14240

Trench Soil (vacuum container)

184 grams

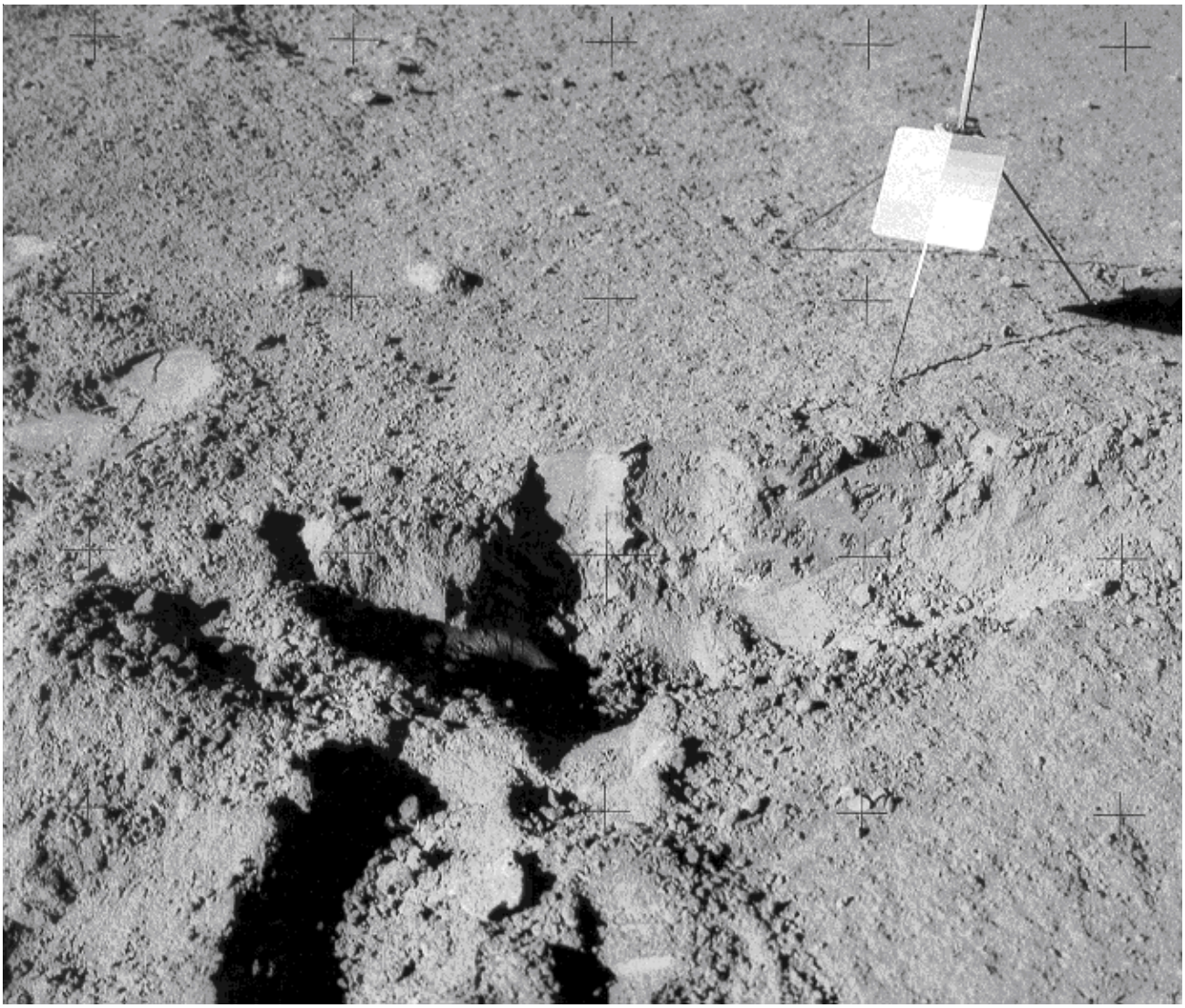


Figure 1: Soil Mechanics Trench at Apollo 14. It was only about 30 cm deep. AS14-64-9161.

