62255

Anorthosite with melt

1239 grams

Figure 1: Photo of 62255 showing glass splash on anorthosite. Cube is 1 cm. NASA S # S72-38309.

Introduction

Lunar sample 62255 is significant because it is largely composed of pristine anorthosite (Warren and Wasson 1977). Surprisingly, this material has not been thoroughly studied and an age has not been determined. The anorthosite has been crushed and granulated by shock and is penetrated with patches and veins of mafic melt.

62255 was found "perched" on the lunar surface at Buster Crater (figures 2 and 3). The cosmic exposure age of about 2 m.y. and the glass coat indicate that it is a "bomb" from South Ray Crater (Eugster 1999).

Petrography

Ryder and Norman (1979, 1980) summarized what was known about 62255 at that time. It consists of about 65% pristine ferroan anorthosite and 35% recrystallized impact melt rock (figures 4 and 11). The anorthosite is cataclastic and consists of plagioclase (An_{92-97}) with minor pyroxene (Wo_4En_{50} and $Wo_{45}En_{35}$). Some of the original grain boundaries are intact (figure 5).

See et al. (1986) and Morris et al. (1986) studied the dark glass splash coating on 62255 and other rocks. Ryder and Norman (1980) noted that it had a surface patina with micrometeorite craters on "most faces". However, the zap pits are mostly on the N1-T1 face (figure 1).

James (1981) refer to this kind of rock as "dimict" breccia and Ryder and Norman (1980) classified it as "dilithologoic". There are regions of chalky anorthosite intermixed with a dark, mafic recrystallized melt. Floss et al. (1998) studied the anorthositic material, but it appears that the dark portion of the rock remains unstudied.

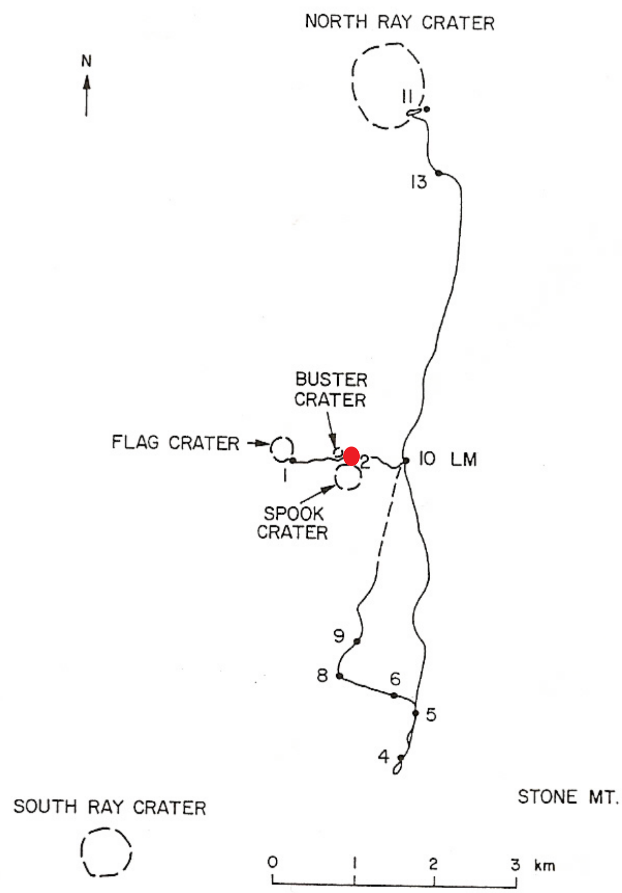

Figure 2: Map of Apollo 16 traverses wiht location of 62255 near Buster Crater.

