73275

Micropoikilitic Impact melt Breccia

429.6 grams

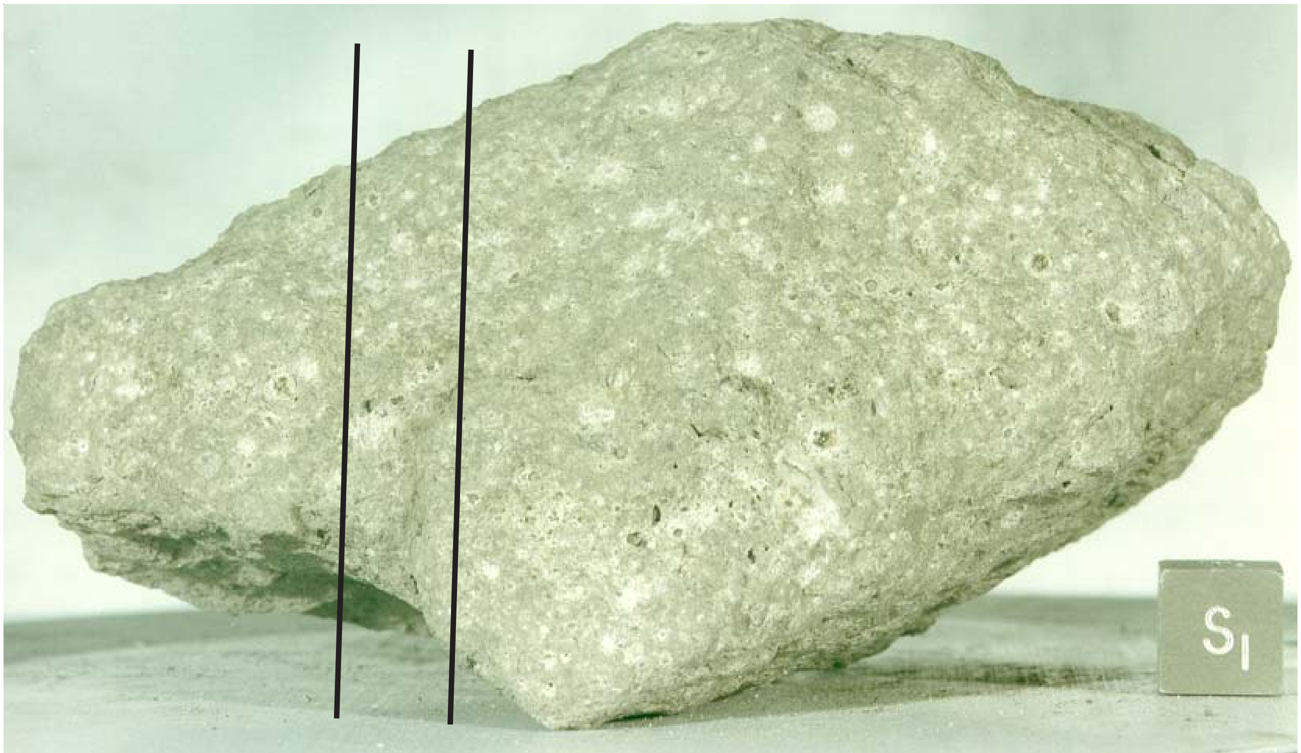

Figure 1: Photo of 73275. NASA S73-16925. Cube is 1cm. Note numerous zap pits and smooth-rounded surface..

Introduction

Lunar sample 73275 was collected from station 3, Apollo 17 (Wolfe et al. 1981). It was found sitting perched on the regolith near the rim of a small crater (figures 2, 3). It is rounded and covered with micrometeorite craters on all sides except where a piece broke off (figure 1).

73275 is an impact melt breccia with fine-grained poikilitic matrix and minor vesicularity (figure 4). It has a crystallization age of about 3.9 b.y. with exposure to cosmic rays about 140 m.y.

Petrography

Ryder (1993) describes 73275 as a clast-bearing micropoikilitic impact melt breccia with a composition similar to other samples thought to be from the Serenitatis impact event.

