15255 REGOLITH BRECCIA, GLASS-COATED ST. 6 240.4 g

INTRODUCTION: 15255 is a tough, medium-light brownish gray regolith breccia which has a glass-coat (Fig. 1), mainly on one ("N") side. It contains a typically regolith assemblage of glass, minerals, and lithic fragments. The fragments are not heavily shocked. Some mare basalt is present, but KREEP basalts are not obvious. The breccia appears to be a little less KREEP-rich than local soils; the glass is distinctly different from local soil in having lower alumina and higher rare-earths.

Figure 1. Post-saw view of ,0, showing interior of breccia, and vesicular glass coat on "N" side. S-72-15232

15255 is subangular, rounded, and fairly homogeneous. The glass coating is finely fractured and has vesicles up to 15 mm in size. Although the original catalog (Lunar Sample Information Catalog Apollo 15, 1971) reported many zap pits, a later description by Horz (data packs) found only one, a secondary, even under binocular to 80x, in a 6 to 8 cm^2 area and none with the naked eye on the sample. This observation apparently refers only to the glass. 15255 was collected less than 1 m from 15256, 30 m west of the LRV and approximately 25 m southwest and upslope of the 12 m crater at Station 6. Its orientation is known and the glass coat was on the underside.

PETROLOGY: The breccia is non-porous, with a brown glassy matrix (Fig. 2). Glass shards and spheres include colorless, pale yellow, and some green glass. Red/orange glass appears to be absent. There are also schlieren of brown devitrified glass, and glassy breccias. Mare basalt fragments are definitely present, and include coarse pyroxene-poikilitic rocks, and others with a variety of textures. KREEP basalts are not evident. The lithic and mineral fragments are not strongly shocked. Nava et al. (1977) found that the breccia consisted of 45% undevitrified glass, with fragments of plagioclase, olivine, pyroxene, ilmenite, and minor cristobalite and chromian ulvospinel. The lithic fragments are small and most of the igneous areas ones are "norites." The mafic minerals have a wide compositional range, including pyroxferroite and fayalite (Fig. 3), and at least these Fe-rich minerals are probably mare-derived. Winzer (1978) tabulated area analyses (focussed beam, scans) for ten clasts, which have several sources including mare basalt, green glass, VHA-poik, and others; most have Al_2O_3 in the range 20-25 wt %.

The glass coat is banded, pale-green, and vesicular. The contact with the host breccia is sharp but in some places uneven. Nava et al. (1977) reported the presence of a fine-vesicular layer at the contact, such as might be produced from a hot melt splash on a cooler breccia, with local degassing. The chemistry and texture indicates that the glass is not a melt of the rock. It includes tiny metal spherules. Winzer et al. (1978) found that 15255 had the most fragment-free glass coat of several they studied; the glass exhibited flowage.

Nava et al. (1977) analyzed glasses in 15255, including the rind glass (Fig. 4). There is a variety of glass compositions. The rind glass has a higher mafic content and a lower alkali and alumina content than most matrix glasses.

Reflection spectra for 15255 shows that the sample has among the most high-Ca pyroxene of Apollo 15 breccias, as indicated in a plot of the wavelengths of the positions of the pyroxene absorption bands against each other (Adams and McCord, 1972).