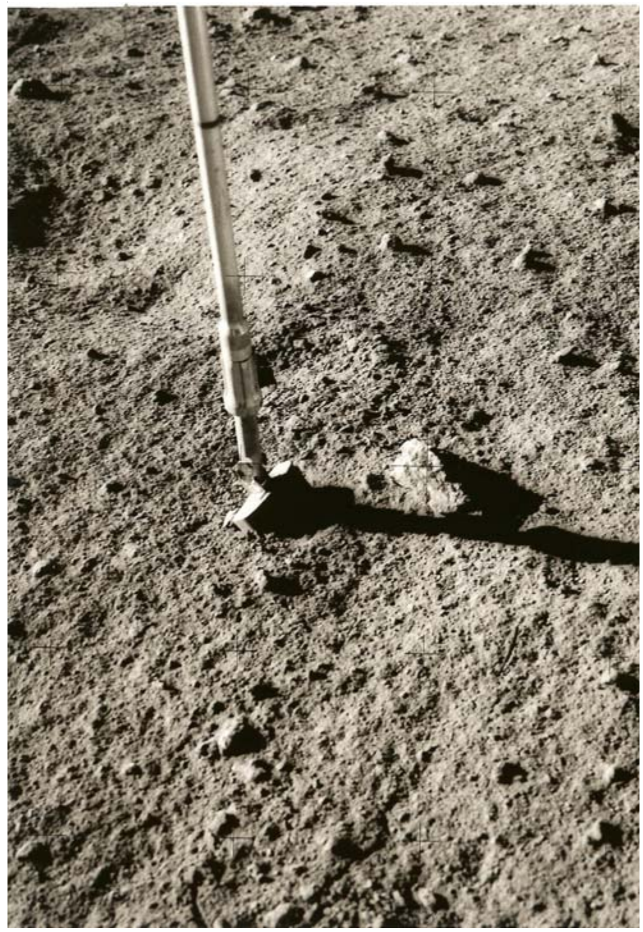

Figure 3: Photo of 62255 on lunar surface before it was picked up. AS16-109-17844.

Mineralogy

Pyroxene: Hypersthene $Wo_4En_{50}Fs_{46}$ was reported by Schaal et al. (1976). Ryder and Norman (1979) reported both $Wo_{4-9}En_{45-50}$ and $Wo_{39-45}En_{34-36}$ (figure 6). Some pyroxene grains are large (2 mm). Bersch et al. (1991) also reported the composition of pyroxenes in 62255.

Plagioclase: Schaal et al. (1976) report that the plagioclase in 62255 anorthosite is An_{92-96}. Plagioclase grains up to 6 mm were reported. Meyer (1979) and Floss et al. (1998) determined trace elements in plagioclase in 62255.

Chemistry

Taylor et al. (1975) measured the composition of the white anorthositic portion of 62255 (figure 8) and Hertogen et al. (1977) found it to be low in meteoritic siderophiles (table 1). I can find no analyses of the dark, mafic melt.

Moore and Lewis (1976) reported 20 ppm carbon and 9 ppm nitrogen (probably from the anorthositic portion).

See et al. (1986) and Morris et al. (1986) determined the composition of the glass splash on the outer surface.

Radiogenic age dating

The only radiometric dating was by Jessberger et al. (1977), who were unable to obtain a satisfactory Ar/Ar plateau age for a "pyroxene-rich clast" from 62255. Boyet et al. (2009) and Lee et al. (1997) apparently also tried to date the anorthosite.

