15100
Soil
936.4 grams

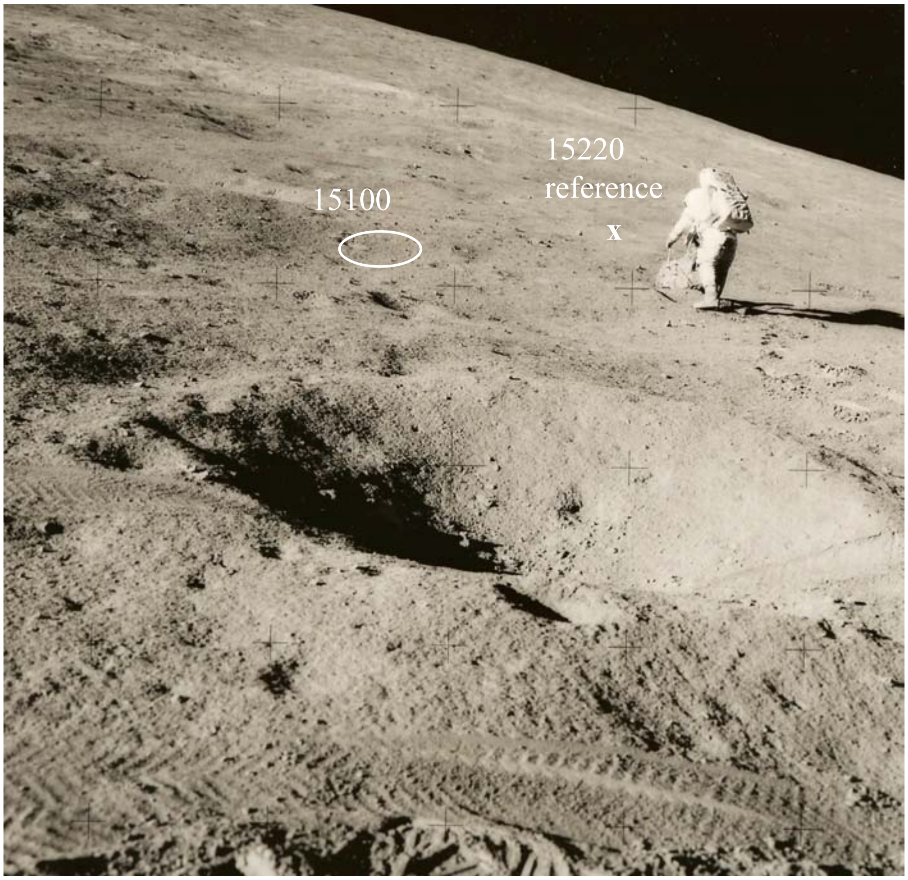


Figure 1: Picture of location where soil sample 15100 and adjacent rake samples were taken. AS15-85-11435. Astronaut is seen sampling 15205 and 15206 from the boulder in background. Soils 15090, 15200, 15210, 15220 and 15230 were all collected near boulder. Double drive tube 15008/7 was also collected near here.

Introduction

Lunar soil sample 15100 is part of a comprehensive suite of samples including soils 15090, 15210, 15220 and 15230, double drive tube 15007/15008 and a rake sample (15115-15148). The location was on the Apennine Front on the flank of St. George Crater (figure 1). The rake sample didn't collect many fragments, consistent with a high maturity index for this location. The sieved soil contained only one basalt fragment (15105).

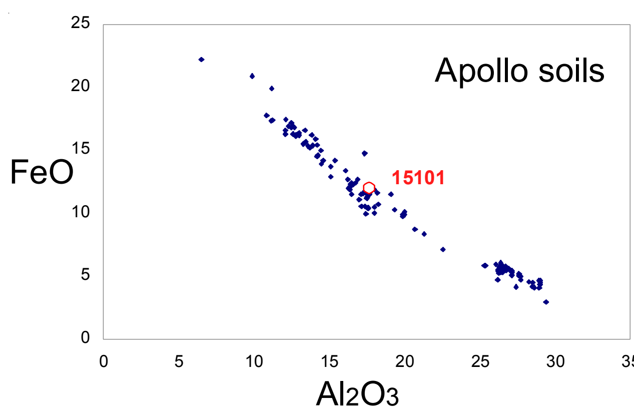


Figure 2: Chemical composition of 15101 compared with other Apollo soil samples.

