12037

Soil

145 grams

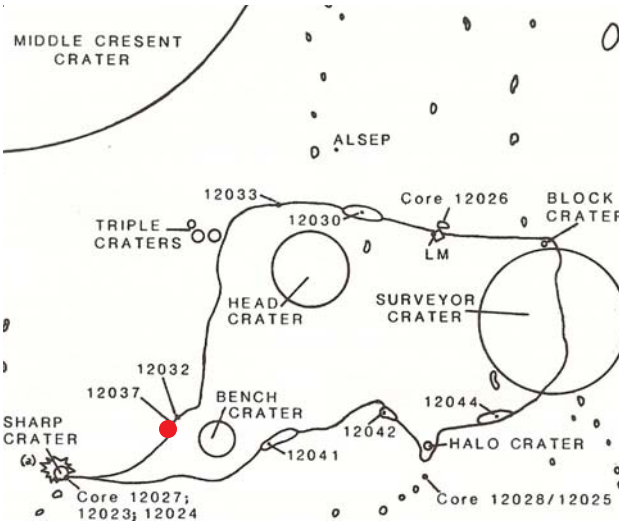

Figure 1: Location of 12037.

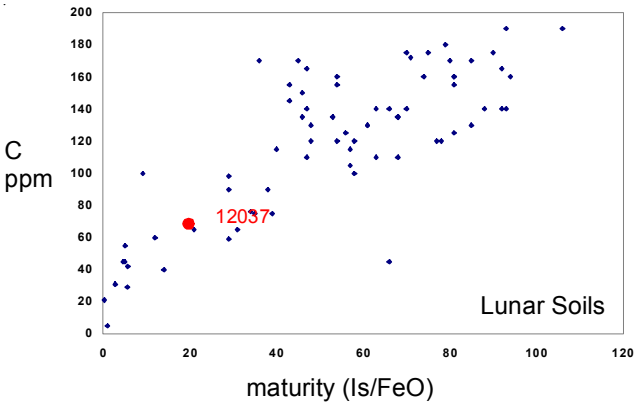

Figure 2: Carbon content and maturity index for 12037 soil.

Mineralogical Mode

Frondel et al. 1971

Olivine + Pyroxene	63.7 %
Plagioclase	19.7
Opaques	6.3
Glass, angular	8.7
Glass, rounded	1.3
Silica	0.3

Mineralogical Mode

McKay et al. 1971

Grain size	37-62.5	62.5-125
Olivine	11 %	8
Pyroxene	31	45
Plagioclase	13	12
Glass	13	9
Aggregates	**31**	**27**

Mineralogical Mode (250-1000 microns)

McKay et al. (1971)

Glazed Aggregates	3 %
Single xtl.	48
Glasses	23
Rocks	11
Breccias	15
Spherules	-

Introduction

12037 are the fines collected along with a friable basalt (12036) and returned in documented bag 8. The samples were from the rim of Bench Crater (figure 1). Since a friable basalt was in the same bag, this soil may contain a significant basalt component.

Petrography

The maturity index for 12037 is I_s/FeO = 21 (Morris 1987). The average grain size of 12037 is either 157 or 115 microns, depending on who measured it (figures 4 a,b). Presumably the difference is attributed to the length of time of the sieving, which tends to allow breakup of friable pieces.

Frondel et al. (1971) determined the mineral mode, but did not specify agglutinates. Wood et al. (1971) and Marvin et al. (1971) studied particles from 12037 (figure 5). Note the high percentage of "basalt" particles. McKay et al. (1971) noted a high percentage of single crystals – many olivine – in the fines.

Simon and Papike (1985) describe an "anorthosite" particle from 12037 (figure 3).

Chemistry

The composition of 12037 is reported in table 1 (be mindful that it may contain chips from 12036).

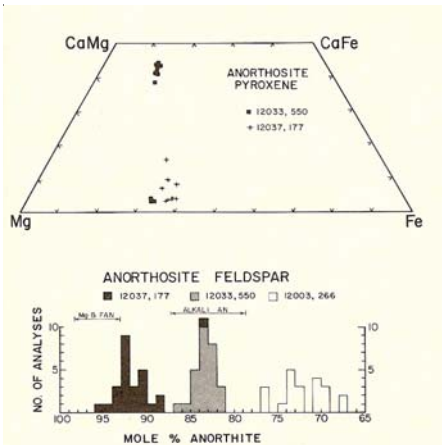

Figure 3: Pyroxene and plagioclase from 12037 particles (Simon and Papike 1985).