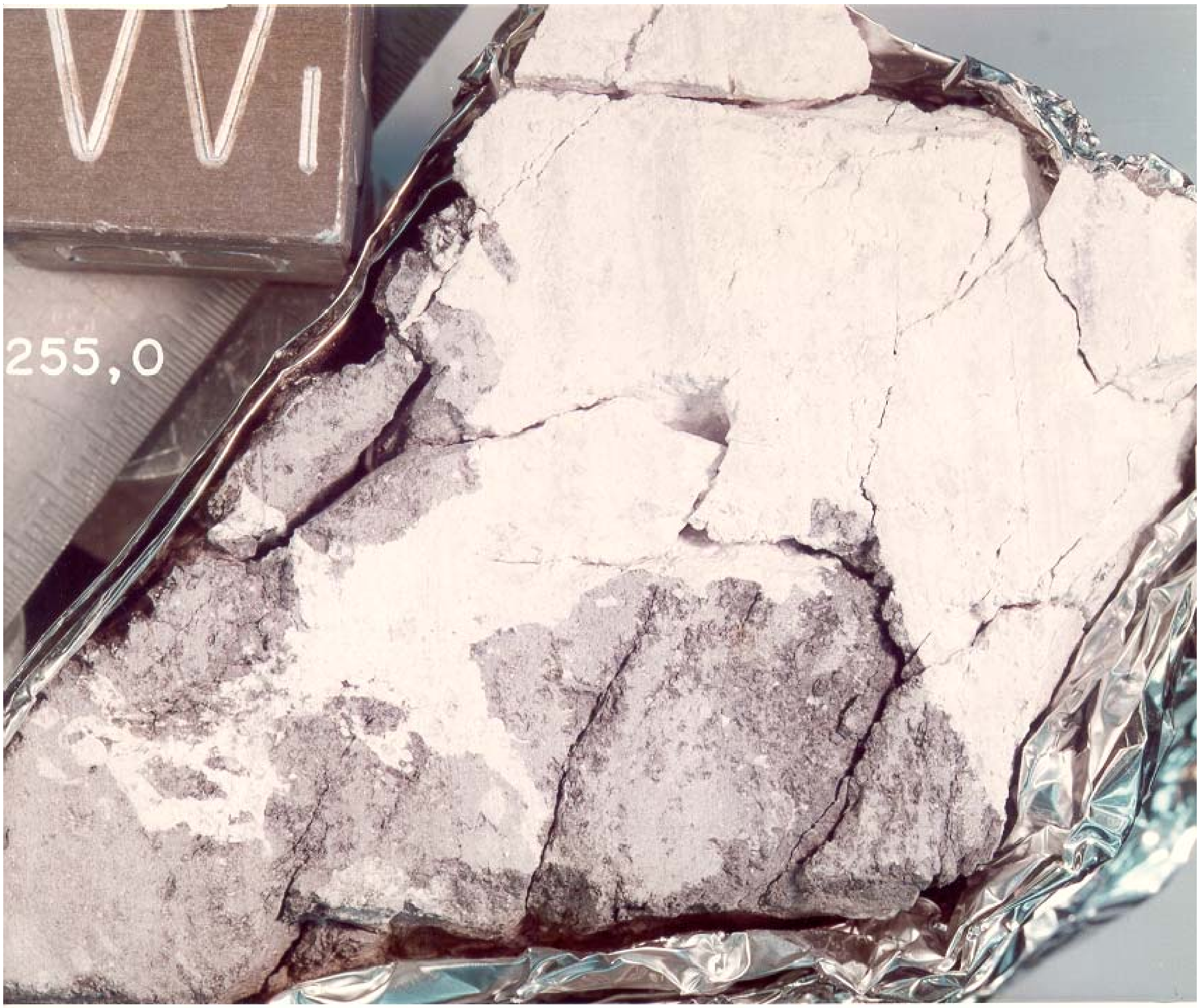

Figure 4: Photo of sawn surface of 62255,0 showing anorthosite surrounded by impact melt. Cube is 1 inch for scale. NASA S75-33052.

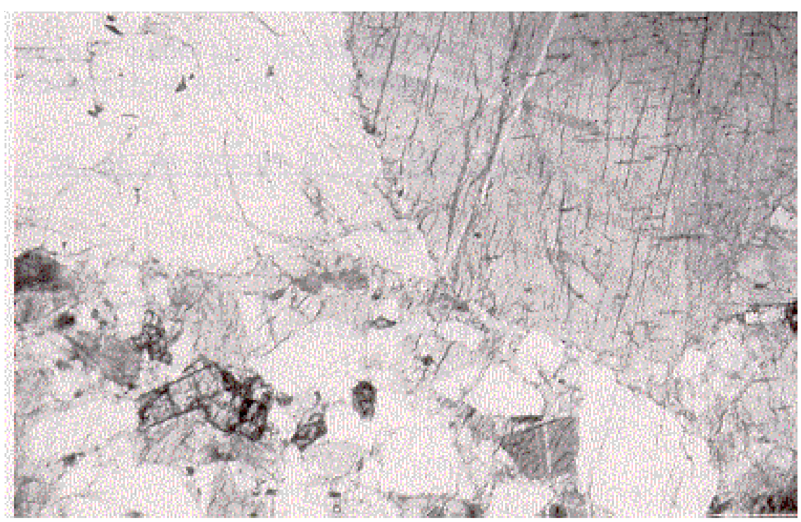

Figure 5: Photomicrograph of thin section of 62255 showing large plagioclase and small pyroxene. Field of view 2 mm.

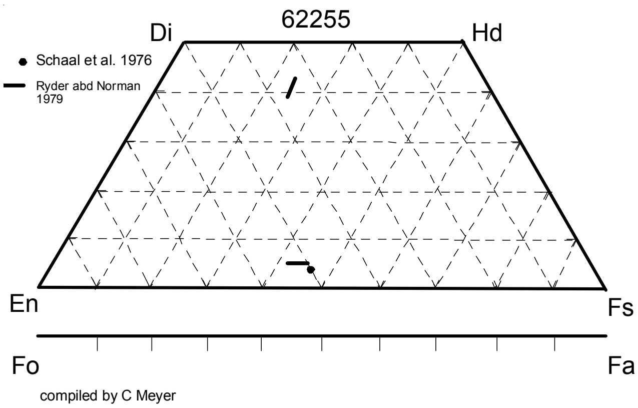

Figure 6: Composition of mafic minerals in 62255 anorthosite as reported (but never studied in detail).