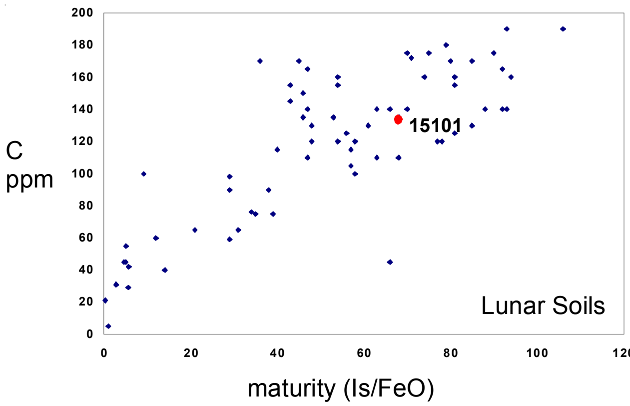


Figure3 : Carbon content and maturity for 15101 (Moore et al. 1973; Morris 1978).

Modal content of soil 15101.
From Heiken and McKay 1972

Agglutinates	42
Basalt	2
Breccia	7
Anorthosite	4
Norite	
Gabbro	
Plagioclase	12
Pyroxene	14
Olivine	2
Ilmenite	
Glass other	17

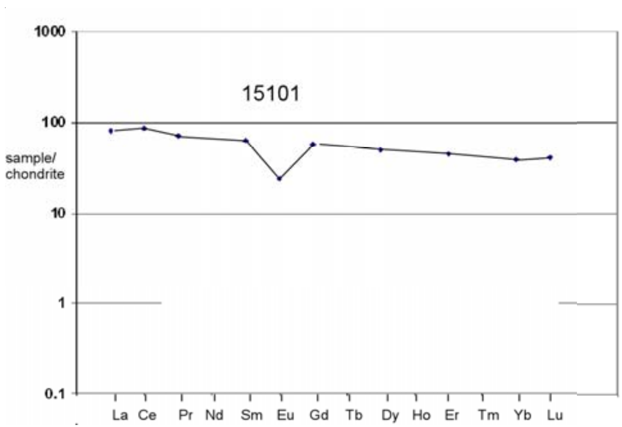


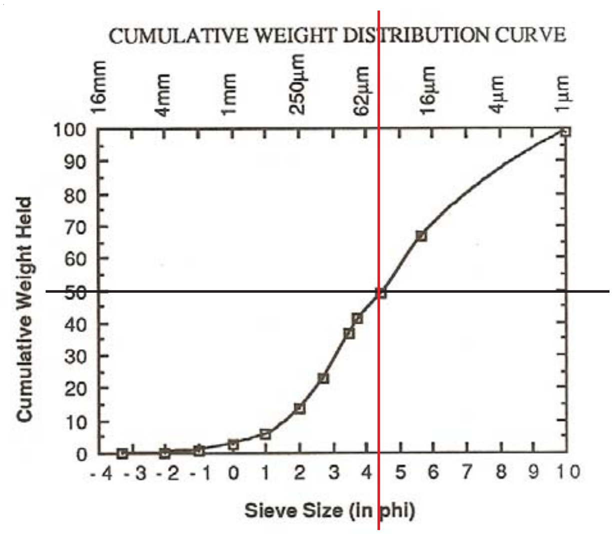
Figure 4: Normalized rare-earth-element diagram for 15101.

Petrography

15100 is a mature lunar soil (I_s/FeO = 70) with about 42% agglutinates (unpublished). King et al. (1972) determined the grain size distribution (figure 5).

Housley et al. (1972, 1974), Pillinger et al. (1974), Des Marais et a l. (1975) and Morris (1980) studied the reduction of FeO by solar wind implanted H and C with heating by micrometeorite bombardment and glass formation.

Mixing model calculations depend largely on what is chosen as the basic components. Walker and Papike (1981) calculated that 15101 was about 20-30 % mare basalt, 23-30 % LKFM basalt, 19-26 % KREEP, 6-9 % green glass and the rest some sort of anorthosite (but they didn't get a good match to known components). Wanke et al. (1972) calculated 37% KREEP, 40% basalt and 23 % anorthosite while Schonfeld (1975) calculated 2% olivine basalt, 0 %



Average grain size = 42 microns

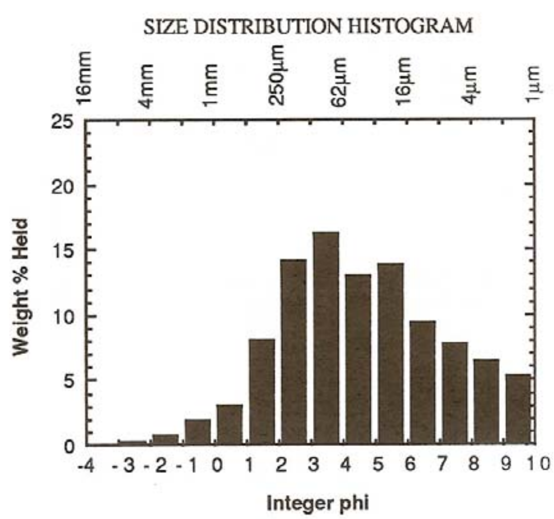


Figure 5: Grain size distribution of 15100 (Graf 1993).