Simonds et al. (1974) describes the matrix of 73275 as subophitic-micropoikilitic, giving the grain size of plagioclase as 10-50 microns (figure 4). Heuer et al. (1974) and Radcliffe et al. (1974) describe 73275 as a recrystallized breccia with large clasts of plagioclase (0.3-1.0 mm), orthopyroxene (0.1-0.2 mm) and smaller olivine (0.05-0.2 mm). They reported the calcic cores of plagioclase (An_{90-97}) have sodic overgrowths (An_{85-90}) and the pyroxene has wide exsolution lamellae indicating prolonged annealing at high temperature.

73275 apparently lacks “flow banding” and relic aphanitic clasts that are characteristic of adjacent samples (732xx).

Schneider and Horz (1974) determined the size distribution of micrometeorite craters.

Mineralogy

Pyroxene: Simonds et al. (1974) determined the pyroxene compositions in the matrix and small clasts (figure 5).

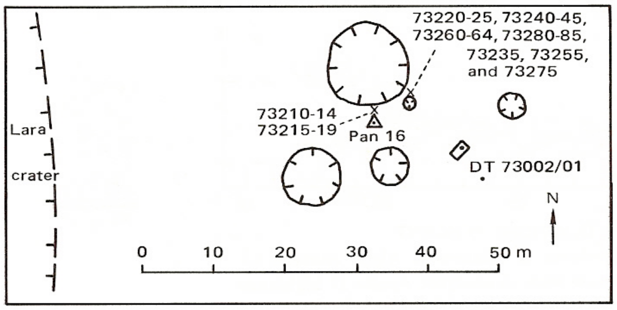

Figure 2: Location of 73275 at Station 3, Apollo 17.

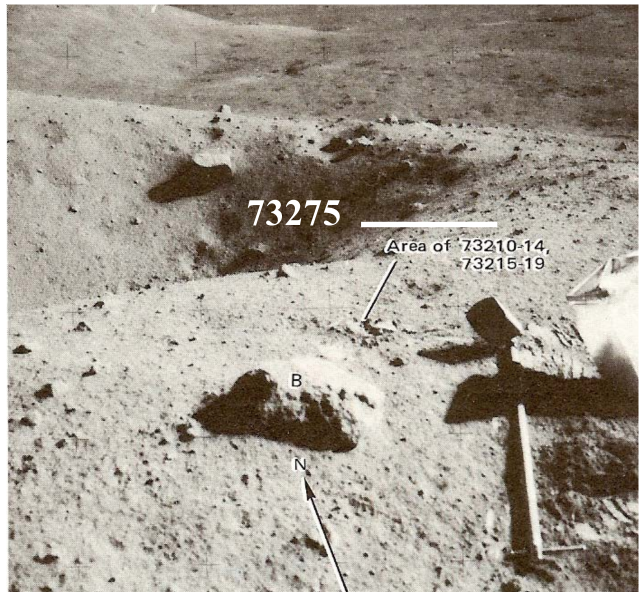

Figure 3: Surface photo of 10 meter crater at station 3.

Plagioclase: Heuer et al. (1974) reported plagioclase composition (An_{90-97}).

Metallic iron: Goldstein et al. (1976) analyzed the Ni, Co and C content of iron grains found interstitial to silicates in 73275 (Ni = ~6%, Co = ~0.6%).

Cohenite: Goldstein et al. (1976) found cohenite ($(Fe,Ni)_3C$) apparently exsolved from kamacite (figure 6 and 7). The carbon (and Ni) is probably of meteoritic origin.

Chemistry
The chemical composition of 73275 is generally similar to that of the other station three breccias and to that of 77135 from a boulder on the other side of the Taurus-Littrow valley (figure 8). Morgan et al. (1976) found the meteoritic siderophile elements were a match with other samples from the Serenitatis Basin (table 1).

Radiogenic age dating
Turner and Cadogen (1975) dated 73215 at 3.96 ± 0.05 b.y. by the Ar 39/40 method (figure 9). Nyquist et al. (1974) and Oberli et al. (1978) determined whole rock Rb-Sr, Sm-Nd and U-Th-Pb isotopic data.

Cosmogenic isotopes and exposure ages
Turner and Cadogen (1975) determined the cosmic ray exposure age as 160 m.y. by ^{38}Ar (figure 9). Crozaz et al. (1974) determined the CRE age as 139 m.y. by ^{81}Kr. Crozaz et al. (1974) and Goswami and Lal (1974) determined cosmic ray track density yielding "ages" in the range of a few m.y.