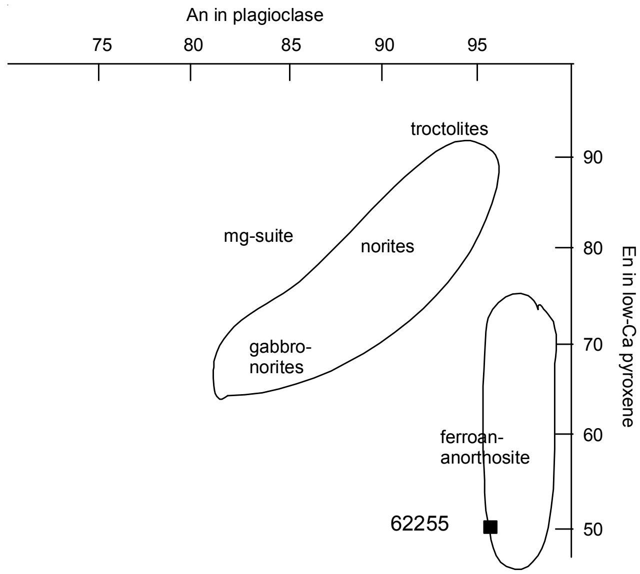

Figure 7: The white portion of 62255 is a ferroan anorthosite.

Cosmogenic isotopes and exposure ages

Jessberger et al. (1977) reported an ^{38}Ar exposure age of 3 ± 1 m.y. Ryder and Norman (1980) report an ^{81}Kr age of 1.9 m.y. (apparently from Marti 1975 pers. comm.)

Other Studies

Brownlee et al. (1975) and Schaal et al. (1976) studied the glass linings of impact craters on the surface of anorthosite portion of 62255 (figure 9). They found that the composition of the glass lining the crater was close to that of the underlying substrate (plagioclase) (figure 10).

Lightner and Marti (1974) determined the isotopic composition of rare gases in 62255.

Padawer et al. (1974) studied depth profiles of F and Cl in 62255, but found they were due to contamination by Teflon packaging.

Housley et al. (1976) found that ferromagnetic resonance absorption was week.

Processing

62255 was sawn in half, exposing the interior (figures 4, 11). It was not slabbed. There are 19 thin sections of 62255.

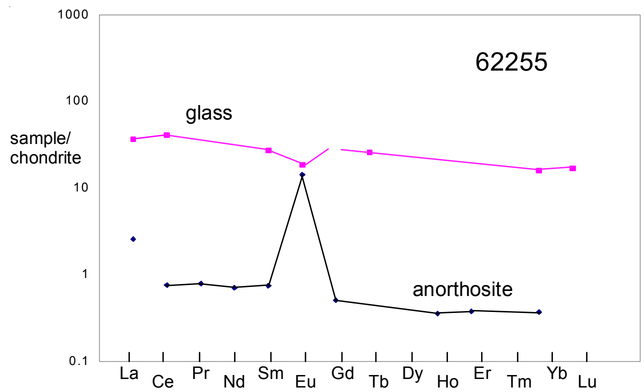

Figure 8: Normalized rare-earth-element diagram of 62255 anorthosite and of black glass coating (data from Taylor et al. and Morris et al. 1986).

Table 1. Chemical composition of 62255.

