15505 REGOLITH BRECCIA, GLASS-COATED ST. 9 1147.0 g

INTRODUCTION: 15505 is a regolith breccia derived mainly from mare materials and almost entirely coated with glass (Fig. 1). The composition of the glass is similar to that of the breccia. The sample is irregularly shaped. The glass coat is black; the interior breccia is coherent and medium dark gray. The sample was less than one-half buried and lacks zap pits; its lunar orientation is known.

15505 was collected 15 m west of the rim of a small crater and is probably part of the ejecta blanket. Samples 15506 and 15508 probably broke off 15505 in transit.

PETROLOGY: 15505 is a regolith breccia (Fig. 2) which is derived principally from the bedrock quartz-normative mare basalts at St. 9 (Engelhardt et al., 1972, 1973) and is similar to soils collected at that site in its fragment population. Both Engelhardt et al. (1972, 1973) and Michel-Levy and Jahann (1973) agreed that the matrix is rich in comminuted debris including abundant glass particles and spheres and welded with glass. Engelhardt et al. (1973) analyzed glass fragments but reported no specific data. Pyroxene mineral fragments are more abundant than plagioclase. Gleadow et al. (1974) noted a group of mafic metabasalts in the sample, and defocused beam, energy-dispersive microprobe analyses of these and other components are given in Sewell et al. (1974).

Wilshire and Moore (1974) noted that the glass does not mask the sharply angular character of the rock, and concluded that the glass is exposed veins which had developed along conjugate fracture surfaces. Michel-Levy and Jahann (1973) agreed that the glass cannot be a "splash" glass because it covers the entire sample, and interpreted it as an "exudation" glass derived from the matrix. Winzer et al. (1978) reported a composition for the glass coat (Table 2). Griscom and Marquardt (1972) and Tsay et al. (1976) reported brief electron spin resonance data for surface glass samples.

CHEMISTRY: Chemical analyses of the matrix are listed in Table 1 and of the glass "coat" in Table 2, with rare earths for the matrix shown as Figure 3. There is a distinct similarity between glass, breccia, and local soils. Modzeleski et al. (1972) reported CO, CO_2, and CH_4 determinations from which their bulk carbon abundance is derived.

STABLE ISOTOPES: Garner et al. (1975) reported Li, K, and Rb isotopic determinations; they could not distinguish whether their samples were breccia, glass, or a mixture. They found the sample to be depleted in ^{39}K, the first rock so found. Reed et al. (1977) reported ^{204}Pb data.

RADIOGENIC ISOTOPES: Silver (1973) reported Pb isotopic data and found that bulk rock, matrix, and glass are all similar, and similar to local soils. Schaeffer and Schaeffer (1977) found that Ar gas release gave little information, with increases and decreases

with temperature increase, ranging from 3.33 to 6.83 b.y. The total K-Ar "age" is 5.18 ± 0.05 b.y. The sample has a large trapped Ar component. Rosholt (1975) and Rosholt and Tatsumoto (1973) reported Th isotopic data in a discussion of the sources of the radioactivity in the sample.

Figure 1. Pre-split showing abundant vesicular glass, with breccia matrix in lower left. S-71-47283

EXPOSURE AND TRACKS: Rancitelli et al. (1972) reported cosmogenic radionuclide data: ^{26}Al is extremely undersaturated, indicating exposure for only a few hundred

thousand years. The Ar data of Schaeffer and Schaeffer (1977) give an exposure of 604 m.y. averaged over the entire release, but the range is 1 to 3800 m.y. Ar is too complexly distributed for meaningful interpretations. Fleischer et al. (1973) found a minimum track density in pyroxene of 2 x 10^6 cm^{-2}, at 1.5 mm depth, indicating an exposure of <600,000 yrs. According to Crozaz et al. (1974) the exposure is multistage.