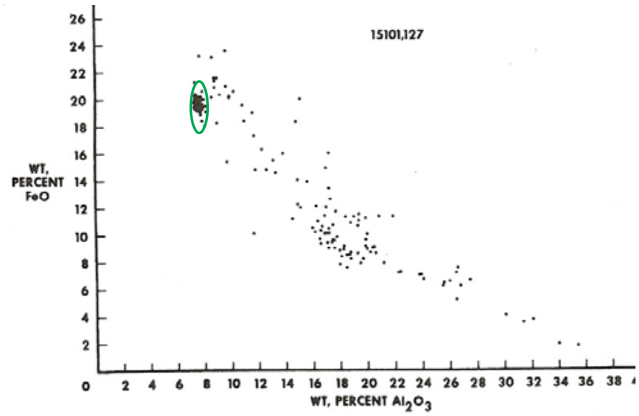


Figure 6: Composition of individual glass beads in 15101 (Reid et al. 1972).

KREEP, 94 % brown matrix breccia and 0 % green glass.

Coarse fines from 15103 were cataloged by Powell (1972) and studied by Cameron et al. (1973), Powell et al. (1973) and Ryder and Sherman (1989).

Glass: Warner et al. (1972), Reid et al. (1972), Best and Minkin (1972), Meyer (1978) and others analyzed the glass particles in 15101. Reid et al. developed the interesting hypothesis that the clusters of glass compositions indicted the presence of "highland basalt" and "LKFM basalt" in Apennine Front samples. They also found a cluster of "green glass" particles (figure 6).

Chemistry

Cuttitta et al. (1973) analyzed many of the station 2 soil samples including 15101 (table 1), finding that they were all the same (within error). Korotev (1987) give the most comprehensive set of analyses of Apollo 15 soil, and although he didn't give an analysis of 15101, he does give an analysis of nearby soil 15201. Wiesmann and Hubbard (unpublished) give a precise analysis of 15101 (figure 4).

The carbon content of 15101 (130 ppm) was determined by Moore et al. (1973) and Des Marais et al. (1973) (figure 3). The bulk nitrogen content (109 ppm) was determined by Muller (1972) with an enrichment in the fine fraction. These elements are implanted by the solar wind.

Cosmogenic isotopes and exposure ages

O'Kelley et al. (1972) determined the cosmic-ray-induced activity of ^{26}Al = 120 dpm/kg., ^{22}Na = 44 dpm/kg, ^{48}V = 9 dpm/kg and ^{56}Co = 11 dpm/kg for 15101.

Bhandari et al. (1973) and Goswami and Lal (1975) studied solar flare and cosmic ray tracks.

Other Studies

Bauer et al. (1972), Heymann et al. (1972), Yaniv and Heymann (1972), Kirsten et al. (1972), Frick et al. (1973) and Bogard and Nyquist (1973) determined the abundance of rare gases and their isotopic ratios in 15101.

Schaal and Horz (1980) and Lofgren et al. (1978) used 15101 in experiments to study the shock features and textures induced.

Processing

15100 was returned in a sealed ALSRC (#1). It included 15105. The rake samples themselves were returned in a separate bag.

Table 1. Chemical composition of 15101.