Other Studies
Nagata et al. (1974) and Housley et al. (1976) studied the magnetic properties of 73275. Huffman et al. (1974) and Huffman and Dunphyre (1975) studied 73275 by Mossbauer spectroscopy.

Processing
A slab was cut from 73275 (figure 10). There are 16 thin sections of 73275.

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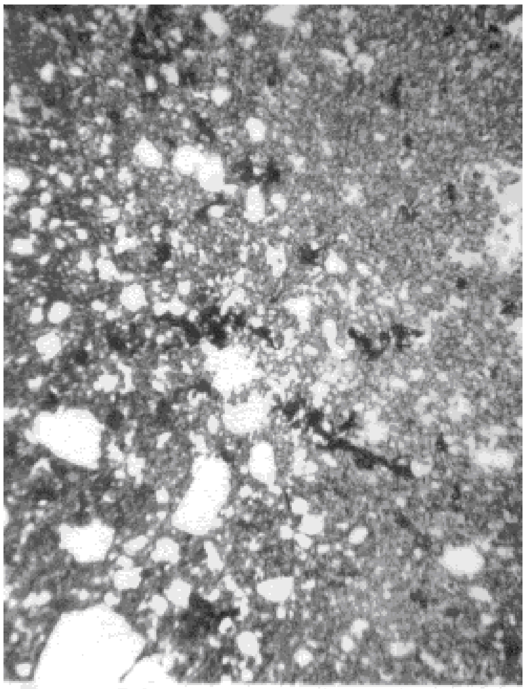

Figure 4: Photomicrograph of thin section of 73275 showing "micropoikilitic" texture (from Ryder 1993). Field of view is 2 mm.

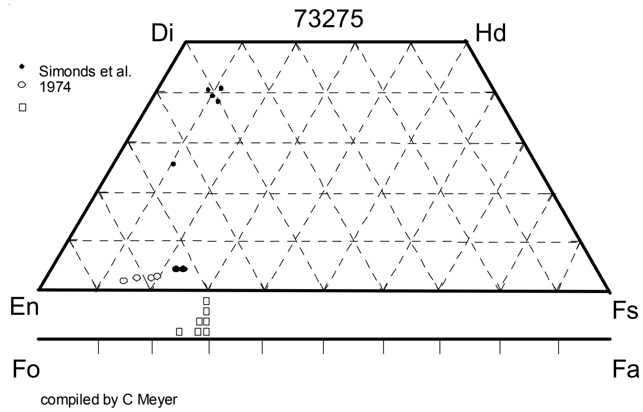

Figure 5: Pyroxene and olivine composition of 73275 (matrix and clasts) from Simonds et al. (1974).

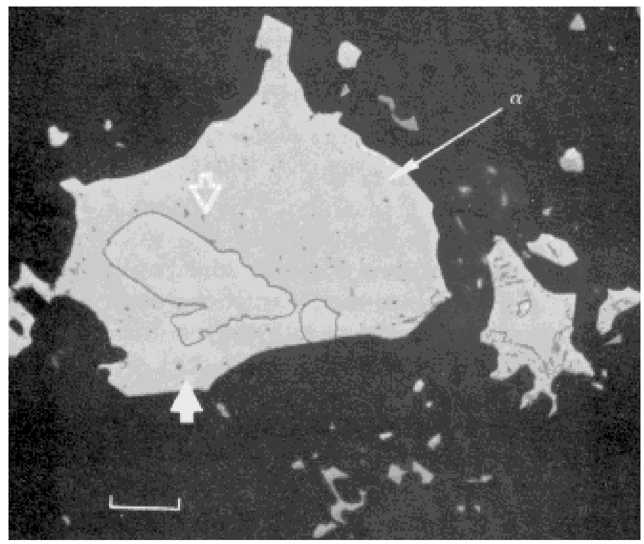

Figure 6: Reflected light photo of metallic iron grain in 73275,68 showing cohenite included in kamacite (Goldstein et al. 1976). Scale bar is 16 microns.

