15471

Soil

250.5 grams

Figure 1: Location of 15470. AS15-87-11759

Modal content of soil 15471.
From Basu et al. 1981.

Agglutinates	37%
Mare Basalt	8
KREEP basalt	1.2
Breccia	7.7
Anorthosite	1.2
Norite	
Gabbro	0.5
Plagioclase	8.5
Pyroxene	23.1
Olivine	2.6
Ilmenite	0.6
Glass other	5.5

From Carr and Meyer. 1974.

Agglutinates	32.4%
Basalt	5.8
Breccia	3.6
Plagioclase	10.6
Pyroxene	30.8
Olivine	6.2
Ilmenite	1.4
Glass other	9.2

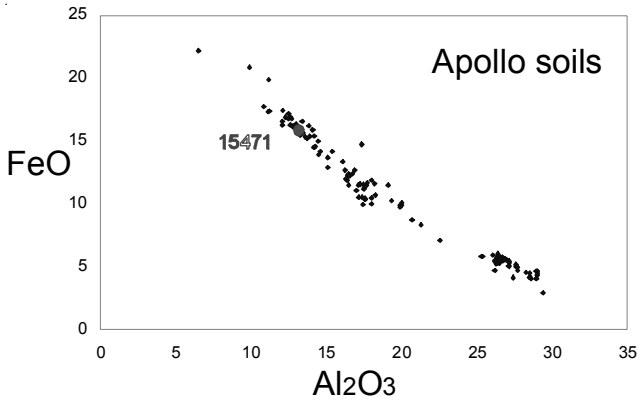


Figure 2: Chemical composition of 15471 compared with other Apollo soils.

Introduction

15470 – 15474 was collected about 30 meters from the rim of Dune Crater (480 meters diameter) and should contain mare material from the bedrock below the regolith.

Petrography

The maturity index (I_s/FeO) of 15471 is 34 (submature)(Morris et al. 1978) and the agglutinate content is 32 – 37 %. The grain size distribution is normal with average grain size 80 microns (figure 5).

Carr and Meyer (1974) and Basu et al. (1981) determined the mineral mode, finding 6 – 8 % mare basalt and relatively high olivine content (3 – 6 %).

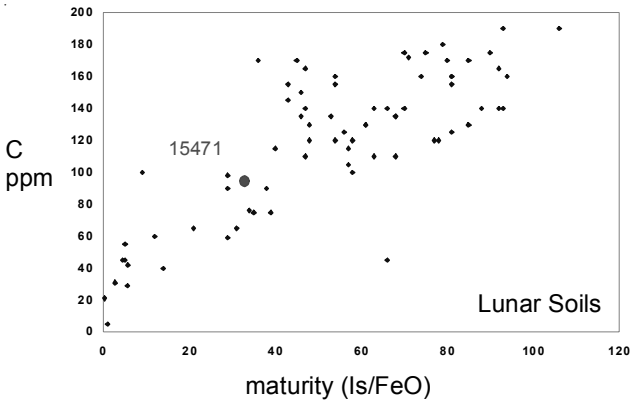


Figure 3: Carbon content and maturity of 15471.

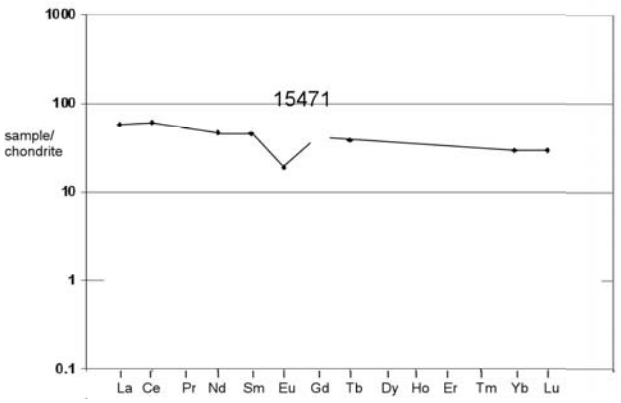


Figure 4: Normalized rare-earth-element diagram for 15471 (Korotev 1987).

Powell (1972) and Ryder and Sherman (1989) cataloged the coarse fine particles (including small fragments of basalt).

Chemistry

Figure 2 shows that 15471 is one of the more mafic lunar soils because of its relatively high content of mare material (16.5 % FeO). However, it has the characteristic REE pattern for soils with a significant component of KREEP basalt (figure 4).

Moore et al. (1973) reported 89 and 74 ppm carbon for two splits of 15471 (figure 3).

Radiogenic age dating

Husain (1974) obtained the age of three basalt fragments from the coarse fines.

Cosmogenic isotopes and exposure ages

Husain (1974) determined the ^{38}Ar exposure age of 4 fragments from 15473, ranging from 200 to 560 m.y.

