65035

Glass-coated Breccia

446 grams

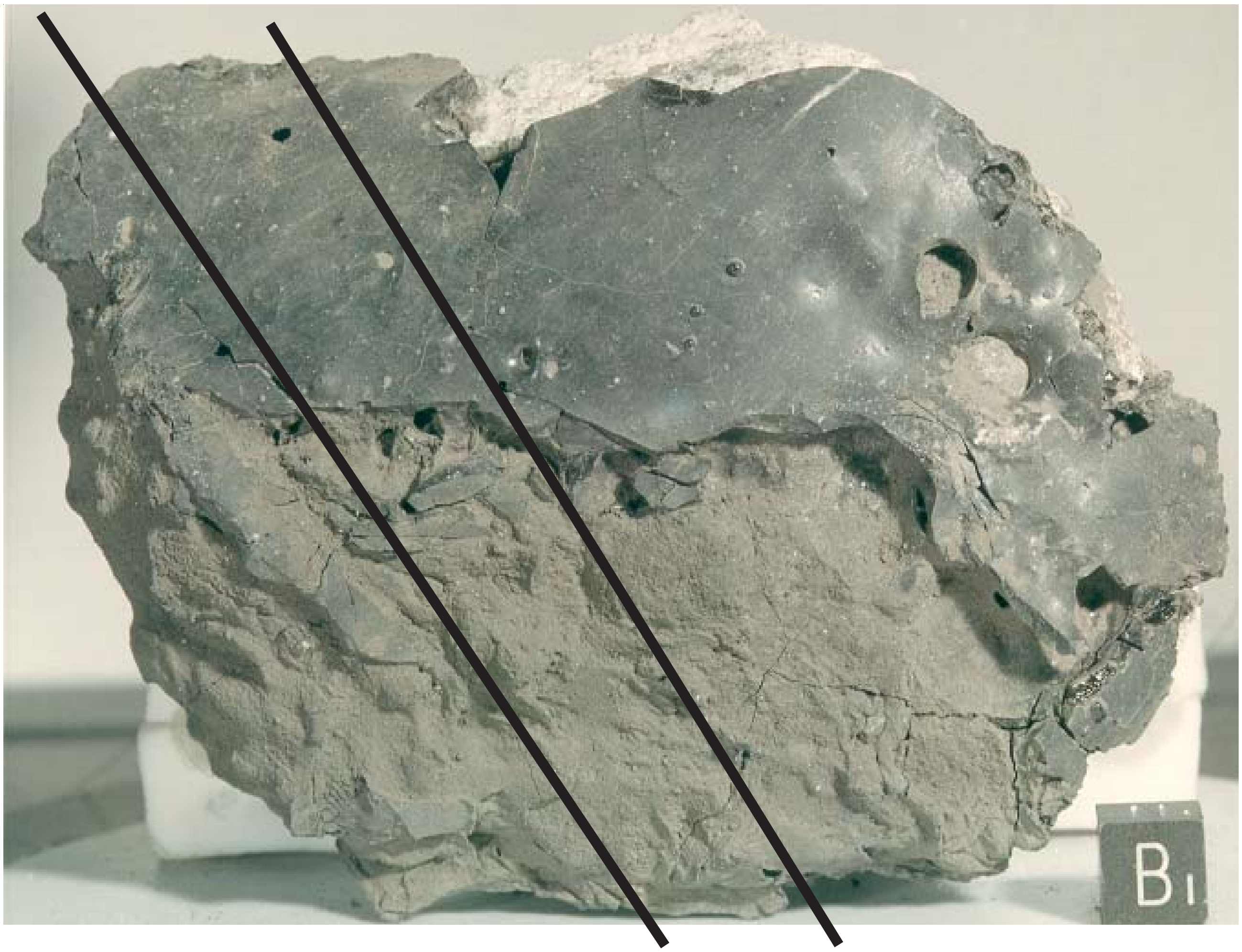

Figure 1: Photo of 65035. NASA S72-39666. Cube is 1 cm. Saw cuts are indicated.