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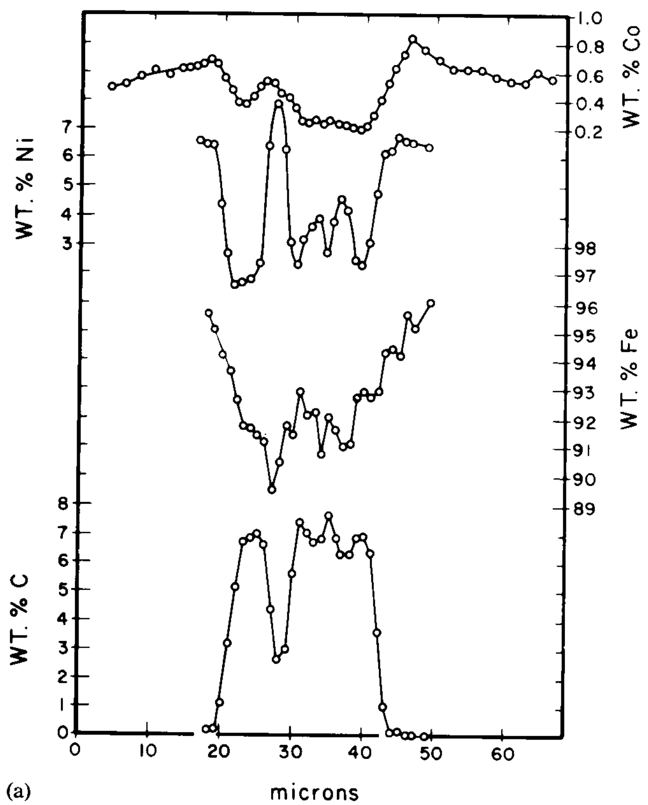

Figure 7: Electron microprobe traverse across metallic iron grain (with carbon) in 73275,68 (from Goldstein et al. 1976).

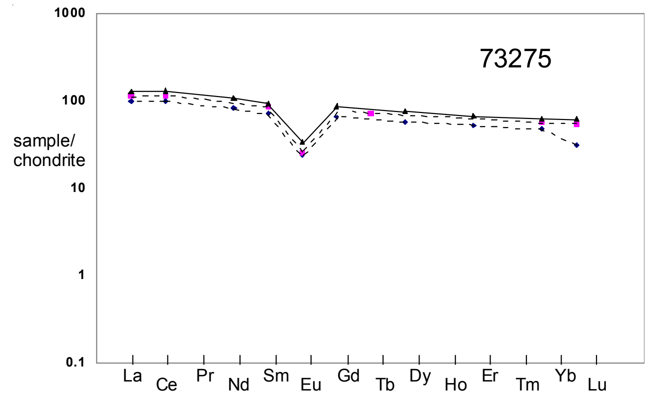

Figure 8: Normalized rare-earth-element diagram for 73275 (solid) compared with that of 73215 and 73235 (dashed). Data from Wiesmann and Hubbard 1975.

Summary of Age Data for 73275

	Ar/Ar	U/Pb
Turner and Cadogen 1975	3.96 ± 0.05 b.y.	
Oberli et al. 1978		~4.42 b.y.

Caution: Data is with old decay constants.

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Figure 9: Ar release pattern for 73235, 73275 and 78155 (from Turner and Cadogen 1975).

