# DRAFT

## 10010 Contingency Soil

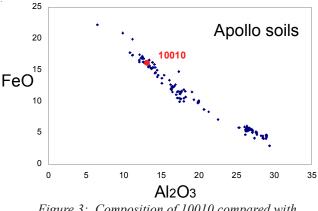
#### 491 grams



*Figure 1: Photo of a portion of 10010. Spatula about 3 mm wide. S69-45229.* 



Figure 2: Small glass spheres found in 10010. Largest sphere is 3 mm. S69-45181.



*Figure 3: Composition of 10010 compared with other luanr soils.* 

#### **Introduction**

This was the first sample of the Moon (figure 1). It was picked up as soon as Armstrong got off the ladder, placed in a large Teflon bag and put in a pocket in his spacesuit in case he had to immediately get back on board the LM! Several rock samples > 1 cm were included (10021-10032). Total weight 1014 grams!

During PET, Frondel ran a hand magnet through this sample to extract metallic iron particles (King 1969). *Note: the magnetism of 10023 is presumably due to this* 

#### **Petrography**

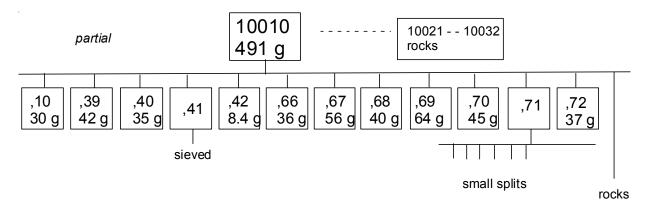
10010 is a mature soil with Is/FeO = 75 (Morris 1978). For some reason the grain size distribution and modal mineralogy have not been determined (Carrier 1973). During PET it was noted that the soil contained glass spheres with a variety of color from clear white, to orange, to black (figure 2).

#### **Chemistry**

Rhodes and Blanchard (1981) reported an analysis of 10010. It is not significantly different from 10084. Figure 3 shows the composition of the Apollo 11 soils with respect to the other Apollo soils.

### Table 1. Chemical composition of 10010.

reference	Rhodes	81	Other Studies	
Al2O3 FeO	41.5 7.58 13.21 15.83 0.24 7.82 12.05 0.44 0.14	<ul> <li>(a)</li> <li>(a)</li> <li>(a)</li> <li>(a)</li> <li>(a)</li> <li>(a)</li> <li>(a)</li> <li>(a)</li> <li>(a)</li> </ul>	Initially, lunar soil samples were of interest to the soil mechanics and biological sciences communities. <b>Processing</b> The contingency sample was apparently sieved at 1	
P2O5 S % <i>sum</i>	0.11	(a)	cm to extract the > 1 cm rocks – see table.	
Sc ppm V Cr Co Ni Cu	61 47 2080 29 197	(b) (b) (b) (b) (b)		
Zn Ga Ge ppb As Se	35 7	(b) (b)		
Rb Sr Y Zr Nb Mo Ru Rh Pd ppb Ag ppb Cd ppb In ppb Sn ppb Sb ppb Te ppb	3 160 101 303 19	(b) (b) (b) (b)		
Cs ppm Ba La Ce Pr	205 14.9 46	(b) (b) (b)		
Nd Sm Eu Gd	12.1 1.66	(b) (b)		
Tb Dy Ho Er Tm	2.5	(b)		
Yb Lu Hf	9.91 1.49 9.7	(b) (b) (b)		
Ta W ppb Re ppb Os ppb Ir ppb Pt ppb Au ppb	9.7 1.6	(b) (b)		
	1.5	(b)		
technique:	(a) XRF	(b) INAA		



#### **References for 10010.**

Beaty D.W. and Albee A.L. (1980) The geology and petrology of the Apollo 11 landing site. *Proc.* 11<sup>th</sup> Lunar *Planet. Sci. Conf.* 23-35.

Carrier W.D. (1973) Lunar grain size distribution. *The Moon* **6**, 250-263.

Doell R.R. and Gromme C.S. (1970) Survey of magnetic properties of Apollo 11 samples at the Lunar Receiving Laboratory. *Proc. Apollo 11 Lunar Sci. Conf.* 2093-2096.

Funkhauser J.G., Schaeffer O.A., Bogard D.D. and Zahringer J. (1970) Gas analysis of the lunar surface. *Proc. Apollo 11 Lunar Sci. Conf.* 1111-1116.

Heiken G.H. (1974) A catalog of lunar soils. JSC Curator

Heiken G.H. (1975) Petrology of lunar soils. *Rev. Geophys. Space Phys.* **13**, 567-587.

Hintenberger H., Schultz L. and Weber H.W. (1975a) A comparison of noble gases in lunar fines and soil breccias: Implications for the origin of soil breccias. *Proc.* 6<sup>th</sup> Lunar Sci. Conf. 2261-2270.

Johnson R.D and Davis C.C. (1970) Total organic carbon in the Apollo 11 lunar samples. *Proc. Apollo 11 Lunar Science Conf.* 1805-1812.

King E.A. *and a cast of thousands* (1969) Lunar Sample Information Catalog, Apollo 11. Lunar Receiving Laboratory, MSC 412 pp

Kramer F.E., Twedell D.B. and Walton W.J.A. (1977) Apollo 11 Lunar Sample Information Catalogue (revised). Curator's Office, JSC 12522

LSPET (1969a) Preliminary examination of lunar samples. *In* Apollo 11 Prelim. Sci. Rpt. NASA SP-214. 123-142

Rocks > 1 cm split from 10010.

		wt. gr.
10021	breccia	250
10022	basalt	95.5
10023	breccia	66
10024	basalt	68.12
10025	breccia	8.5
10026	breccia	9.25
10027	breccia	8.87
10028	breccia	3.53
10029	basalt	5.53
10030	breccia	1.81
10031	basalt	2.7
10032	basalt	3.13

LSPET (1969b) Preliminary examination of lunar samples from Apollo 11. *Science* **165**, 1211-1227.

Morris R.V., Score R., Dardano C. and Heiken G. (1983) Handbook of Lunar Soils. Two Parts. JSC 19069. Curator's Office, Houston

Morris R.V. (1978) The surface exposure (maturity) of lunar soils: Some concepts and Is/FeO compilation. *Proc.* 9<sup>th</sup> *Lunar Sci. Conf.* 2287-2297.

Rhodes J.M. and Blanchard D.P. (1981) Apollo 11 breccias and soils: Aluminous mare basalts or multi-component mixtures? *Proc.* 12<sup>th</sup> Lunar Planet. Sci. Conf. 607-620.

Shoemaker E.M. and 11 others (1969) Geologic setting of the lunar samples returned by the Apollo 11 mission. *In* Apollo 11; Preliminary Science Rpt. NASA Spec Publ. 214

Yaniv A. and Heymann D. (1972) Atmospheric Ar40 in Lunar Fines. *Proc.* 3<sup>rd</sup> *Lunar Sci. Conf.* 1967-1981.