Introduction

65035 is a breccia with large clasts of light-colored cataclastic anorthosite intermixed with dark-colored basaltic impact melt. It is covered or coated with a thick glass coat on one side (figure 1). Although a slab was cut through the middle, 65035 has not been studied. The anorthositic portion is lithologically similar to 65315, a rake sample collected nearby (Sutton 1981).

65035 was a glass coated bomb that landed on the regolith while the glass was apparently still molten allowing welding of fine regolith material (figure 1). The side that was exposed to space experienced meteorite bombardment to erode the glass coating (figure 2). However, photos of the sample on the lunar surface show the glass side facing upward. This must be recent, because there are generally no zap pits on the smooth shiny glass.

An age of 2.29 m.y. indicates that this rock was derived from South Ray Crater.

Petrography

Photographs of the interior of 65035 (figures 4 and 7), show that it has two main lithologies (in addition to the glass coating). The dark lithology has a basaltic texture (figure 5) and the light lithology is cataclastic

Figure 2: Photo of 65035. NASA S79-33984. Sample is about about 11 cm across. Lines indicate trace of saw cuts to produce slab ,28.

anorthosite (figure 6) of the ferroan type. 65035 is typical of the "dilithic breccia" from this location. James (1980) termed these materials "dimict breccias".

Schaal et al. (1979) and Ryder and Norman (1980) give a brief petrologic description.

Mineralogy

Olivine: not reported

Pyroxene: McGee (1993) reported pyroxene content of anorthositic portion (figure 3). Ryder and Norman (1980) also reported an analysis by Schaal of pyroxene (Wo_2En_{63}).

Plagioclase: Plagioclase is reported as $An_{96\text{-}97}$ (determined by Schaal), reported in Ryder and Norman (1980). McGee (1993) determined the Mg and Fe content (figure 8).

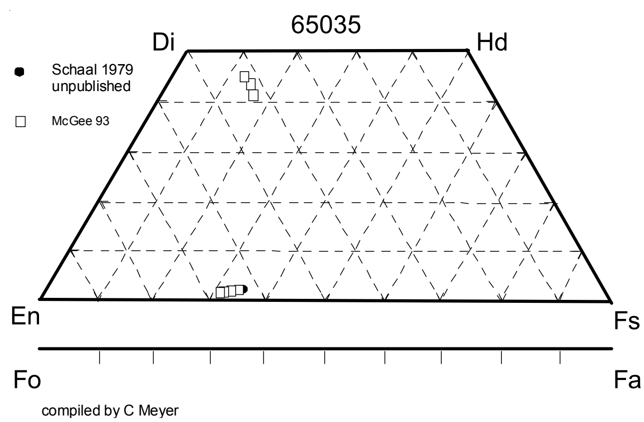

Figure 3: Pyroxene composition of white portion of 65035 (as reported in Ryder and Norman 1980 and McGee 1993).

Figure 4: Sawn surface of 65035,0 showing dilithic nature of anorthosite and melt rock. NASA S89-42856.

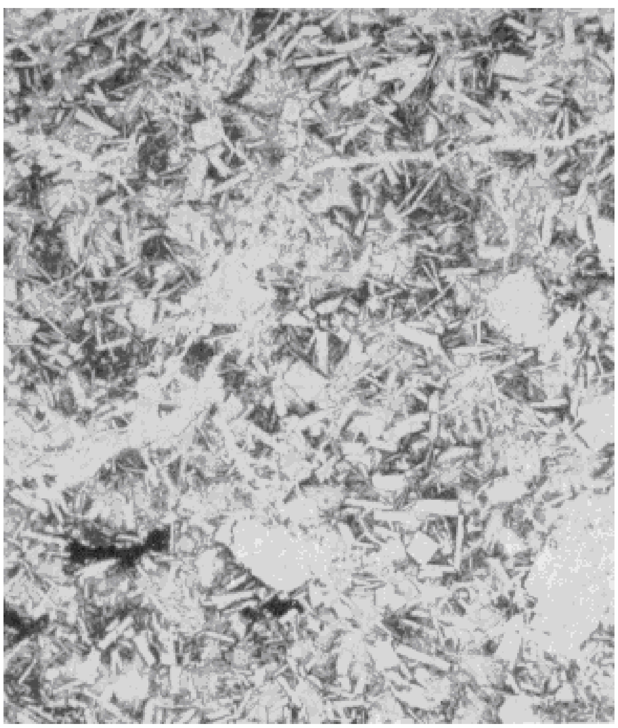

Figure 5: Photomicrograph of thin section 65035,5 showing basaltic texture of impact melt. Field of view 0.5 mm. From Ryder and Norman 1980.