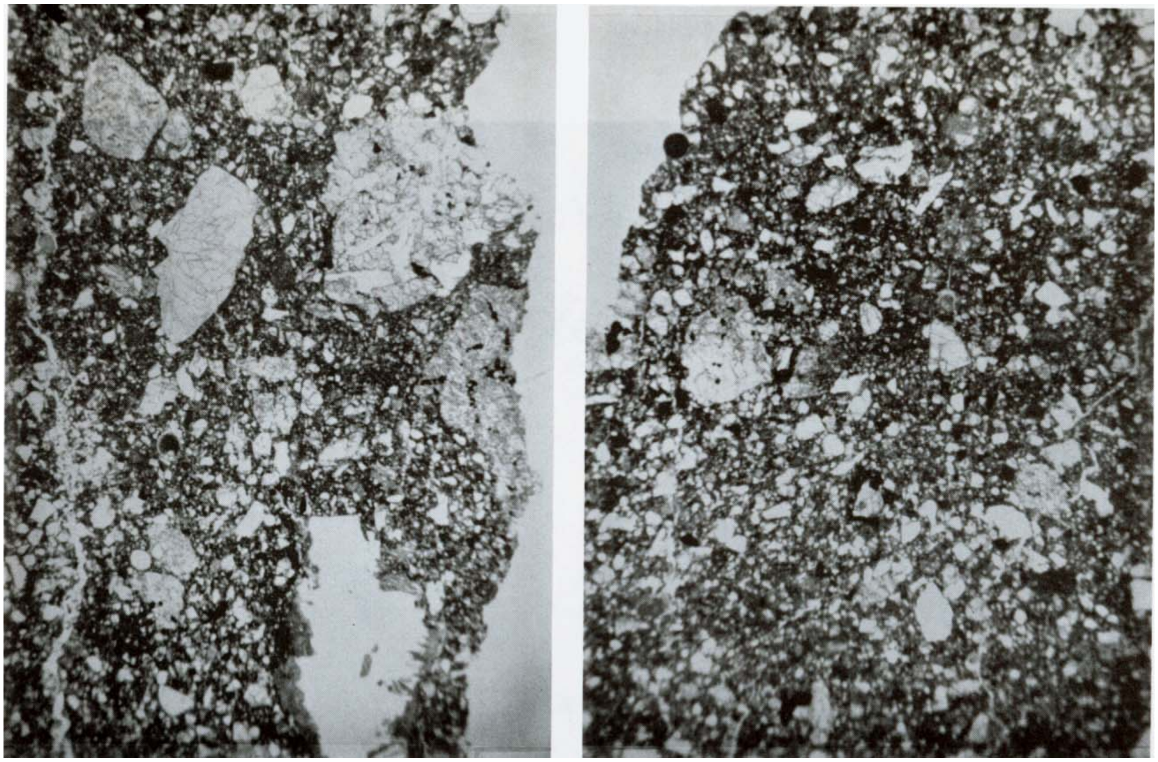


Figure 2. General photomicrographs of 15255,76. Widths about 2 mm.
Transmitted light. a) shows a mare basalt clast in the upper right.

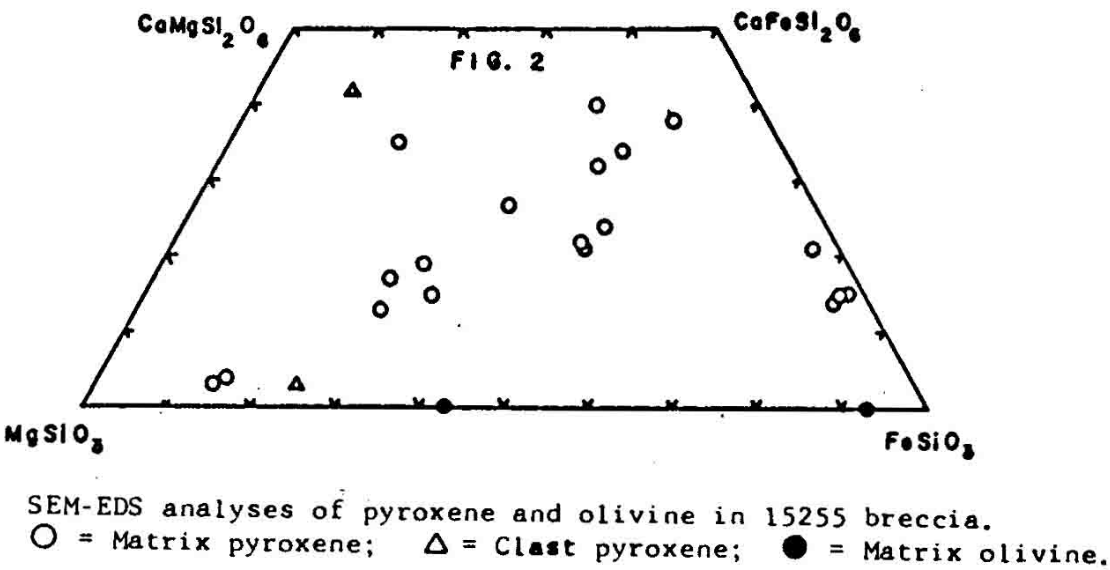
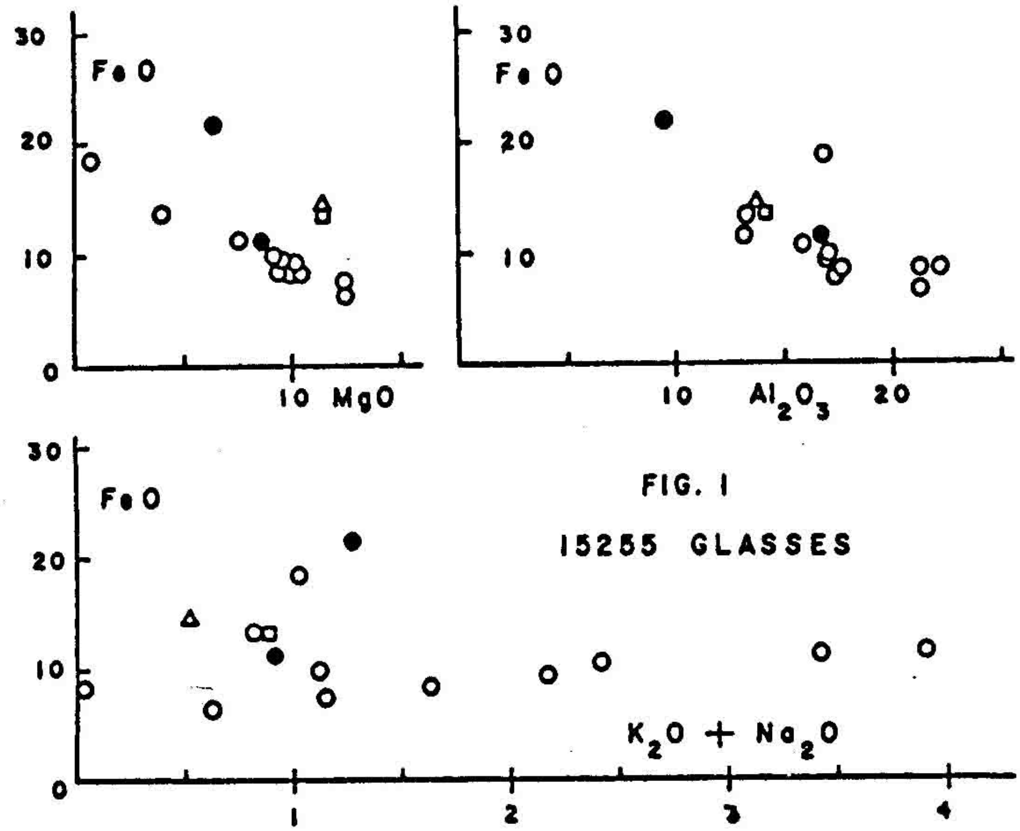