Other Studies

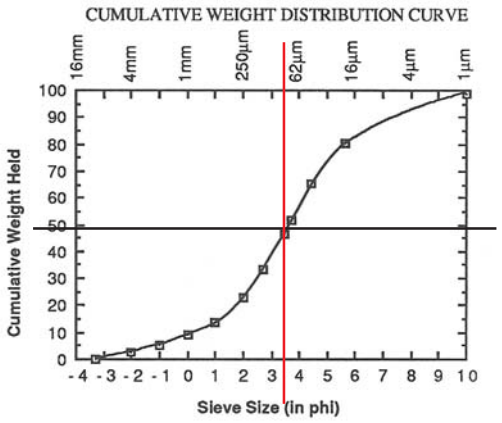
Hintenberger and Weber (1973) found that solar wind implanted rare gasses were surface correlated. Bogard and Nyquist (1973) reported the isotopic ratio of Ar.

Processing

15470 was returned in a sample collection bag (#5) placed in ALSRC#2 (which did not seal).

Summary of Age Data for 15473

	Ar/Ar
Husain 1974	3.2 ± 0.07 b.y.
	3.26 ± 0.05
	3.16 ± 0.08



Average grain size = 80 microns

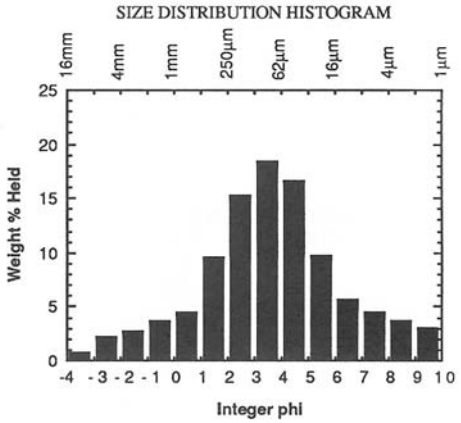


Figure 5: Grain size distribution 15470 (Graf 1993).

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Table 1a. Chemical composition of 15471.

reference	LSPET72		Korotov87		Helmke72		Duncan75		Ganapathy73 Morgan72		Fruchter73		Janghorbani73	Taylor73	
weight															
SiO2 %	46.1	(a)					46.26	(a)					47.7		
TiO2	1.58	(a)	1.2	(b)			1.55	(a)			1.55		1.6		
Al2O3	12.91	(a)	13.4	(b)			13.22	(a)			13.2		13.2		
FeO	16.24	(a)	16.6	(b)			15.96	(a)			16.6		16.25		
MnO	0.21	(a)	0.2	(b)			0.204	(a)					0.2		
MgO	11.11	(a)	11.6	(b)			11.19	(a)					10.1		
CaO	10.42	(a)	8.9	(b)			10.46	(a)							
Na2O	0.32	(a)	0.41	(b)			0.35	(a)			0.35		0.39		
K2O	0.12	(a)					0.11	(a)			0.14				
P2O5	0.12	(a)					0.136	(a)							
S %	0.07	(a)													
sum															
Sc ppm			32.6	(b)	30.2	(b)					32	(b)		35	(d)
V							128	(a)						140	(d)
Cr	3216	(a)	3310	(b)	*5200*	(b)	3229	(a)			3100			3100	(d)
Co			50.5	(b)	45.5	(b)	46	(a)	45	(c)	47	(b)		48	(d)
Ni			172	(b)			179	(a)	150	(c)				208	(d)
Cu							5	(a)						5.4	(d)
Zn					19	(b)	12	(a)	11	(c)					
Ga					4.8	(b)								4.6	(d)
Ge ppb									310	(c)					
As															
Se									184	(c)					
Rb	3	(a)					3.2	(a)	4.2	(c)				3.1	(d)
Sr	124	(a)	115				115	(a)							
Y	54	(a)					51.4	(a)						54	(d)
Zr	229	(a)	220	(b)			228	(a)						240	(d)
Nb	15	(a)					14	(a)						15.9	(d)
Mo															
Ru															
Rh															
Pd ppb															
Ag ppb									62	(c)					
Cd ppb									36	(c)					
In ppb									*330*	(c)					
Sn ppb														0.24	(d)
Sb ppb									1.24	(c)					
Te ppb									8.7	(c)					
Cs ppm			0.1	(b)					0.175	(c)				0.18	(d)
Ba			153	(b)			165	(a)						200	(d)
La			13.4	(b)	13.9	(b)					16.5	(b)		15.3	(d)
Ce			36	(b)	34.4	(b)					54	(b)		39.5	(d)
Pr														5.64	(d)
Nd			21	(b)	26	(b)								23.9	(d)
Sm			6.63	(b)	7.12	(b)					7.3	(b)		6.7	(d)
Eu			1.055	(b)	1.05	(b)					1.19	(b)		1.2	(d)
Gd					8.7	(b)								8.42	(d)
Tb			1.37	(b)	1.53	(b)					1.2	(b)		1.33	(d)
Dy					10	(b)								9.1	(d)
Ho					2.1	(b)								2.13	(d)
Er					5.4	(b)								6	(d)
Tm														1	(d)
Yb			4.74	(b)	5.07	(b)					5.5	(b)		6.1	(d)
Lu			0.71	(b)	0.71	(b)					0.75	(b)		0.94	(d)
Hf			5.4	(b)	*12*	(b)					5.7	(b)		4.7	(d)
Ta			0.69	(b)											
W ppb														0.34	(d)
Re ppb									0.47	(c)					
Os ppb															
Ir ppb			3.3	(b)					5.9	(c)					
Pt ppb															
Au ppb			1.8	(b)					1.79	(c)					
Th ppm	3	(a)	2	(b)							*6.3*			2.42	(d)
U ppm			0.61	(b)										0.63	(d)