Figure 6: Photomicrograph of thin section 65035,8 showing coarse plagioclase in anorthosite portion. Crossed polarizers. Field of view 2 mm. From Ryder and Norman 1980.

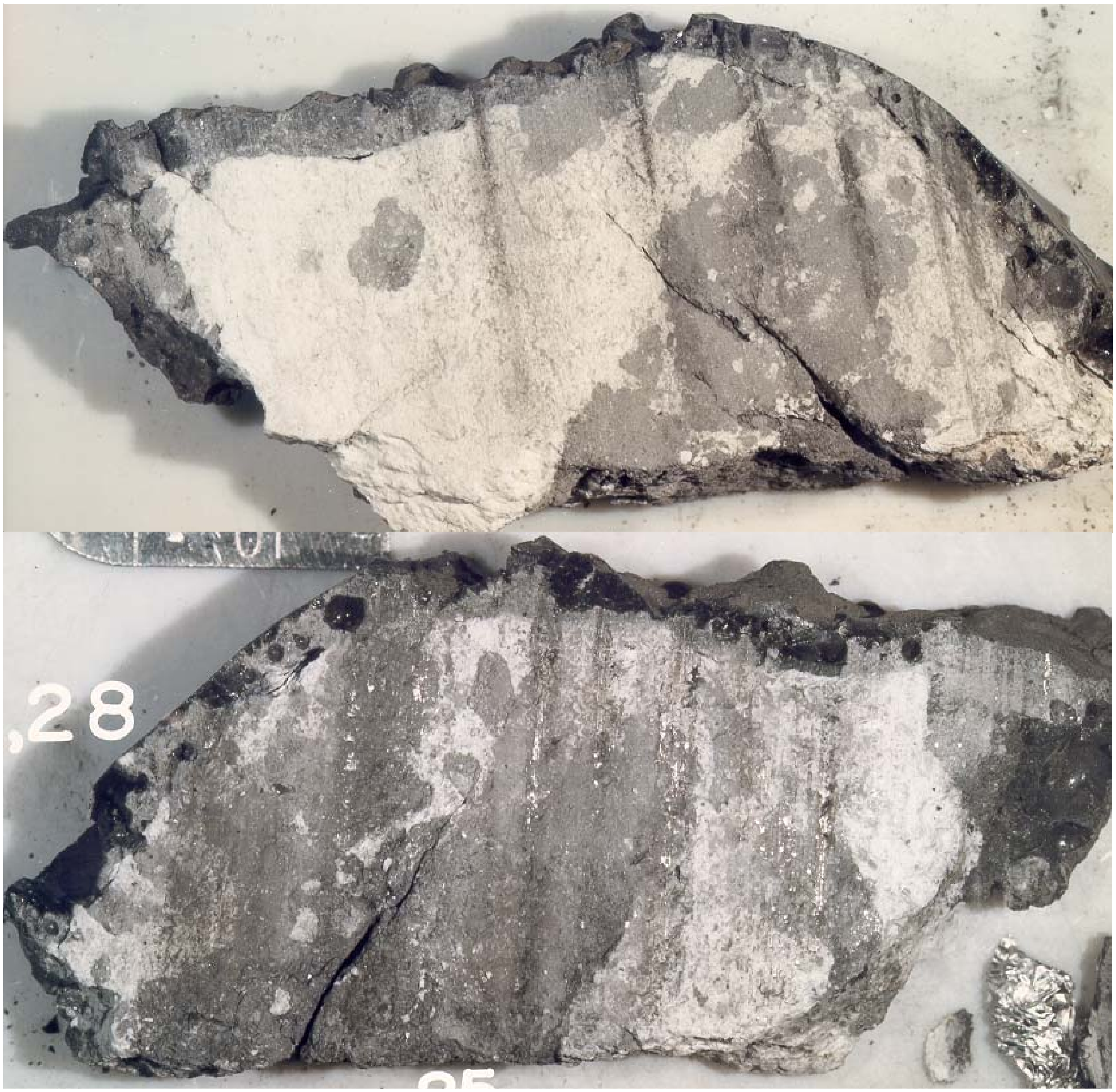

Figure 7: Photos of slab 65035,28. NASA S89-46521 (top) and 42853 (bottom). Saw marks partially obscure image.