Figure 3. Plots of mafic mineral compositions for 15255
(Nava et al., 1978).



Compositions, in weight %, of glasses in 15255.
□ = Rind glass (SEM-EDS average of 20);
△ = Rind glass (EMP average of 13-19);
● = Glass patches within rind glass (SEM-EDS);
○ = Matrix glasses (SEM-EDS).

Figure 4. Plots of glass compositions for 15255
(Nava et al., 1978).

TABLE 15255-1. Chemical analyses of bulk matrix

		,0	,15	,34
Wt %	SiO2			
	TiO2			
	Al2O3			
	FeO			
	MgO			
	CaO			
	Na2O			
	K2O	0.187		0.181
	P2O5			
(ppm)	Sc			
	V			
	Cr			
	Mn			
	Co			
	Ni			
	Rb			4.91
	Sr			122
	Y			
	Zr			290
	Nb			
	Hf			7.9
	Ba			225
	Th	3.5		
	U	0.92		
	Pb			
	La			
	Ce			
	Pr			
	Nd			35.1
	Sm			10.2
	Eu			1.30
	Gd			
	Tb			
	Dy			13.5
	Ho			
	Er			8.05
	Tm			
	Yb			7.26
	Lu			1.11
	Li			13.3
	Be			
	B			
	C		123	
	N			
	S			
	F			
	Cl			
	Br			
	Cu			
	Zn			
(ppb)	I			
	At			
	Ga			
	Ge			
	As			
	Se			
	Mo			
	Tc			
	Ru			
	Rh			
	Pd			
	Ag			
	Cd			
	In			
	Sn			
	Sb			
	Te			
	Cs			
	Ta			
	W			
	Re			
	Os			
	Ir			
	Pt			
	Au			
	Hg			
	Tl			
	Bi			
		(1)	(2)	(3)

References and methods:

(1) Keith et al. (1972); gamma ray spectroscopy
(2) Moore et al. (1973); pyrolysis, gas chromotography
(3) Nava et al. (1977); isotope dilution/mass spectrometry