Kerridge et al. (1978) found 115 ppm C and 40 ppm N, while Moore et al. (1971) reported 65 ppm C and 96 ppm N (figure 2).

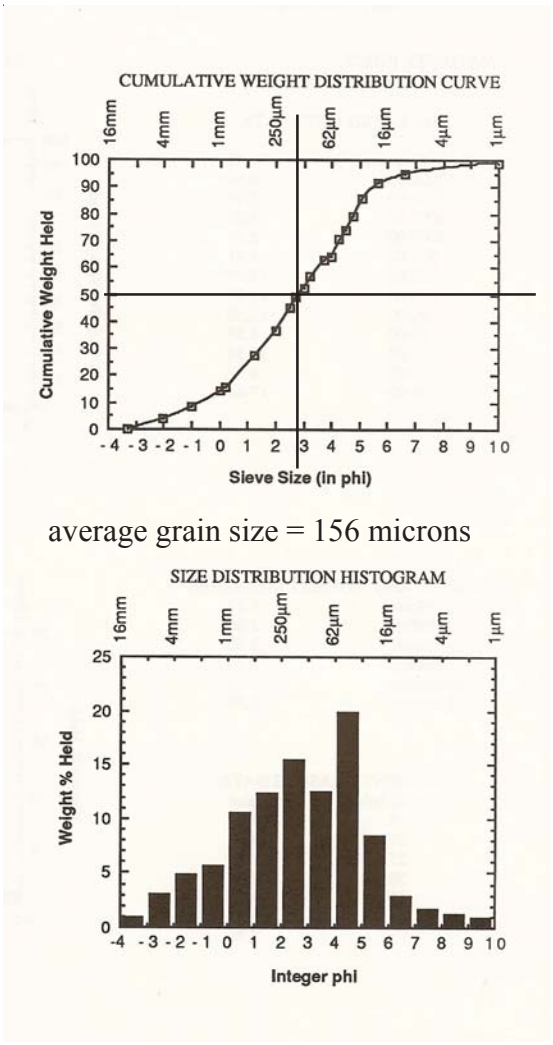

Figure 4a: Grain size distribution for 12037 (Graf 1993, data from McKay)

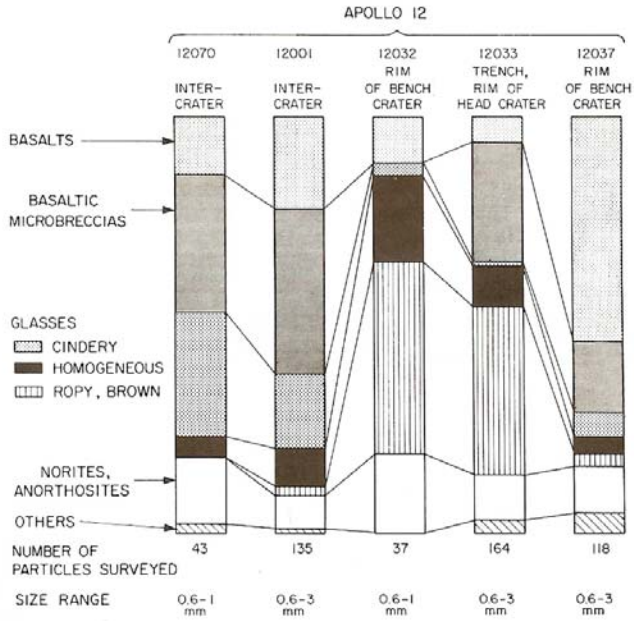

Figure 5: Modal analysis of coarse particles in Apollo 12 soils (Marvin et al. 1971).