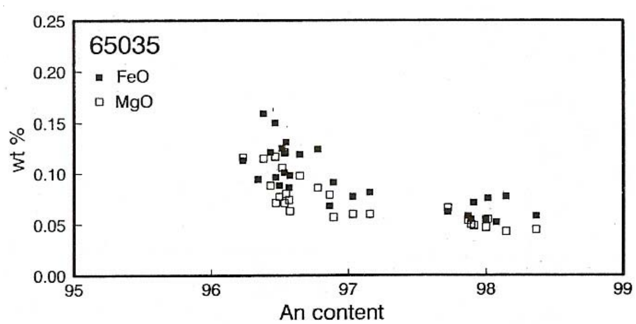

Figure 8: Composition of plagioclase in 65035 (McGee 1993).

Glass: Schaal et al. (1979), See et al. (1986) and Morris et al. (1986) reported on the glass coating.

Chemistry

Rancitelli et al. (1973a) determined the bulk composition of the whole sample. Morris et al. (1986) analyzed the glass coat (figure 11). The interior impact melt and anorthositic breccia have apparently never been analyzed !

Figure 9: Close-up photo of micrometeorite craters with glass-lined central pits and wide spall zone of glass coating on 65035,0. NASA S88-46193.

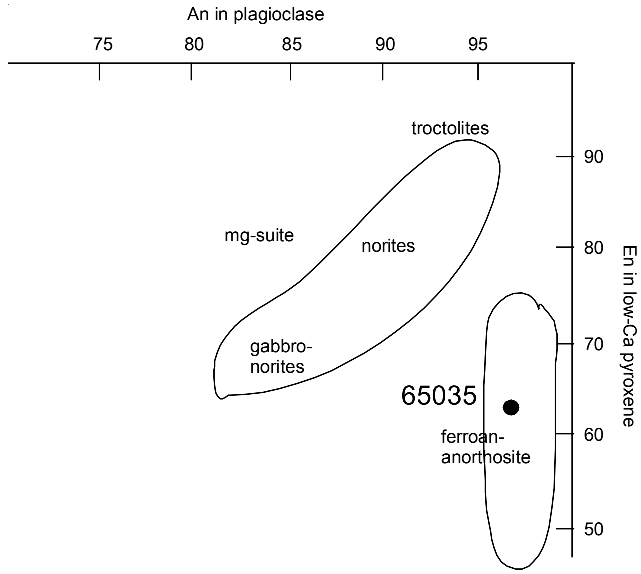

Figure 10: Plagioclase and pyroxene composition of 65035 anorthosite compared with those of other lunar highland rocks. unpublished data

Cosmogenic isotopes and exposure ages

Rancitelli et al. (1973b) determined the cosmic-ray-induced activity of ^{22}Na = 49 dpm/kg. and ^{26}Al = 172 dpm/kg. Eugster (1999) determined a cosmic ray exposure age of 2.29 ± 0.5 m.y. by the ^{38}Ar method.

Processing

A slab was cut across the sample in 1989 (see trace in figures 1 and 2). There are 26 thin sections. It is apparently a rock of the James Consortium.

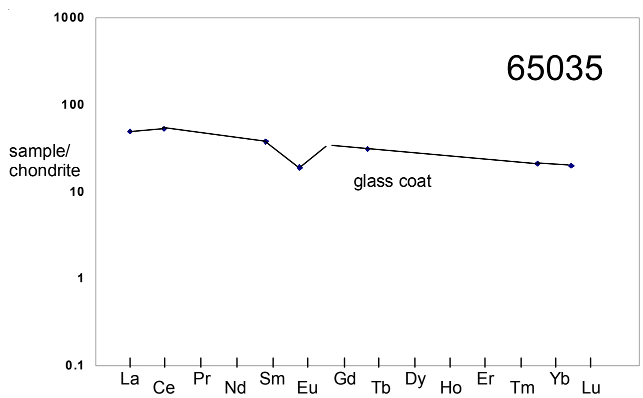

Figure 11 : Normalized rare-earth-element diagram for glass coat on 65035.