reference	LSPET71		Cuttitta73		Wiesmann75		Willis72		Muller74		Scoon72		O'Kelley72	
weight					Church72		Masuda72							
SiO2 %	45.95	(d)	46.29	(b)			45.97	(d)			46.63	(f)		
TiO2	1.27	(d)	1.31	(b)	1.27	(c)	1.26	(d)			1.41	(f)		
Al2O3	17.38	(d)	17.7	(b)			17.58	(d)			17.56	(f)		
FeO	11.65	(d)	11.53	(b)			11.54	(d)			11.74	(f)		
MnO	0.16	(d)	0.16	(b)			0.16	(d)			0.16	(f)		
MgO	10.36	(d)	10.55	(b)			10.32	(d)	10.2	(e)	10.06	(f)		
CaO	11.52	(d)	11.54	(b)	11	(c)	11.71	(d)	11.8	(e)	11.73	(f)		
Na2O	0.39	(d)	0.41	(b)	0.46		0.37	(d)	0.42	(e)	0.43	(f)		
K2O	0.17	(d)	0.19	(b)	0.17	(c)	0.165	(d)	0.17	(a)	0.18	(f)	0.178	(g)
P2O5	0.13	(d)	0.16	(b)			0.158	(d)			0.17	(f)		
S %	0.06	(d)					0.085	(d)			0.07	(f)		
sum														
Sc ppm			21	(b)										
V			94	(b)										
Cr			1505	(b)	3065	(c)	2258	(d)			2190	(f)		
Co			44	(b)										
Ni	260	(d)	295	(b)										
Cu			9.4	(b)										
Zn			16	(b)										
Ga			3.4	(b)										
Ge ppb														
As														
Se														
Rb	4.9	(d)	5.6	(b)	4.52	(c)			4.6	(a)				
Sr	149	(d)	170	(b)	146	(c)			135	(a)				
Y	69	(d)	76	(b)										
Zr	313	(d)	300	(b)	298	(c)								
Nb	19	(d)	12	(b)										
Mo														
Ru														
Rh														
Pd ppb														
Ag ppb														
Cd ppb														
In ppb														
Sn ppb														
Sb ppb														
Te ppb														
Cs ppm									0.2	(a)				
Ba			350	(b)	203	(c)			216	(a)				
La			28	(b)	19	(c)	21	(c)	19	(a)				
Ce					51.8	(c)	55.1	(c)						
Pr														
Nd					32.1	(c)	34.37	(c)						
Sm					9.3	(c)	9.91	(c)						
Eu					1.33	(c)	1.19	(c)						
Gd					11.2	(c)	11.74	(c)						
Tb														
Dy					12.1	(c)	12.87	(c)						
Ho														
Er					7.2	(c)	7.87	(c)						
Tm														
Yb			9.4	(b)	6.32	(c)	6.88	(c)						
Lu					0.989	(c)	1.02	(c)						
Hf					9.6	(c)								
Ta														
W ppb														
Re ppb														
Os ppb														
Ir ppb														
Pt ppb														
Au ppb														
Th ppm	3.3	(d)											3.1	(g)
U ppm					0.99	(c)			0.91	(a)			0.86	(g)

technique: (a) INAA, (b) microchemical, (c) IDMS, (d) XRF, (e) AA, (f) wet, (g) radiation count.

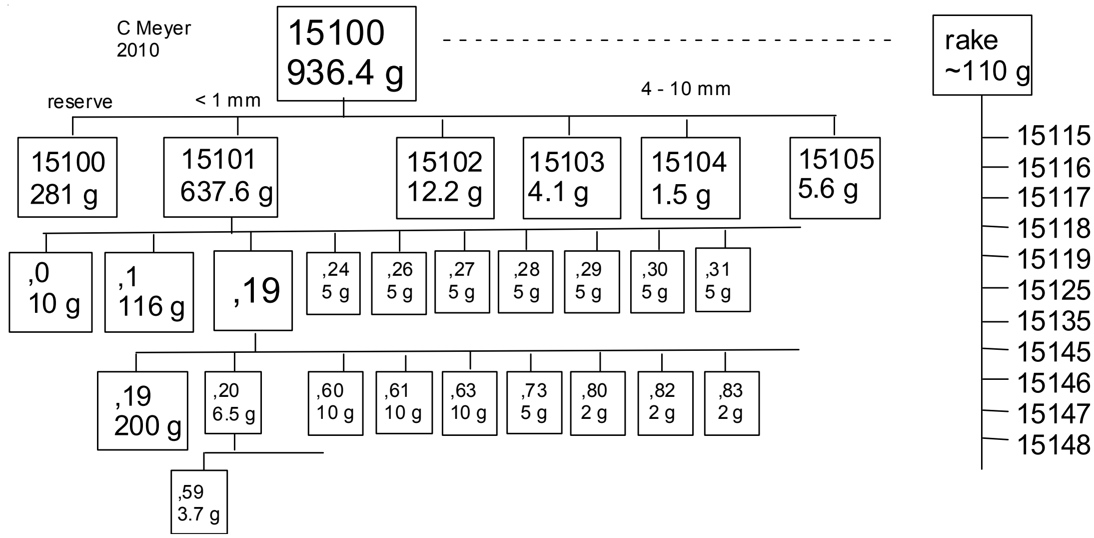


Table 2: Walnuts and rake samples station 2.

	weight	Ryder	ref
15105	5.6	fine-grained olivine-normative mare basalt	Dowty 73
15115	4	porphritic subophitic pigenonite basalt	
15116	7.2	porphritic subophitic pigenonite basalt	Dowty 73
15117	23.3	porphritic subophitic pigenonite basalt	DAP+GJW
15118	27.6	porphritic radiate pigeonite basalt	Dowty 73
15119	14.1	fine-grained olivine-normative mare basalt	
15125	6.5	porphritic spherulitic pigeonite basalt	Dowty 73
15135	1.6	agglutinate	Steele 77
15145	15.1	basaltic breccia	
15146	1	basaltic breccia	Steele 77
15417	3.7	regolith breccia	
15148	3	regolith breccia	

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