

10093
Regolith Breccia
25.8 grams



Figure 1: Photo of 10093,0. NASA S76-25989. Sample is about 5 cm.

Introduction

10093 is a typical Apollo 11 regolith breccias. It is relatively coherent, with typical dark glass matrix and sparse lithic clasts (figure 1). It has micrometeorite “zap” pits on the surface.

Petrography

Simon et al. (1984) included breccia 10093 in their comprehensive study of Apollo 11 regolith breccias – their mode is given in the table. It has a high proportion of matrix (figure 3). They calculated that it had about 24 % highland component, but couldn’t directly identify that many clasts of highland rock.

Chemistry

Rhodes and Blanchard (1981) found that the composition of 10093 was similar to the other regolith breccias and 10084 (figures 4 and 5).

Simon’s Mode for 10093

	S	L
Mare Basalt	6.5	8.4
Highland Component	0.8	
Regolith breccia	2.9	0.3
Agglutinate	6.9	2.7
Pyroxene	4.7	
Olivine	0.1	
Plagioclase	2.5	
Ilmenite	1.6	
Orange glass	1.5	0.7
Other glass	1.6	0.4
Matrix	57.7 %	

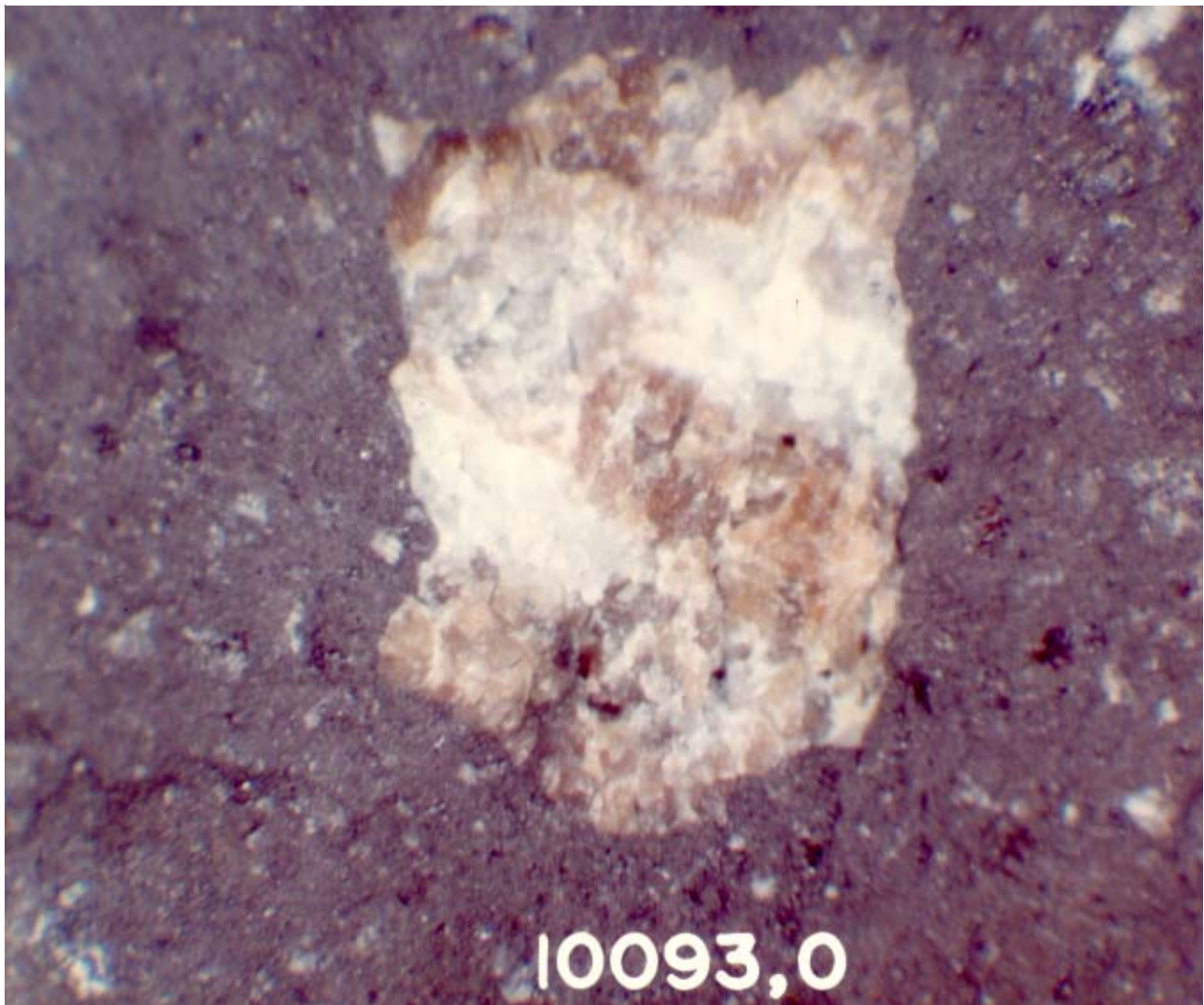


Figure 2: Close up photo of tiny rock clast in 10093 showing plagioclase and honey brown pyroxene. Magnification unknown. NASA S76-25991.

Processing

Apollo 11 samples were originally described and cataloged in 1969 and “recataloged” by Kramer et al. (1977). There are 3 thin sections.