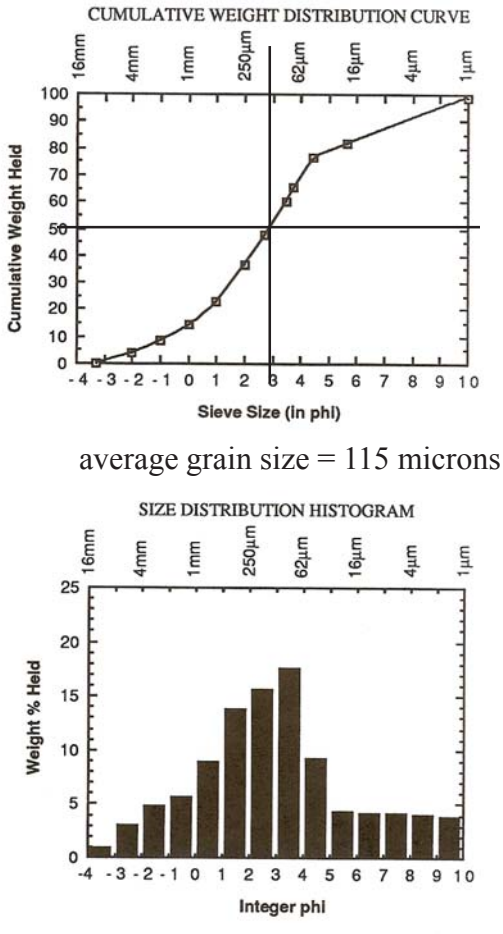

Figure 4b: Grain size distribution for 12037 (Graf 1993, data from McKay).

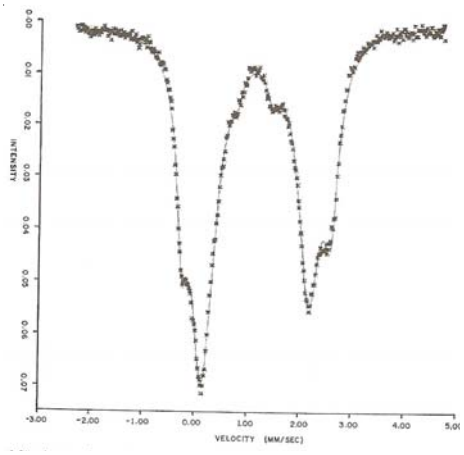

Figure 6: Mossbauer specta for 12037 (Herzenberg et al. 1971).

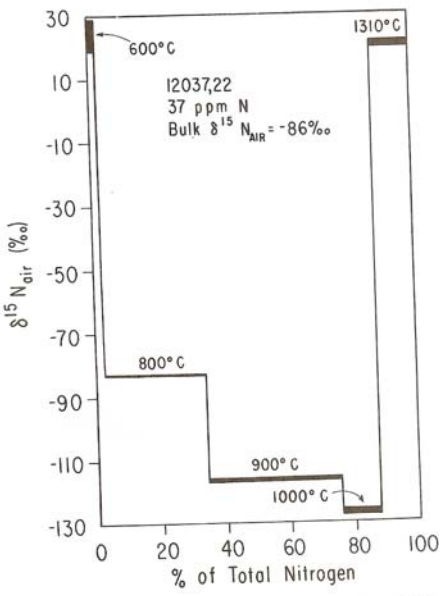

Figure 7: Nitrogen isotopes in 12037 (Becker and Clayton 1978)

Other Studies

Arrhenius et al. (1971) studied the frequency of grains with high fossil nuclear track densities in 12037 (and all other Apollo 12 soil and core samples)(see diagram in 12070).

Herzenberg et al. (1971) measure the Mossbauer spectra (figure 6).

Becker and Clayton (1978) determined nitrogen isotopes as function of release temperature (figure 7).

Processing

Numerous thin sections are available – see flow diagram.