CC: Okay. And Al, one question, did you get the SESC sample out of the bottom of the trench?
CDR: Well, I told you the trench was kind of a miserable thing, because the walls kept falling down. And I could get a sample from the bottom, but it wouldn't be from the bottom, I'm afraid.
CC: I guess we'd still like the SESC sample form the bottom of the trench, even though it probably isn't the bottom.
CDR: Well, I'll tell you. I'll go back and whack at it a little bit. See what I can do.
CDR: We're digging the bottom of the trench for you, Fredo. I'm redigging the trench. I can't believe it!
LMP: What's the matter. Al?
CDR: Oh, that (vacuum) seal came off that thing.

Introduction

14240 was collected from the bottom of the Soil Mechanics Trench (figure 1) and brought back in a special environmental sample container (SESC) which was opened by Burlingame in the UC Berkeley Space Science Laboratory (figure 5). However, the lid was not even finger tight and the sample probably not sealed (although the vacuum in the can may have held the lid on). The gas in the SESC was mainly N_2, so the lid may have leaked in the LRL glovebox, rather than in the LM, CM or during transit.

Petrography

The Soil Mechanics Trench was about 25 - 36 cm deep (Mitchell et al. 1971). 14240 was taken from the bottom (although it may contain material slumped from the walls). The trench samples were taken during the 2nd EVA from the rim of a ~6 meter crater at station G. It was planned to dig this trench to be 60 cm deep, but was cut instead to ~30 cm because the walls were caving in. According to Mitchell et al., there was noticeable color change in the wall of the trench. *"The upper 3 to 5 cm were dark brown and fine grained. Next, a very thin layer (0.5 cm thick or less) of black, glassy particles were encountered. Beneath this layer was a much lighter colored and coarser grained material."*

Subsurface samples 14240 (and 14149 from the same trench) are both immature soils (Is/FeO = 46 and 53; Morris 1978). The soil collected from the top of the trench (14148) was more mature Is/FeO = 74.

Various small particles found in the SESC were set aside (figures 7-9).

Chemistry

Rose et al. (1972) and Laul et al. (1972) analyzed 14240 (table 1). Cadogan et al. (1972) and Moore et al. (1972) reported the carbon content (figure 4).

Processing

The samples from the bottom of this trench (14149 and 14240) may have been contaminated by surface material that fell into the trench during digging. As you can see form the transcript, 14240 was the second attempt to sample the bottom of the trench. The slightly lower maturity seems to indicate that it was less contaminated by slumped surface material.

This sample was opened in a dry He glove box at Berkeley (figure 6), and thus may be free of contamination at the LRL (or at least have a different source(s) of contamination). It has been kept in a He "bean pot" at JSC, separate from other lunar samples, all these years.

The official LRL weight was 168 grams based on the difference between the weight of hardware and weight of returned sample, but the actual weight of sample was found to be 184 grams when the sample was opened in the UCB SSL Berkeley (Burlingame 1971).

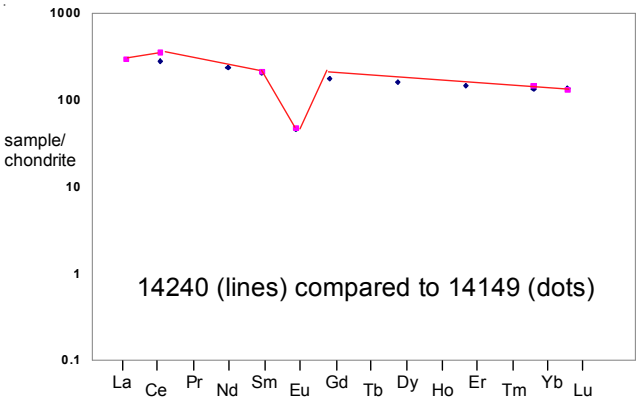


Figure 2: Normalized rare-earth-element diagram for 14240 compared with 14149 (data from Laul et al. 1972).