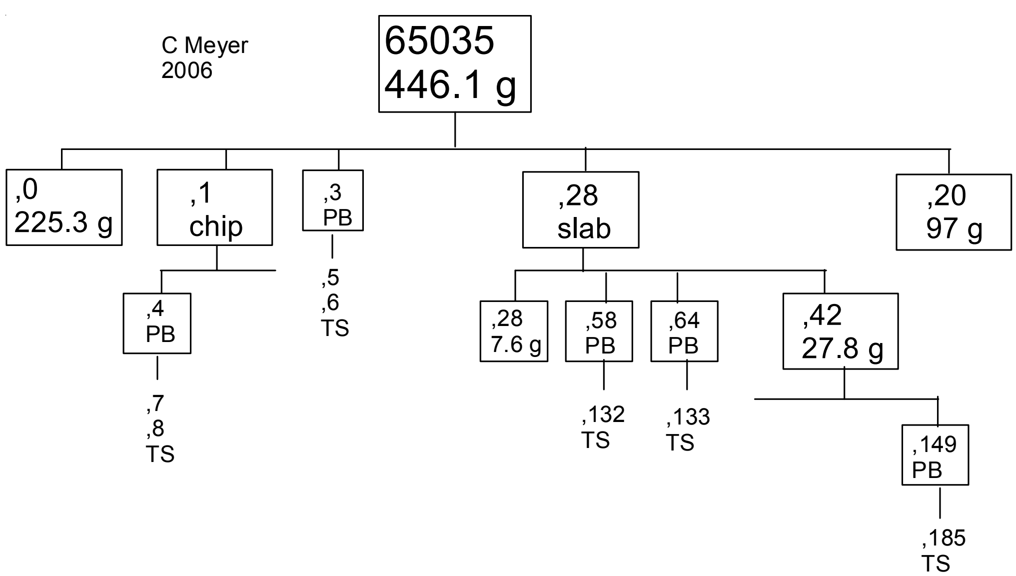

Table 1. Chemical composition of 65035.

			glass		anor	
reference	Rancitelli 73		Morris 86		See 86	
weight	440 g		See 86			
SiO2 %			44.59	(c)	44.61	(c)
TiO2			0.42	(c)	0.27	(c)
Al2O3			25.86	(c)	33.18	(c)
FeO			6.26	(c)	0.95	(c)
MnO						
MgO			7.76	(c)	1.65	(c)
CaO			14.5	(c)	18.47	(c)
Na2O			0.47	(c)	0.45	(c)
K2O	0.11	(a)	0.11	(c)	0.08	(c)
P2O5						
S %						
sum						
Sc ppm			6.64	(b)		
V						
Cr			952	(b)		
Co			63	(b)		
Ni			1143	(b)		
Cu						
Zn						
Ga						
Ge ppb						
As						
Se						
Rb						
Sr						
Y						
Zr						
Nb						
Mo						
Ru						
Rh						
Pd ppb						
Ag ppb						
Cd ppb						
In ppb						
Sn ppb						
Sb ppb						
Te ppb						
Cs ppm						
Ba			105	(b)		
La			11.53	(b)		
Ce			31.7	(b)		
Pr						
Nd						
Sm			5.54	(b)		
Eu			1.06	(b)		
Gd						
Tb			1.12	(b)		
Dy						
Ho						
Er						
Tm						
Yb			3.43	(b)		
Lu			0.48	(b)		
Hf			3.71	(b)		
Ta			0.37	(b)		
W ppb						
Re ppb						
Os ppb						
Ir ppb						
Pt ppb						
Au ppb						
Th ppm	1.65	(a)	2.72	(b)		
U ppm	0.43	(a)	0.35	(b)		

technique: (a) radiation counting, (b) INAA, (c) emp

References for 65035

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