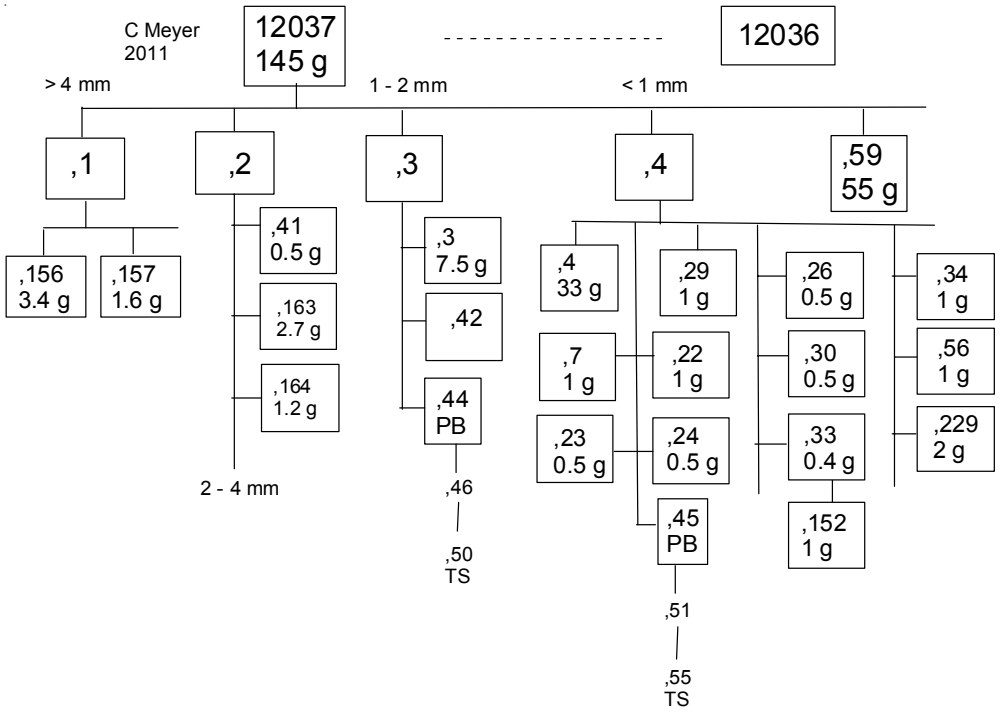

Table 1. Chemical composition of 12037.

reference	Wanke71		Laul71		Frondel71		Wakita71			Morgan72	
weight			mean								
SiO2 %	46.2	(b)			44.8	(a)	41.8		(c)		
TiO2	2.5	(b)			3.5	(a)	3.2	3.3	(c)		
Al2O3	11.1	(b)			15.1	(a)	14.1	12.1	(c)		
FeO	18.4	(b)			14.9	(a)	16.3		(c)		
MnO	0.25	(b)			0.25	(a)	0.207	0.227	(c)		
MgO	11.6	(b)			10.2	(a)	10.8		(c)		
CaO	10.4	(b)			10.5	(a)	11.9	10.2	(c)		
Na2O	0.37	(b)			0.65	(a)	0.455	0.461	(c)		
K2O	0.2	(b)			0.38	(a)		0.102	(c)		
P2O5											
S %											
sum											
Sc ppm	39	(b)					40		(b,c)		
V							100	160	(b,c)		
Cr	3230	(b)			2463	(a)	2408		(c)		
Co	47.1	(b)	55	(c)			40		(b,c)		
Ni	180	(b)									
Cu	4.5	(b)									
Zn			6.1	(c)						6.1	(c)
Ga	4.4		3.4	(c)							
Ge ppb											
As											
Se			0.21	(c)						0.166	(c)
Rb	6.1		5.1	(c)				3.3	(b,c)	4.9	(c)
Sr	90										
Y								156	(b,c)		
Zr							310		(b,c)		
Nb											
Mo											
Ru											
Rh											
Pd ppb	13.5										
Ag ppb			5.1	(c)						25	(c)
Cd ppb			35	(c)				10	(b,c)	56	(c)
In ppb	109							3	(b,c)	222	(c)
Sn ppb										0.77	(c)
Sb ppb											
Te ppb			40	(c)							
Cs ppm	0.31		0.24	(c)				0.22	(b,c)	0.21	(c)
Ba	190	(b)					200		(b,c)		
La	24.5	(b)					26.2	51.3	(b,c)		
Ce								136	(b,c)		
Pr	9.1	(b)						19	(b,c)		
Nd								80	(b,c)		
Sm								23.5	(b,c)		
Eu	1.57	(b)						1.96	(b,c)		
Gd	16	(b)						30	(b,c)		
Tb	3.22	(b)						4.6	(b,c)		
Dy	17.8	(b)						28	(b,c)		
Ho	4.13	(b)						7.9	(b,c)		
Er	12.7	(b)						17.4	(b,c)		
Tm								2.6	(b,c)		
Yb	8.9	(b)						17.8	(b,c)		
Lu	1.35	(b)						2.43	(b,c)		
Hf	10.9	(b)					9		(b,c)		
Ta	1.04	(b)									
W ppb	450										
Re ppb										0.25	(c)
Os ppb											
Ir ppb	5		4.3	(c)						4.2	(c)
Pt ppb											
Au ppb	1.5		1.5	(c)						2.2	(c)
Th ppm	3.52	(b)					5.1		(b,c)		
U ppm	0.72	(b)									

technique: (a) wet, (b) INAA, (c) RNAA

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