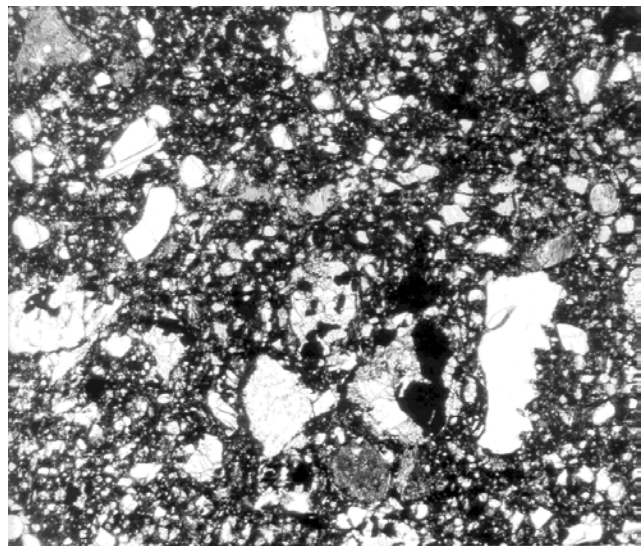


Figure 3: Thin section photomicrograph of matrix of 10093,5. NASA S76-28121. Scale is 2.5 mm.

Table 1. Chemical composition of 10093.

reference weight	Rhodes81	
SiO2 %	42.3	(a)
TiO2	7.87	(a)
Al2O3	12.76	(a)
FeO	16.26	(a)
MnO	0.25	(a)
MgO	8.05	(a)
CaO	11.78	(a)
Na2O	0.47	(a)
K2O	0.18	(a)
P2O5	0.11	(a)
S %		
sum		
Sc ppm	61	(b)
V	49	(b)
Cr	2160	(b)
Co	30	(b)
Ni	211	(b)
Cu		
Zn	45	(b)
Ga	8	(b)
Ge ppb		
As		
Se		
Rb	4	(b)
Sr	162	(b)
Y	112	(b)
Zr	338	(b)
Nb	20	(b)
Mo		
Ru		
Rh		
Pd ppb		
Ag ppb		
Cd ppb		
In ppb		
Sn ppb		
Sb ppb		
Te ppb		
Cs ppm		
Ba		
La	17.3	(b)
Ce	52	(b)
Pr		
Nd		
Sm	13.6	(b)
Eu	1.75	(b)
Gd		
Tb	2.7	(b)
Dy		
Ho		
Er		
Tm		
Yb	11	(b)
Lu	1.6	(b)
Hf	10.6	(b)
Ta	1.6	(b)
W ppb		
Re ppb		
Os ppb		
Ir ppb		
Pt ppb		
Au ppb		
Th ppm	2.4	(b)
U ppm		

technique: (a) XRF, (b) INAA

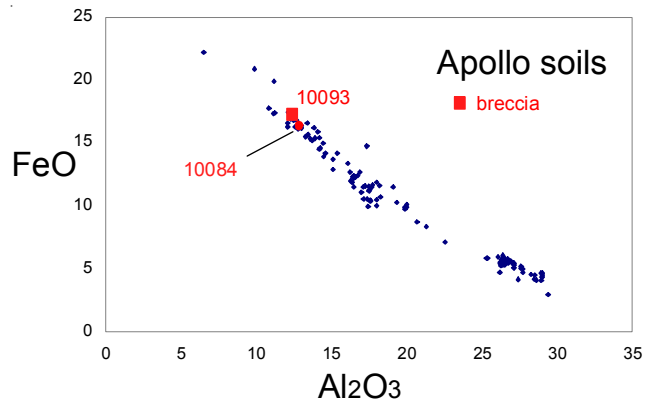


Figure 5: Composition of 10093 compared with that of Apollo soil samples.

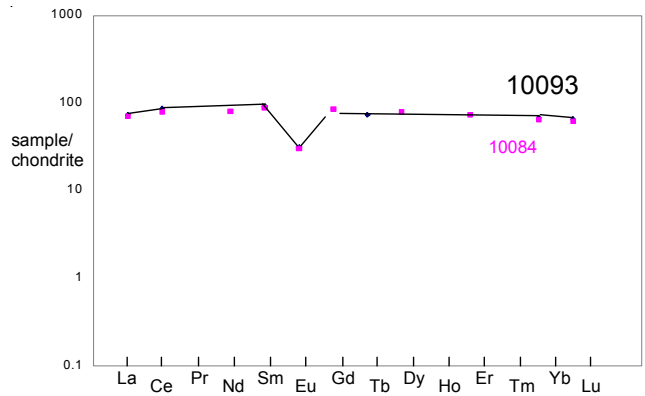
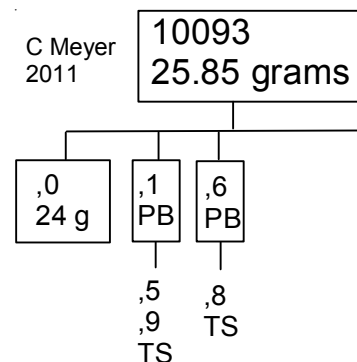


Figure 4: Normalized rare earth element diagram for breccia 10092 compared with soil 10084 (data from Wiesmann et al. 1975).



References for 10093

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