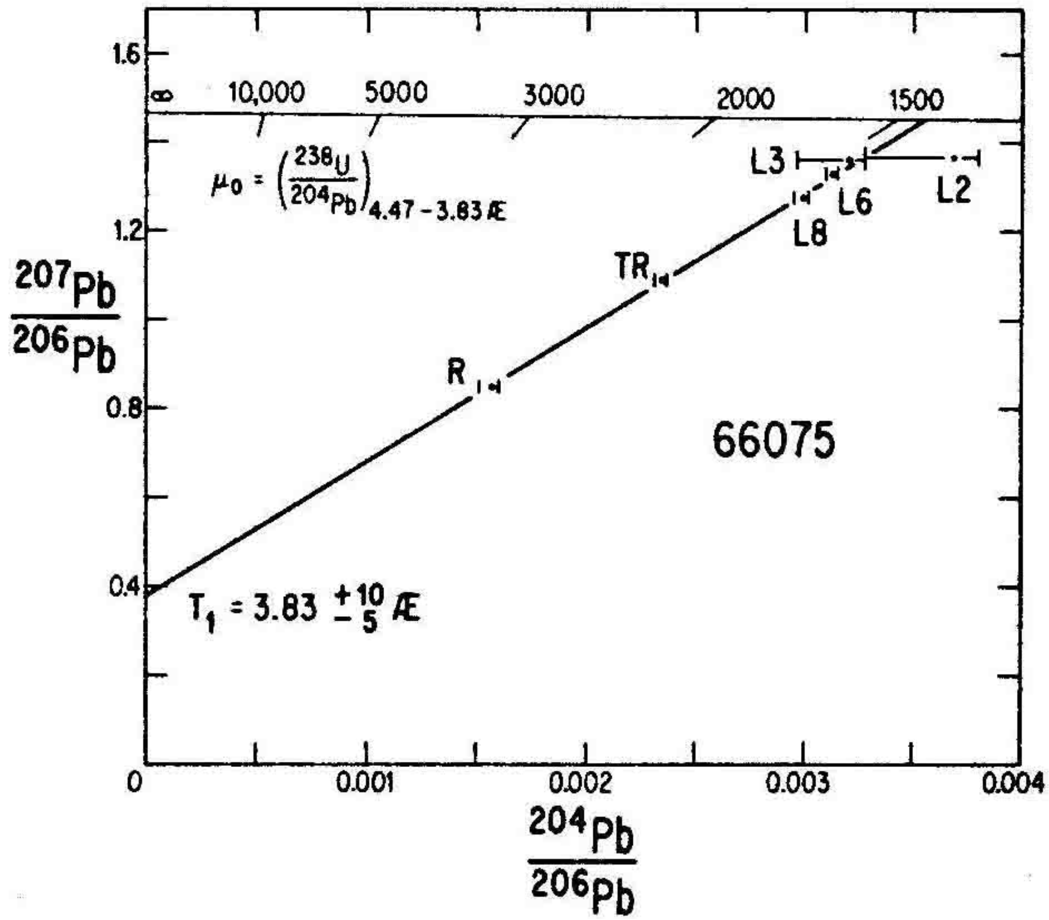


FIGURE 8. Internal isochron, from Oberli et al. (1979).

EXPOSURE AGE: Eldridge et al. (1973) and Clark and Keith (1973) provide whole rock, cosmogenic radionuclide data as determined by gamma-ray spectroscopy. From these data, Yokoyama et al. (1974) conclude that 66075 is saturated in ^{26}Al activity.

MICROCRATERS: Zap pits occur only on the surfaces exposed at the time of collection indicating that 66075 has had a simple exposure history. Morrison et al. (1973) and Neukum et al. (1973) give size-frequency data (Fig. 9). Both consider the exposed surfaces to represent an equilibrium population of pits. Morrison et al. (1973) calculate a "best guess" exposure age of at least 7-10 m.y.

PROCESSING AND SUBDIVISIONS: 66075 was slabbed in 1973 and the slab subdivided (Fig. 10). ,11 was allocated to Wasserburg and yielded the age data. A portion of the large dark clast in ,25 was extracted together with associated matrix as ,19 and made into thin sections (,25 is incorrectly numbered as ,9 on the slab photo # S-73-28303, published in Quick et al., 1978). ,15 and a portion of the large dark clast on the exterior surface of ,12 were also made into thin sections. All of the chemical analyses were made on representative interior chips from the S area of butt end ,24.