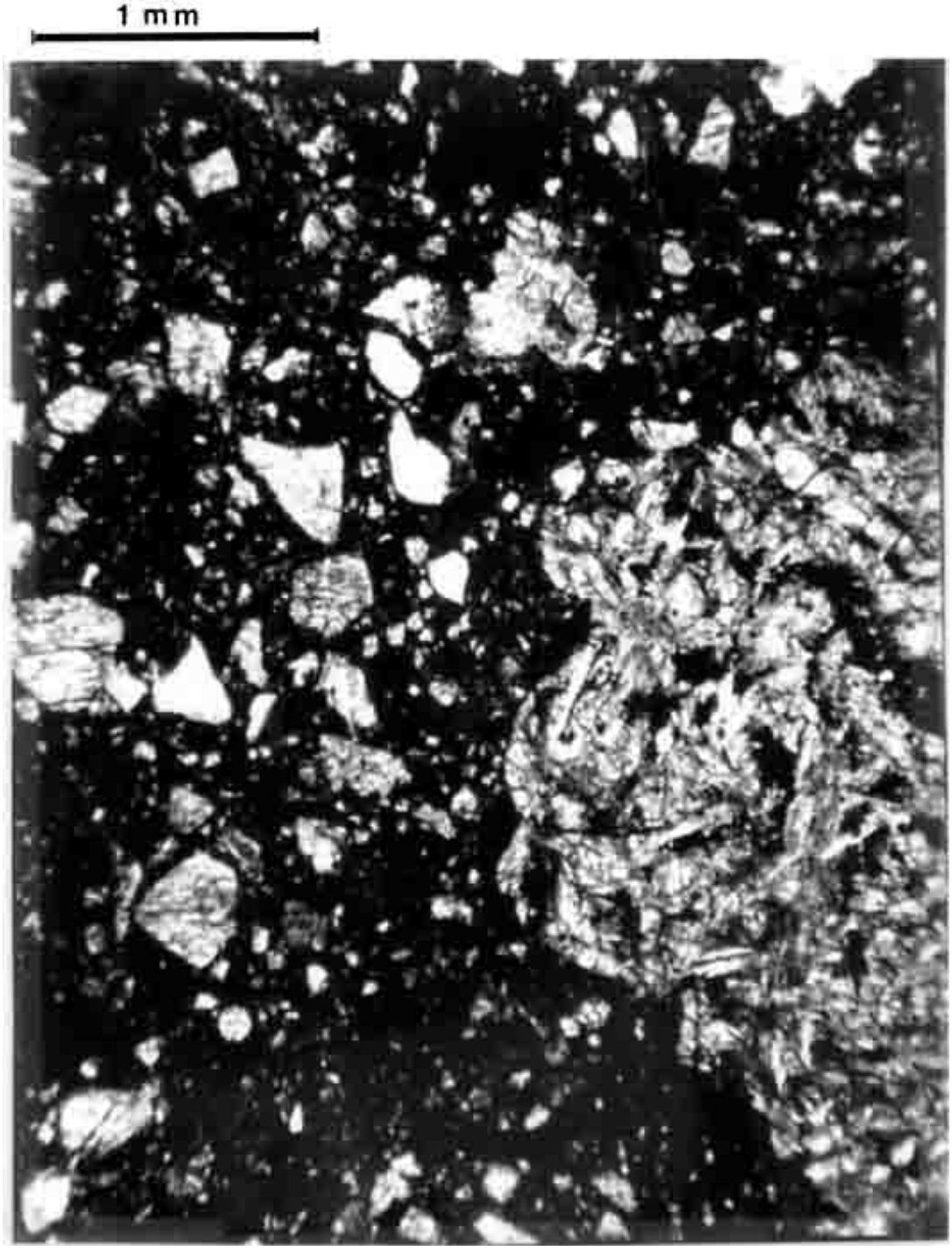

Figure 2. Photomicrograph of matrix of 15505,48, transmitted light.

TABLE 15505-1. Chemical analysis of bulk rock

		,29	,22	,26	,17	,17a	,17	,24	,8	,8M	,72	,0	,91
Wt %	SiO2												
	TiO2	1.6											
	Al2O3	12.4											17.4
	FeO	17.2											
	MgO	9											9.9
	CaO	10.9									14.4		0.40
	Na2O	0.365											
	K2O	0.16									0.1873	0.1868	
	P2O5				0.18	0.2							33.1
(ppm)	Sc	32											
	V	150											3310
	Cr	3030											
	Mn	1640											49.6
	Co	53											205
	Ni												
	Rb												100
	Sr												
	Y												290
	Zr	570											
	Nb												7.9
	Hf	9.0											210
	Ba	150											3.5
	Th	2.8							3.685	3.570		3.64	0.87
	U	0.9			0.87	1.1			1.039	0.984		0.94	
	Pb								2.116	2.032			20.8
	La	21											55
	Ce	57											
	Pr												32
	Nd												10.1
	Sm	10.0											1.25
	Eu	1.2											
	Gd												1.99
	Tb	1.7											
	Dy	6.4											
	Ho												
	Er												
	Tm												6.9
	Yb	7.5											0.97
	Lu	1.1											
	Li				17	19							
	Be												
	B												
	C		47.6	104									
	N												
	S							1100					
	F												
	Cl				15.5	17.3							
	Br				0.193	0.050							
	Cu												
	Zn						11.33						
(ppb)	I				1400	1900							
	At												
	Ga												
	Ge												
	As												
	Se							280					
	Mo												
	Tc												
	Ru												
	Rh												
	Pd												
	Ag							7.8					
	Cd												
	In												
	Sn												
	Sb												
	Te												
	Cs												210
	Ta	900											1040
	W												
	Re							0.59					
	Os							6.5					
	Ir							5.5					7.1
	Pt												
	Au							2.7					3.8
	Hg							2.2					
	Tl						0.89						
	Bi						<7.7	0.56					
		(1)	(2)	(3)	(4)	(4)	(5)	(6)	(7)	(7)	(9)	(10)	(11)