reference	Taylor 74		Hertogen 77		Morris 86		Lee97	
weight					glass coat			
SiO2 %	44.1	(a)			45.28	(d)		
TiO2					0.36	(d)		
Al2O3	35.3	(a)			25.46	(d)		
FeO	0.2	(a)			5.93	(d)		
MnO								
MgO	0.37	(a)			8.03	(d)		
CaO	19.1	(a)			14.29	(d)		
Na2O	0.49	(a)			0.59	(d)		
K2O	0.09	(a)			0.11	(d)		
P2O5								
S %								
sum								
Sc ppm					5.4	(d)		
V	7	(b)						
Cr	17	(b)			820	(d)		
Co					63	(d)		
Ni			1.6	(c)	1317	(d)		
Cu								
Zn			0.31	(c)				
Ga								
Ge ppb			5.8	(c)				
As								
Se			2.9	(c)				
Rb			0.025	(c)				
Sr								
Y								
Zr	0.45	(b)						
Nb								
Mo								
Ru								
Rh								
Pd ppb			0.13	(c)				
Ag ppb			2	(c)				
Cd ppb			3.8	(c)				
In ppb			1.7	(c)				
Sn ppb								
Sb ppb			0.54	(c)				
Te ppb			2.9	(c)				
Cs ppm			0.0005	(c)				
Ba	14.6	(b)			92	(d)		
La	0.6	(b)			8.68	(d)		
Ce	0.46	(b)			24.8	(d)		
Pr	0.07	(b)						
Nd	0.32	(b)						
Sm	0.11	(b)			4.04	(d)		
Eu	0.8	(b)			1.04	(d)		
Gd	0.1	(b)						
Tb					0.94	(d)		
Dy								
Ho	0.02	(b)						
Er	0.06	(b)						
Tm								
Yb	0.06	(b)			2.68	(d)		
Lu					0.43	(d)		
Hf					3.01	(d)	0.0239	(e)
Ta					0.47	(d)		
W ppb							3.46	(e)
Re ppb			0.0087	(c)				
Os ppb			0.018	(c)				
Ir ppb			0.016	(c)				
Pt ppb								
Au ppb			0.062	(c)				
Th ppm					1.94	(d)		
U ppm			1.37	(c)	0.46	(d)		

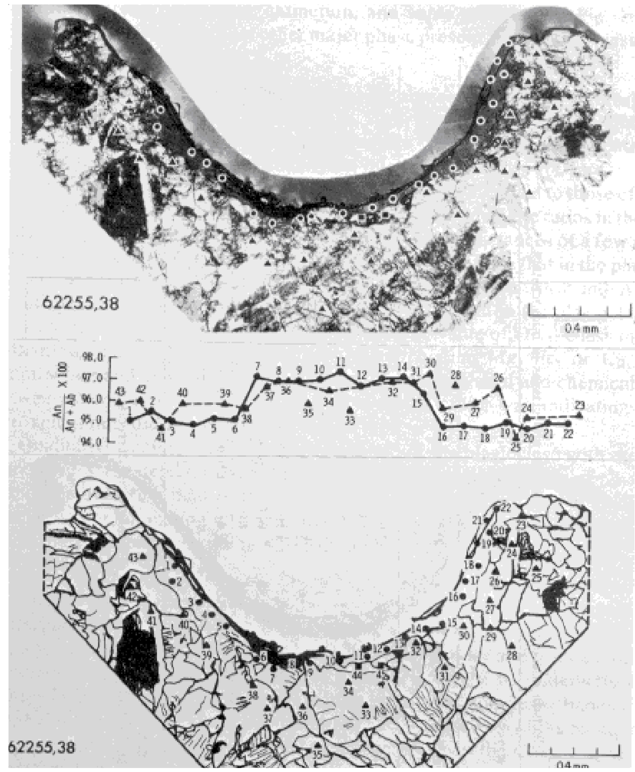

Figure 9: Cross section of large micrometeorite crater in plagioclase portion of 62255 (from Schaal et al. 1976).

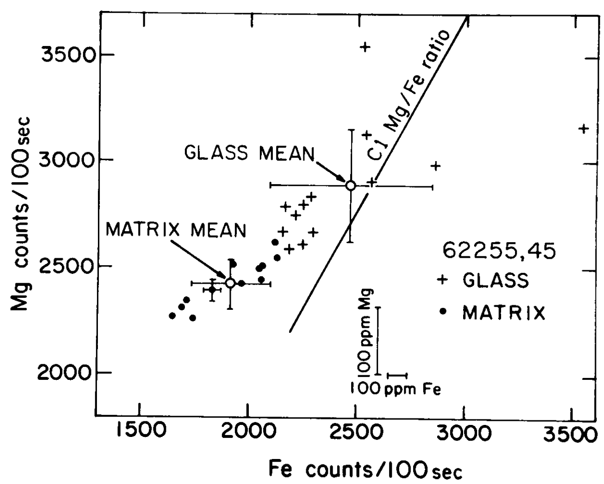

Figure 10: Composition of glass lining crater in plagioclase on 62255 (from Brownlee et al. 1975).