TABLE 15255-2. Chemical analyses of rind glass

		,77(a)	,77	,34	,38
Wt %	SiO_2	48.0	46.4		46.76
	TiO_2	1.61	1.80		1.74
	Al_2O_3	14.37	14.1		13.91
	FeO	13.24	14.7		14.58
	MgO	11.43	11.1		11.29
	CaO	10.26	10.7		11.06
	Na_2O	0.77	0.38		0.18
	K_2O	0.10	0.16	0.282	0.16
	P_2O_5		0.11		
(ppm)	Sc				
	V				
	Cr		3010		3150
	Mn	1550	1700		
	Co				
	Ni				
	Rb			7.49	
	Sr			134	
	Y				
	Zr			501	
	Nb				
	Hf				
	Ba			383	
	Th				
	U				
	Pb				
	La				
	Ce			71.5	
	Pr				
	Nd			53.9	
	Sm			15.0	
	Eu			1.67	
	Gd				
	Tb				
	Dy			20.0	
	Ho				
	Er			12.2	
	Tm				
	Yb			11.0	
	Lu			1.54	
	Li			18.0	
	Be				
	B				
	C				
	N				
	S				
	F				
	Cl				
	Br				
	Cu				
	Zn				
(ppb)	I				
	At				
	Ga				
	Ge				
	As				
	Se				
	Mo				
	Tc				
	Ru				
	Rh				
	Pd				
	Ag				
	Cd				
	In				
	Sn				
	Sb				
	Te				
	Cs				
	Ta				
	W				
	Re				
	Os				
	Ir				
	Pt				
	Au				
	Hg				
	Tl				
	Bi				
		(1)	(2)	(3)	(4)

References and methods:

(1) Nava et al. (1977); SEM-EDS
(2) Nava et al. (1977); microprobe
(3) Nava et al. (1977); isotope dilution, mass spectrometry
(4) Winzer et al. (1978); SEM-EDS

Notes:

(a) some uncertainties very large (especially Mn, Na, K)

CHEMISTRY: Limited chemical data for the breccia (Table 1) and for the rind glass (Table 2) are available. Rare earths are shown in Figure 5. The limited data suggest that the breccia composition is similar to, but a little less KREEP-rich than Station 6 soils; the glass is distinctly more mafic and more KREEP-rich (Fig. 5). The difference in composition precludes the formation of the glass by melting of the rock.

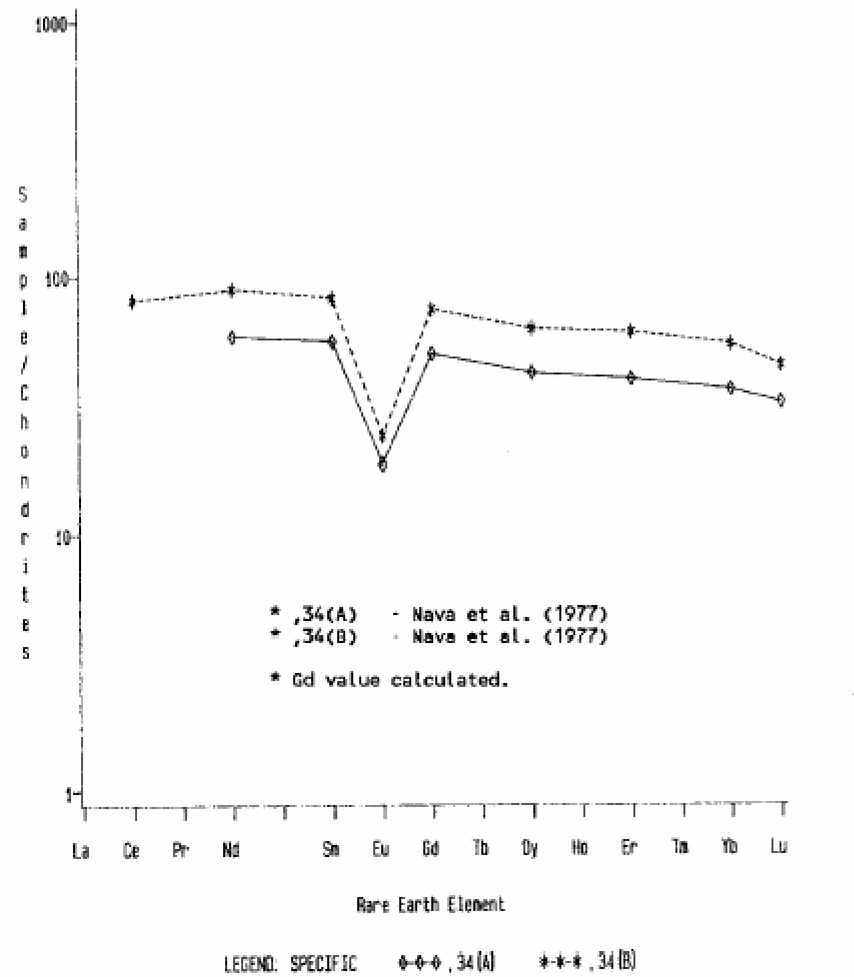


Figure 5. Rare earths in 15255 lithologies.