References to Table 15505-1

References and methods:
(1) Laul and Schmitt (1973); INAA
(2) Modzeleski et al. (1972); Vacuum pyrolysis/MS
(3) Moore et al. (1973)
(4) Jovanovic and Reed (1975); RNAA, etc.
(5) Reed et al. (1977)
(6) Hughes et al. (1973); RNAA
(7) Silver (1973); ID/MS
(8) Winzer et al. (1978); Microprobe
(9) Schaeffer and Schaeffer (1977); MS
(10) Rancitelli et al. (1972); Gamma ray spectroscopy
(11) Korotev (1984 unpublished); INAA

Notes:
(a) ~50% glass, ~50% matrix

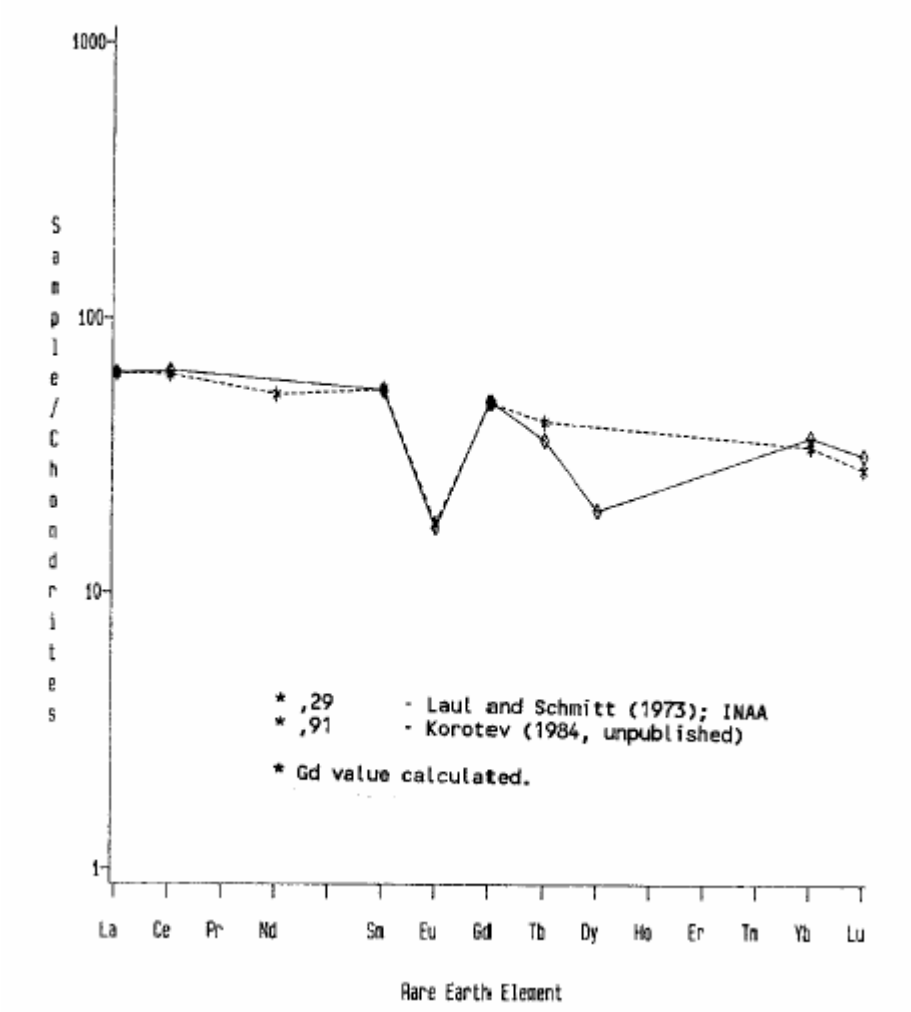

Figure 3. Rare earths in matrix.