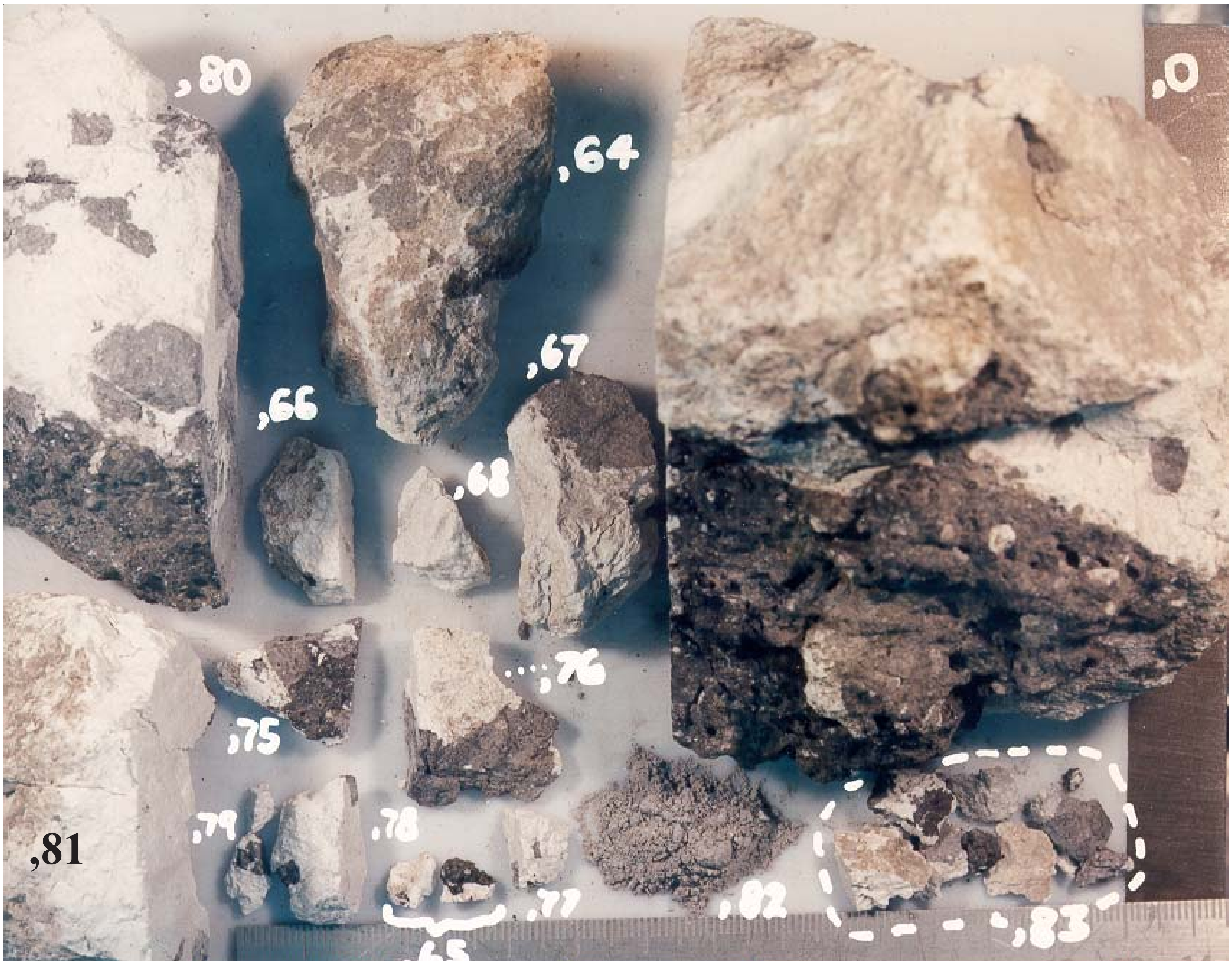

Figure 11: A saw cut in 1975 yielded a large piece (,0) and several smaller pieces. NASA S75-33040. Ruler is marked in cm.