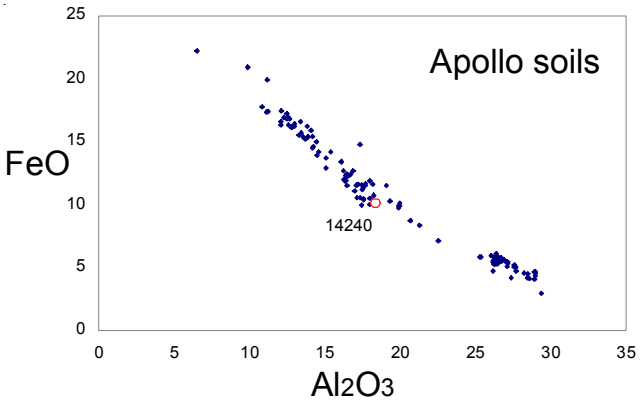


Figure 3: Chemical composition of 14240 compared with other lunar soils.

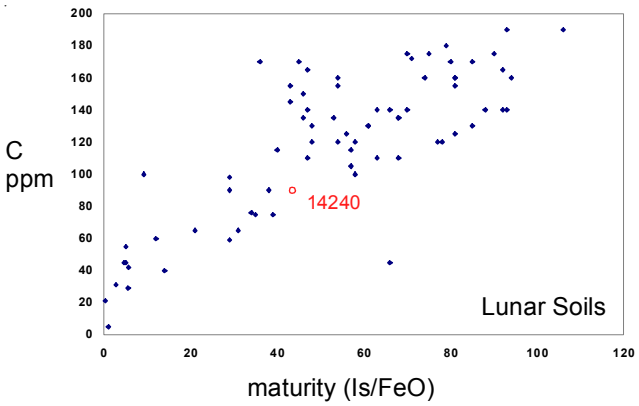


Figure 4: Carbon content and matruity of lunar soils. Data for 14240 from compilations by Cadogen et al. (1972), desMarais et al. (1976) and Morris et al. (1978).

Table 1. Chemical composition of 14240.

							14149
reference	Laul72			Rose72			Laul82
weight							for comparison
SiO2 %				47.77	(b)		
TiO2	1.8	2	(a)	1.67	(b)		1.6
Al2O3	19.4	18.5	(a)	17.99	(b)		17.9
FeO	10.9		(a)	10.02	(b)		10
MnO	0.125	0.13	(a)	0.14	(b)		0.13
MgO				9.47	(b)		9.9
CaO	12	12	(a)	11.25	(b)		11
Na2O	0.717	0.745	(a)	0.7	(b)		0.78
K2O	0.57	0.6	(a)	0.54	(b)		0.58
P2O5				0.55	(b)		
S %							
sum							
Sc ppm	22		(a)	28	(b)		21
V	55	40	(a)	52	(b)		40
Cr	1430		(a)	1574	(b)		1232
Co	36		(a)	33	(b)		27.5
Ni				320	(b)		320
Cu				16	(b)		
Zn				23	(b)		
Ga				7.5	(b)		
Ge ppb							
As							
Se							
Rb				13	(b)		
Sr				390	(b)		170
Y				250	(b)		
Zr	790		(a)	930	(b)		680
Nb				42	(b)		
Mo							
Ru							
Rh							
Pd ppb							
Ag ppb							
Cd ppb							
In ppb							
Sn ppb							
Sb ppb							
Te ppb							
Cs ppm							
Ba	790		(a)				870
La	70		(a)	67	(b)		60.5
Ce	214		(a)				170
Pr							
Nd							110
Sm	31		(a)				26.5
Eu	2.65		(a)				2.2
Gd							
Tb							5.4
Dy							37
Ho							8.2
Er							
Tm							3.3
Yb	24		(a)	23	(b)		20.2
Lu	3.2		(a)				2.8
Hf	20		(a)				21.9
Ta							3
W ppb							
Re ppb							
Os ppb							
Ir ppb							
Pt ppb							
Au ppb							
Th ppm	14		(a)				13.3
U ppm							3.6

technique: (a) INAA, (b) "microchemical"