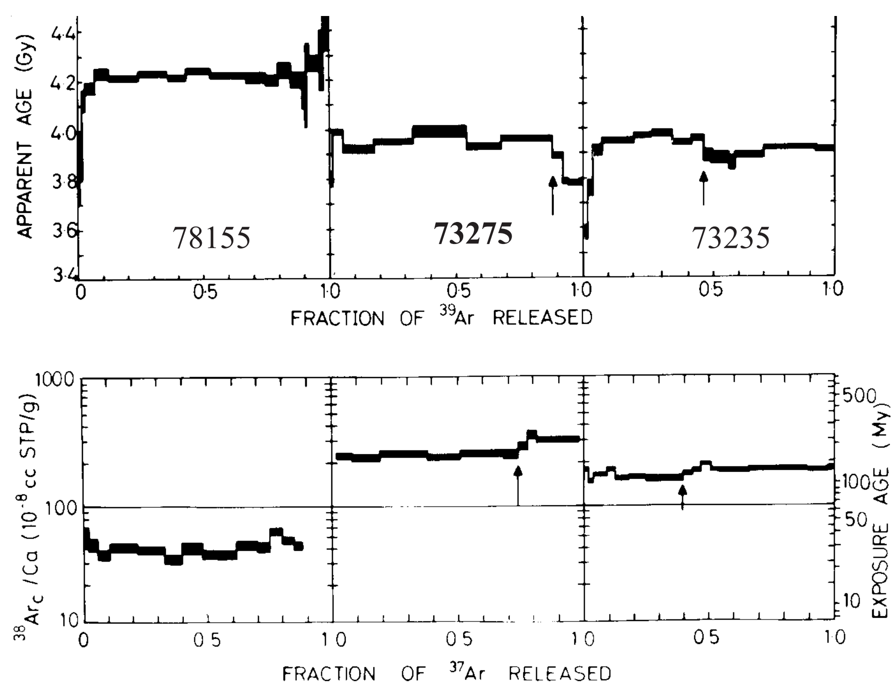
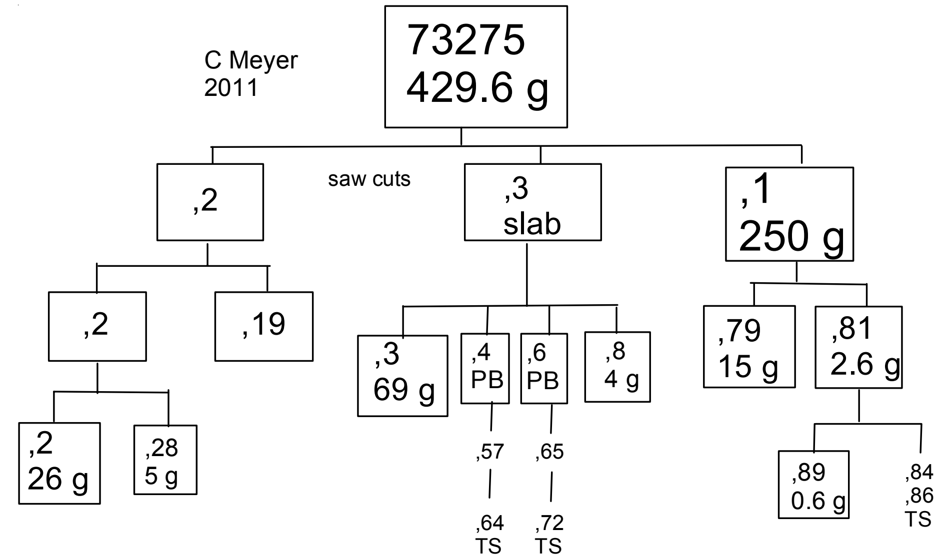


Table 1. Chemical composition of 73275.

reference	Eldridge 1974		Wiesmann75		Rhodes74		Morgan74		Oberli78		Norman2002	
weight												
SiO2 %					46.16	(c)					46.8	(e)
TiO2					1.43	(c)					1.24	(e)
Al2O3					18.49	(c)					18.5	(e)
FeO					9.05	(c)					7.84	(e)
MnO					0.13	(c)					0.12	(e)
MgO					11.54	(c)					11.7	(e)
CaO					11.3	(c)					11.1	(e)
Na2O					0.67	(c)					0.6	(f)
K2O	0.27	(b)	0.27	(a)	0.27	(c)					0.17	(f)
P2O5					0.26	(c)						
S %					0.08	(c)						
sum												
Sc ppm											17.6	(d)
V											51	(d)
Cr			1221	(a)							1442	(d)
Co											26.7	(d)
Ni							182	(c)			214	(d)
Cu											14.5	(d)
Zn							2.5	(c)			13.3	(d)
Ga											4.7	(d)
Ge ppb							265	(c)				
As												
Se												
Rb			6.625	(a)			6.9	(c)	9.11	(a)	6.8	(d)
Sr			172	(a)					185	(a)	166	(d)
Y											106	(d)
Zr			427	(a)							482	(d)
Nb											32	(d)
Mo												
Ru											11.8	(d)
Rh												
Pd ppb											11.8	(d)
Ag ppb							0.74	(c)				
Cd ppb							4.1	(c)				
In ppb												
Sn ppb												
Sb ppb							1.19	(c)				
Te ppb							5.5	(c)				
Cs ppm							0.27	(c)			0.26	(d)
Ba			333	(a)							328	(d)
La			30.2	(a)							27	(d)
Ce			78.6	(a)							68	(d)
Pr											9.47	(d)
Nd			49	(a)					50.7	(a)	43.7	(d)
Sm			13.9	(a)					14.3	(a)	12.4	(d)
Eu			1.89	(a)							1.69	(d)
Gd			17	(a)							13.8	(d)
Tb											2.46	(d)
Dy			18.3	(a)							15.6	(d)
Ho											3.4	(d)
Er			10.7	(a)							9.71	(d)
Tm												
Yb			9.91	(a)							8.8	(d)
Lu			1.48	(a)							1.28	(d)
Hf											9.94	(d)
Ta											1.37	(d)
W ppb											0.64	(d)
Re ppb							0.494	(c)			0.67	(d)
Os ppb												
Ir ppb							5.71	(c)			6.49	(d)
Pt ppb											13.8	(d)
Au ppb							3.34	(c)				
Th ppm	4.53	(b)	4.26	(a)					4.97	(a)	5.69	(d)
U ppm	1.2	(b)	1.36	(a)			1.36	(c)	1.31	(a)	1.56	(d)