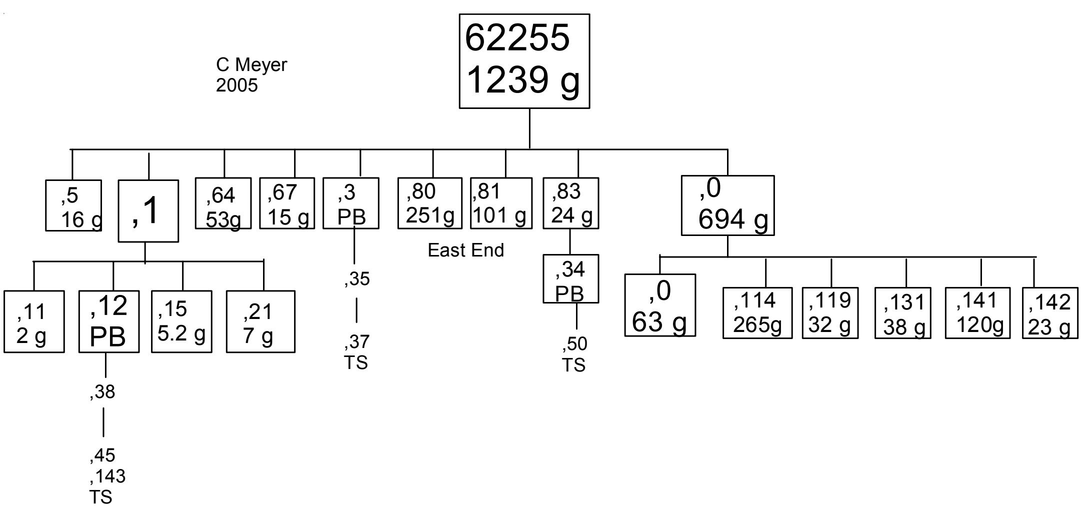

Figure 12: 62255,0 was further subdivided in 1993. Ruler in cm. NASA S93-040245.

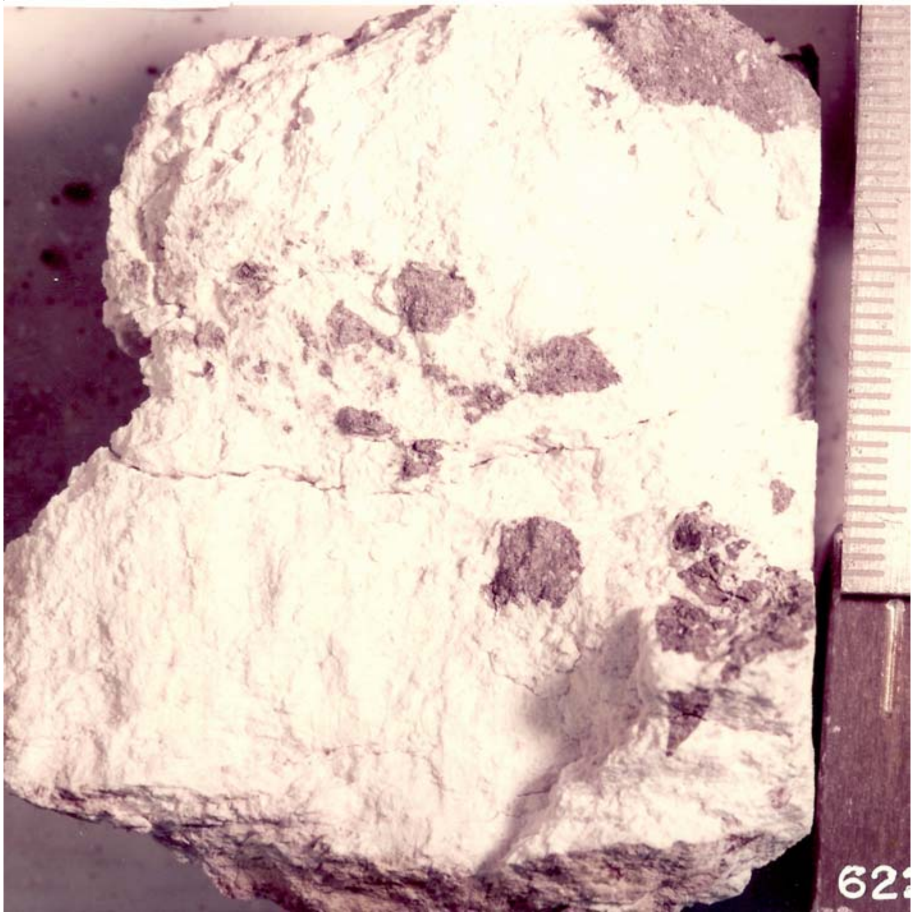

Figure 13: Photo of 62255,81 showing how chalky white the plagioclase is. Scale is marked in cm. S75-33043.

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