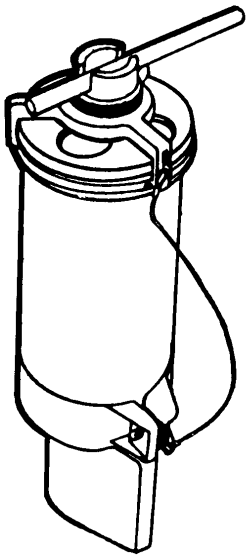
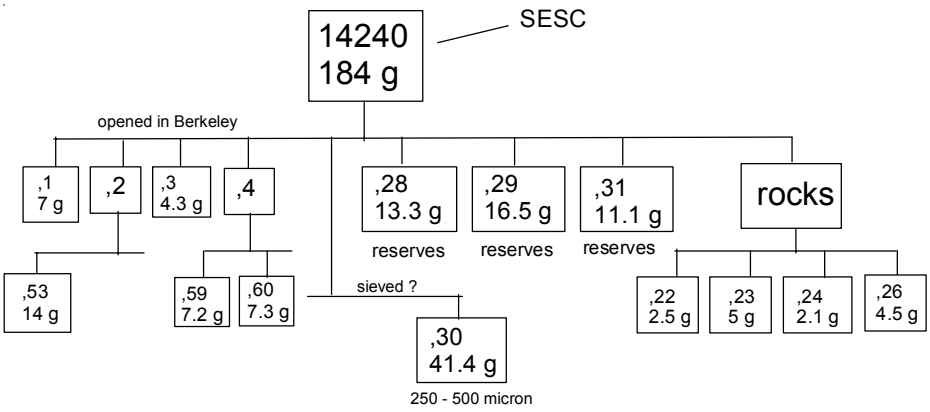


Figure 5: Drawing of SESC container (Allton 1989).

Figure 6: Opening the SESC in the SESC holder at the Berkeley Lab (Burlingame et al. 1971).



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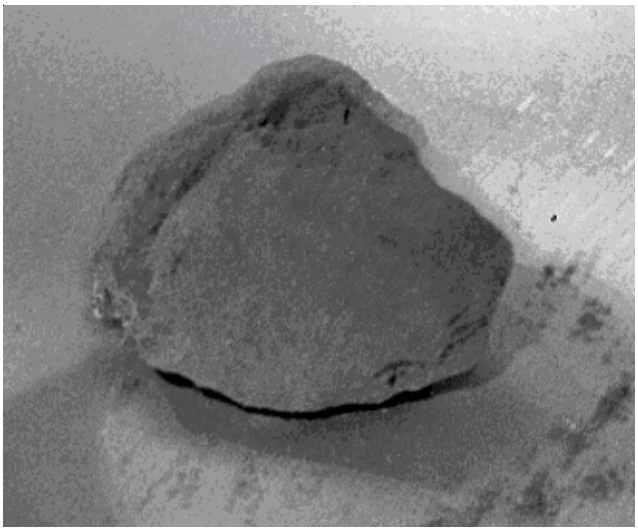

Figure 7: 14240,22 is the first rock found in 14240 and weighs 2.49 g. It appears to be a dark matrix breccia, but has never been studied. It is about 1.2 cm across. (from Burlingame et al. 1971).

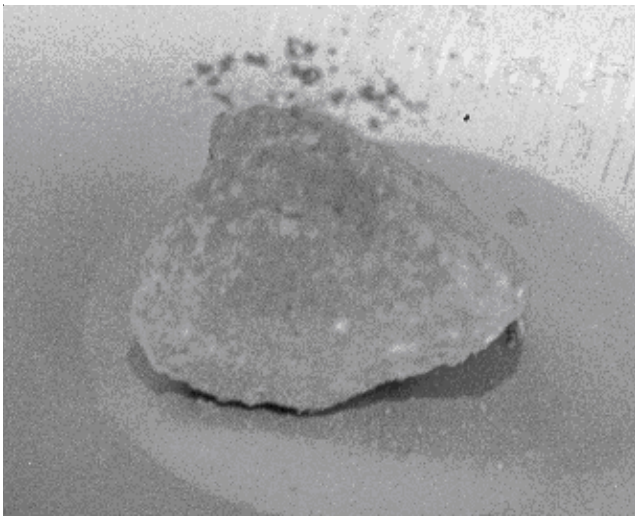

Figure 8: One of three small rocks in 14240,23. It appears to be light matrix breccia, but has never been studied. It is about 1 cm across.

Figure 9: Additional small rocks found in 14240, now collectively numbered 14240,23 (weight 5.06 g). Never studied.

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