EXPOSURE: Cosmogenic radionuclide disintegration count data by Keith et al (1972) (^{26}Al, ^{22}Na, ^{54}Mn, ^{56}Co, ^{46}Sc) implies that ^{26}Al is saturated, indicating a surface residence of about a million years or more. Yokoyama et al. (1974) reanalyzed the data with the ^{26}Al-^{22}Na method and verified that ^{26}Al was saturated. The lack of impact craters led Horz (data pack notes) to believe that the glass had never been exposed.

PROCESSING AND SUBDIVISIONS: 15255 was sawn to produce two ends (,0 and ,1) and multiple thin slab chips ,2 and ,3 (Fig. 6). Subsequently thin sections were made from two daughters of ,3 (,19 and ,20). ,1 was further split and most allocations made from it, and a further potted butt from ,1 (,33) produced another thin section which had glass coat on it. ,0 is now 193.4 g and ,1 is now 13.8 g; no other piece is as large as 7 g.

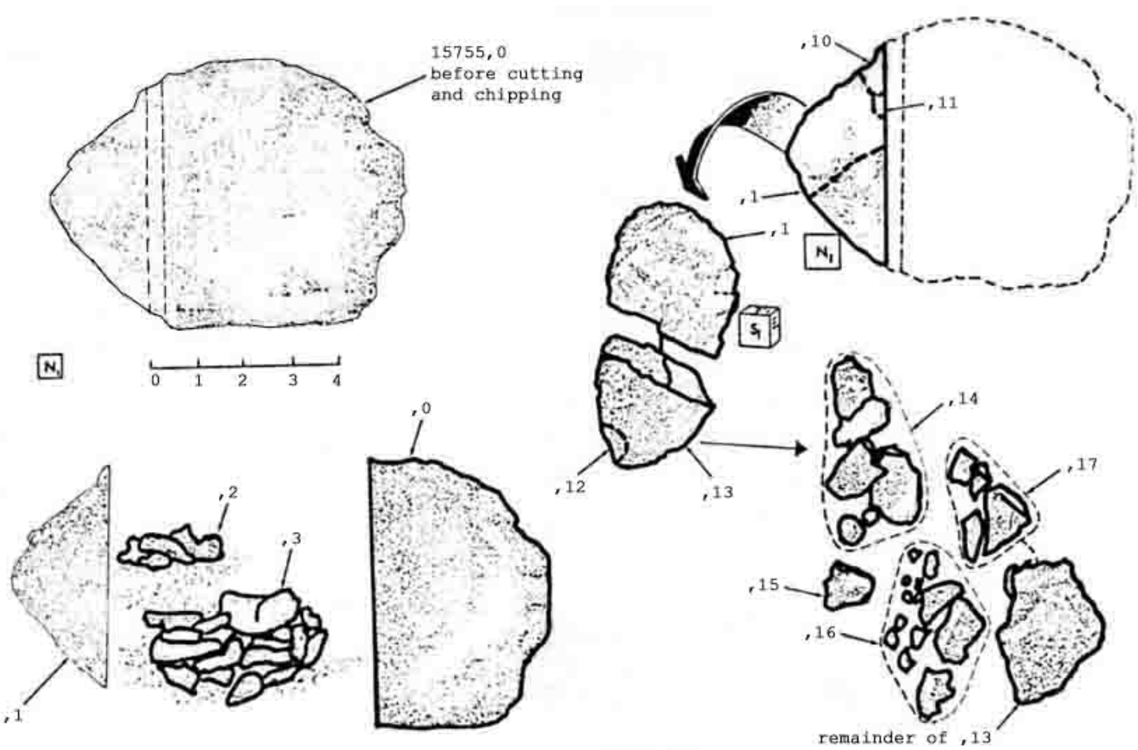


Figure 6. Sawing and splitting of 15255.