technique: (a) XRF, (b) INAA, (c) RNAA, (d) SSMS

Table 1b. Chemical composition of 15471.

reference	Wanke73		Mason72			Laul72	
weight				< 325 um			
SiO2 %	48.4	(b)	46.43	46.22	(a)		
TiO2	1.17	(b)	1.61	1.65	(a)	1.6	(d)
Al2O3	13.4	(b)	13.43	15.35	(a)	13.3	(d)
FeO	16.6	(b)	16.2	14.51	(a)	15.9	(d)
MnO	0.2	(b)	0.26	0.23	(a)	0.204	(d)
MgO	11.6	(b)	11.15	10.11	(a)		
CaO	9.94	(b)	10.58	10.77	(a)	10.9	(d)
Na2O	0.36	(b)	0.37	0.36	(a)	0.364	(d)
K2O	0.12	(b)	0.17	0.18	(a)	0.12	(d)
P2O5			0.11	0.12	(a)		
S %							
sum							
Sc ppm	31	(b)				31	(d)
V			100	75	(c)	147	(d)
Cr	2980	(b)	2395	1916	(a)	2942	(d)
Co	45	(b)	40	37	(c)	44	(d)
Ni			160	225	(c)		
Cu			10	19	(c)		
Zn							
Ga			4	2	(c)		
Ge ppb							
As							
Se							
Rb			5	5	(c)		
Sr			115	125	(c)		
Y			55	65	(c)		
Zr			205	265	(c)	160	(d)
Nb							
Mo							
Ru							
Rh							
Pd ppb							
Ag ppb							
Cd ppb							
In ppb							
Sn ppb							
Sb ppb							
Te ppb							
Cs ppm							
Ba			120	150	(c)	200	(d)
La	15.6	(b)				15	(d)
Ce						42	(d)
Pr							
Nd							
Sm	6.9	(b)				7.4	(d)
Eu	1.12	(b)				0.64	(d)
Gd							
Tb	1.8	(b)				1.5	(d)
Dy	9.7	(b)					
Ho							
Er							
Tm							
Yb	5.1	(b)				5.7	(d)
Lu	0.72	(b)				0.81	(d)
Hf	5.5	(b)				6.3	(d)
Ta	0.68	(b)				0.75	(d)
W ppb							
Re ppb							
Os ppb							
Ir ppb							
Pt ppb							
Au ppb							
Th ppm						2.4	(d)
U ppm						0.7	(d)

technique: (a) Wet chem., (b) INAA, (c) emission spec. , (d) INAA

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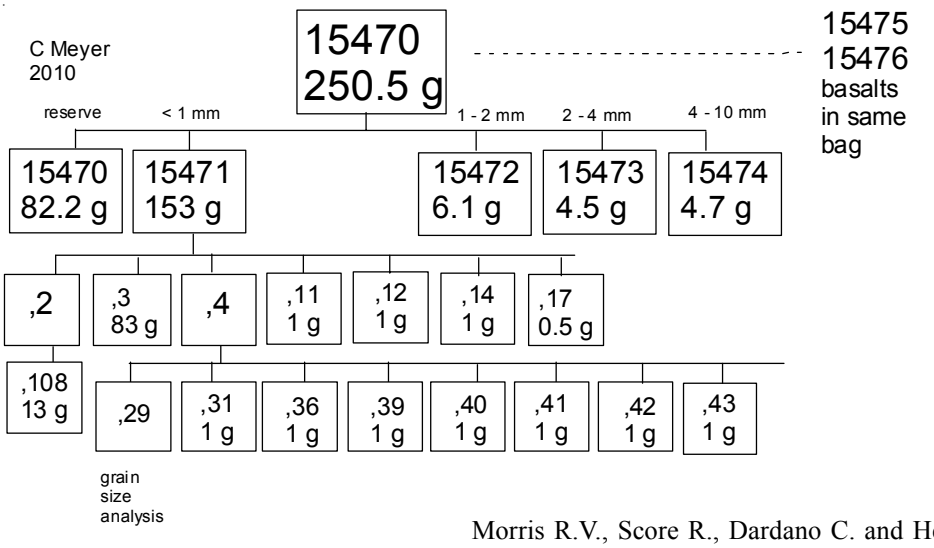

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