technique: (a) IDMS, (b) radiation counting, (c) RNAA, (d) ICP-MS, (e) fused-bead elec. probe, (f) INAA



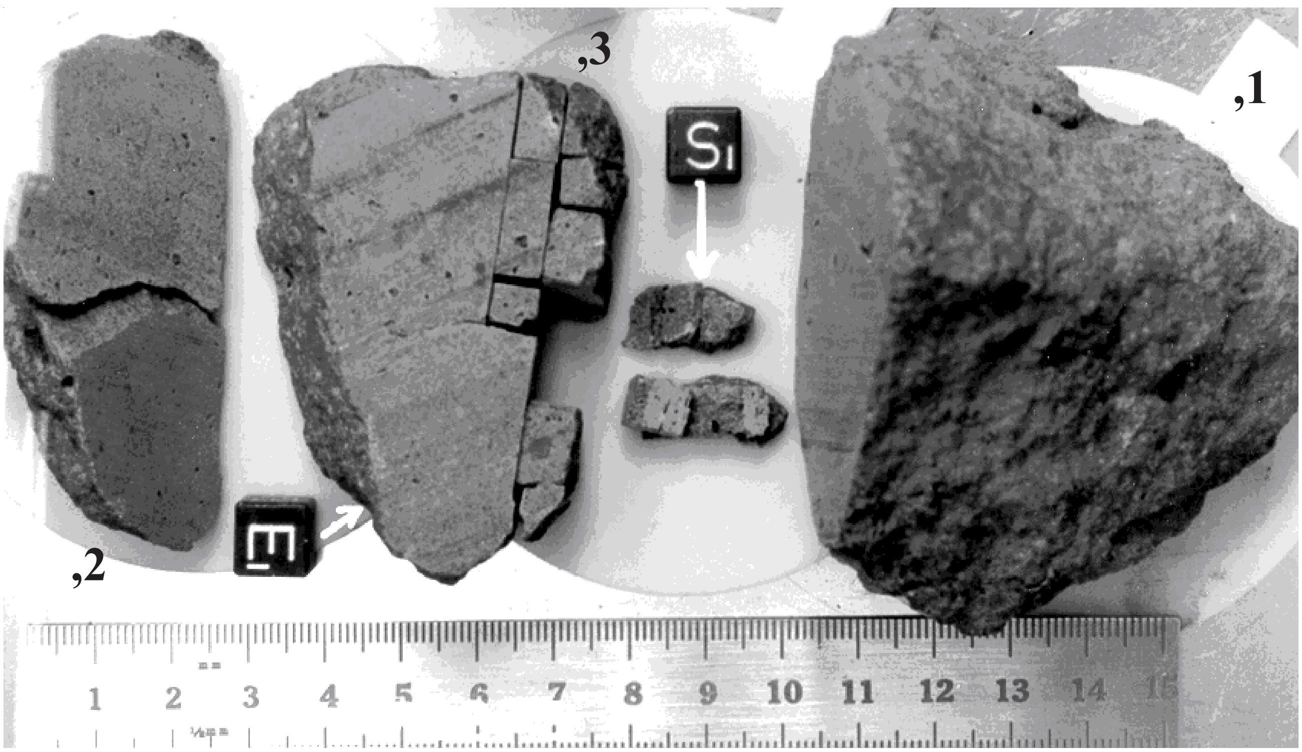


Figure 10: Exploded parts diagram for 73275. NASA S73-34460. Small cube and scale are 1 cm.

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