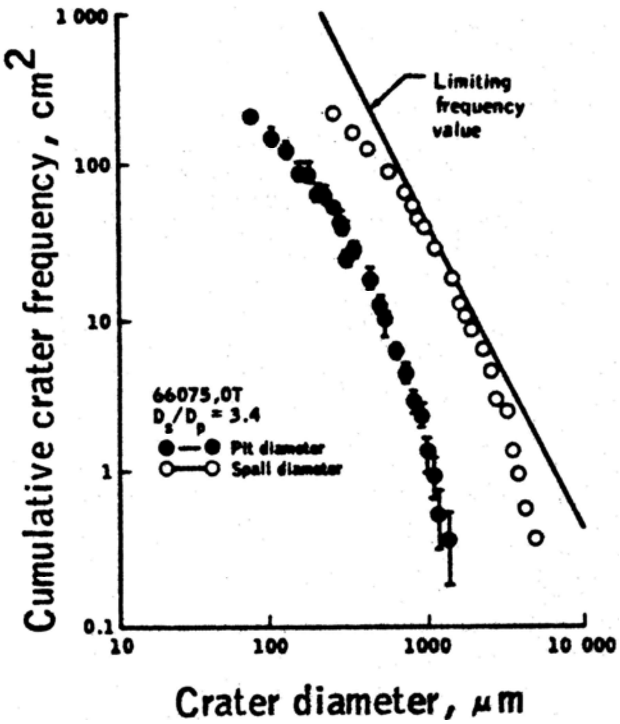


FIGURE 9. Microcraters; from Morrison et al (1973).

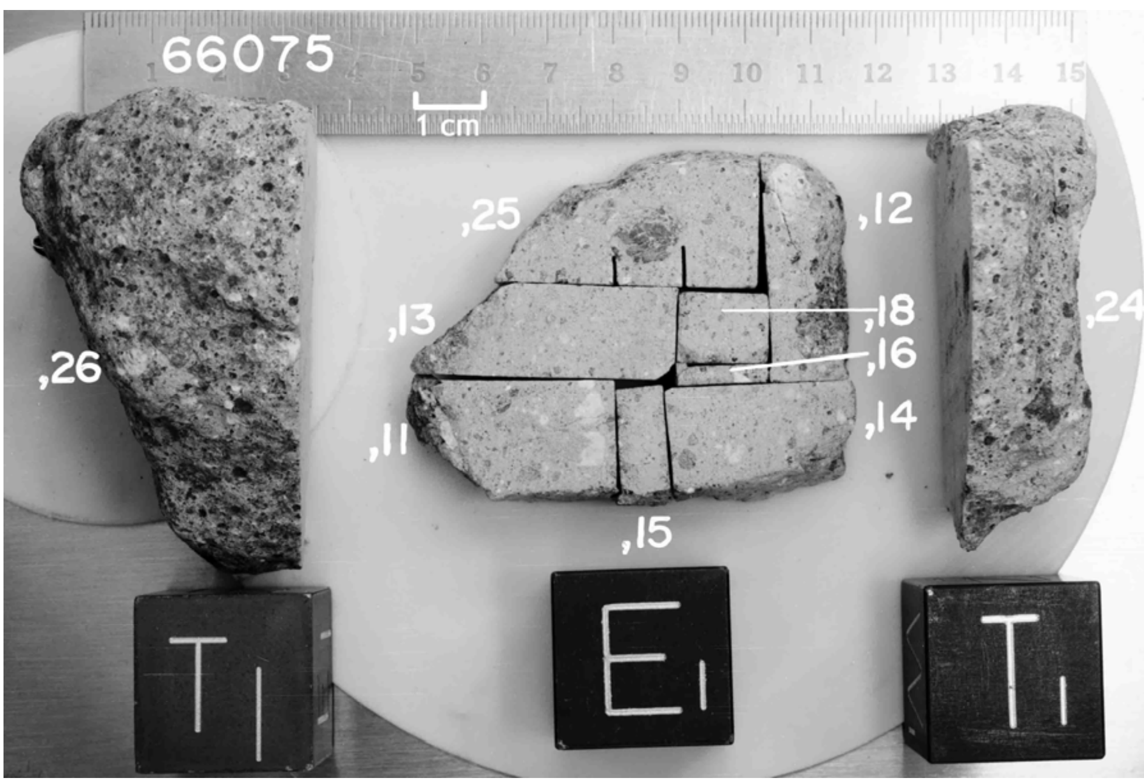


FIGURE 10. S-73-28403.