TABLE 15505-2. Glass

		,80	,8
Wt %	SiO2	49.65	
	TiO2	1.72	
	Al2O3	11.63	
	FeO	14.99	
	MgO	11.22	
	CaO	9.63	
	Na2O	0.45	
	K2O	0.21	
	P2O5		
(ppm)	Sc		
	V		
	Cr	3300	
	Mn		
	Co		
	Ni		
	Rb		
	Sr		
	Y		
	Zr		
	Nb		
	Hf		
	Ba		
	Th		3.565
	U		0.975
	Pb		1.998
	La		
	Ce		
	Pr		
	Nd		
	Sm		
	Eu		
	Gd		
	Tb		
	Dy		
	Ho		
	Er		
	Tm		
	Yb		
	Lu		
	Li		
	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		
		(8)	(7)

References and methods:

(8) Winzer et al. (1978); Microprobe
(7) Silver (1973); IDMS

PROCESSING AND SUBDIVISIONS: A slab was cut from 15505 and substantially dissected (Fig. 4). End piece ,3 (92.4 g) is in remote storage, and ,0 has a mass of 862.1 g. Thin sections were made from a chip ,42 which was taken from exterior pieces ,11 (TS ,48; ,53; ,54; ,55; ,56; ,57), except for TS ,68 (from ,7) and ,80 (from ,78).

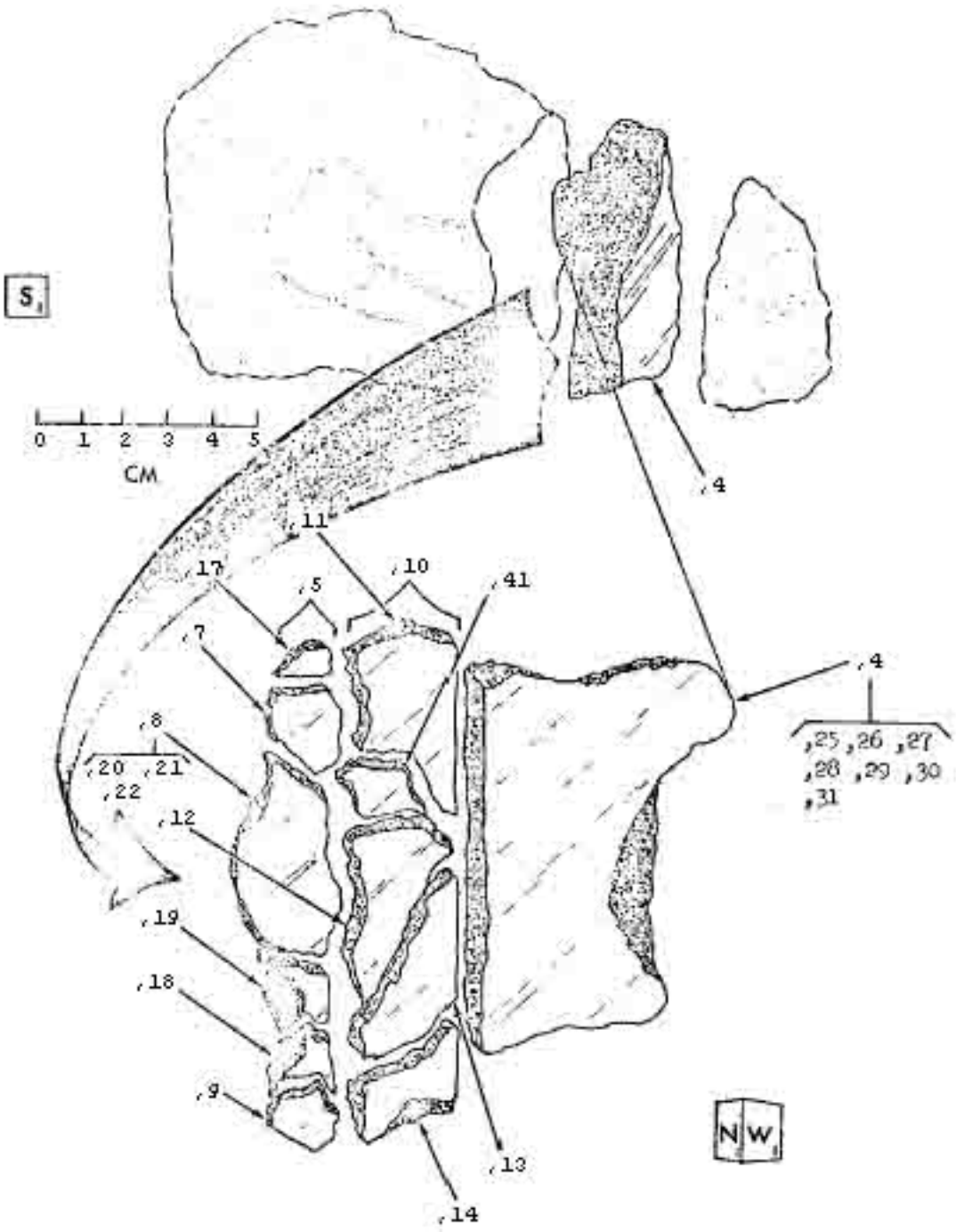

Figure 4. Main splitting of 15505.