

12046
Ilmenite Basalt
 166 grams

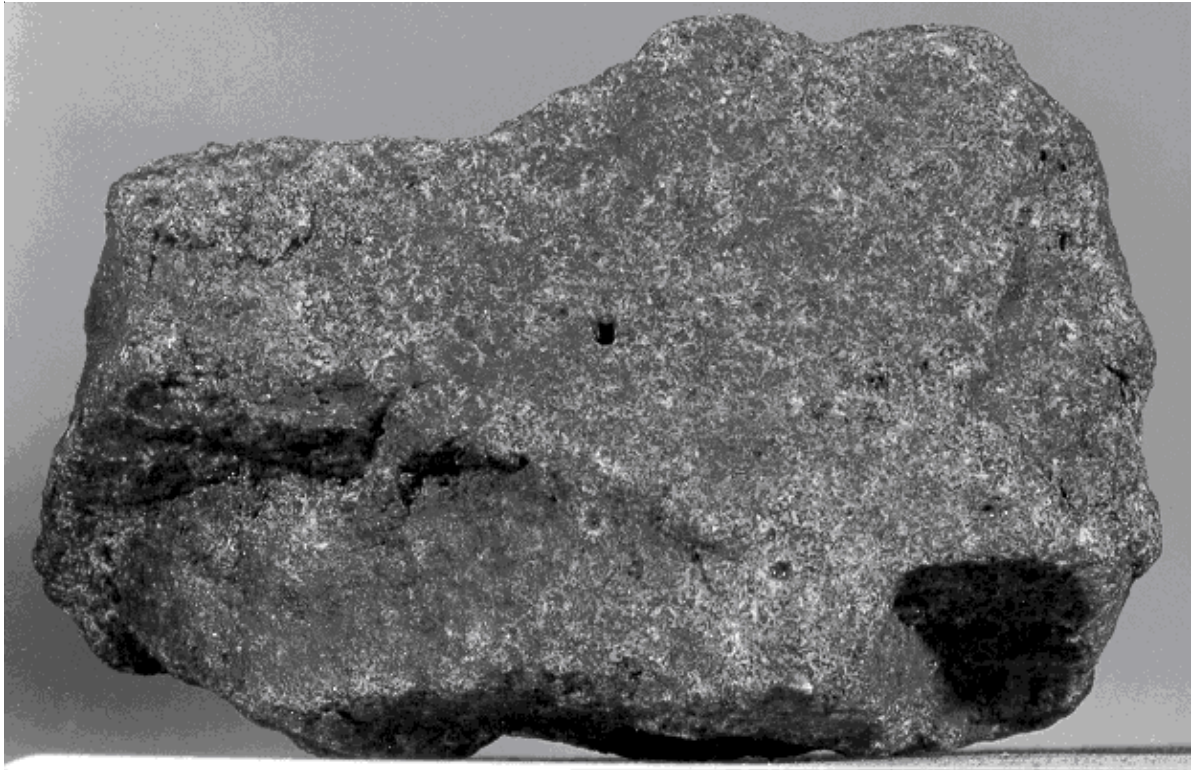


Figure 1: Photo of 12046,0 showing zap pits. Sample is 7 cm across. NASA S70-19036.

Introduction

12046 is an ilmenite basalt with medium-grained ophitic to subophitic texture with a high percentage of pyroxene (figures 1 – 3). It is rounded, with micrometeorite craters on all sides. It has not been dated.

Petrography

Dence et al. (1971) termed 12046 a subophitic microgabbro and compared it with 12056. Neal et al. (1994) show a picture of the texture of 12046 and give mineral analyses. In an appendix to their paper, they describe some olivine phenocrysts as cores to pyroxene phenocrysts (<2 mm). Groundmass includes laths of plagioclase (1.5 mm), pyroxene, ilmenite, tridymite, glass with minute anhedral ulvöspinel, troilite and metal.

Mineralogy

Olivine: Dence et al. (1971) found olivine was Fo₆₅.

Pyroxene: Large grains of pyroxene include corroded olivine and surround plagioclase crystals (figure 4). Dence et al. reported that “pyroxferroite mantles ferroaugite”.

Mineralogical Mode for 12046

	Neal et al. 1994	Dence et al. 1971
Olivine	0.8	2
Pyroxene	60.1	
Plagioclase	29.9	
Ilmenite	3.4	
Chromite +Usp	2	
mesostasis	2.1	
“silica”	1.1	

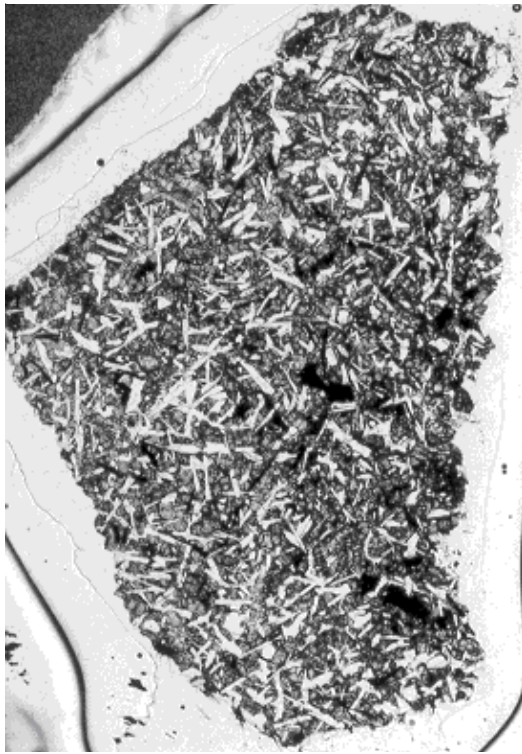


Figure 2: Photomicrograph of whole thin section 12046,5 (2 cm). NASA S70-49389.



Figure 3: Photomicrographs of thin section 12046,6 (plane-polarized and crossed-nicols). Field of view is 2.6 mm. NASA #S70-49813-814.

Plagioclase: Plagioclase laths are An_{91-87} .

Metallic iron: Iron grains are about 2 wt. % Ni. (figure 5).

Chemistry

The chemical composition was determined by Neal et al. (1994).

Radiogenic age dating

Not dated.

Processing

12046 has been used for public display (figure 8). There are 4 thin sections.

List of Photo #s for 12046

S69-63166 – 63189	color mug
S69-61883 – 61906	B & W mug
S70-19027 – 19038	B & W
S70-48421 – 48430	color dusted
S70-49813 – 49816	TS color
S70-49258 – 49259	
S70-50036	
S70-17296 – 17300	display

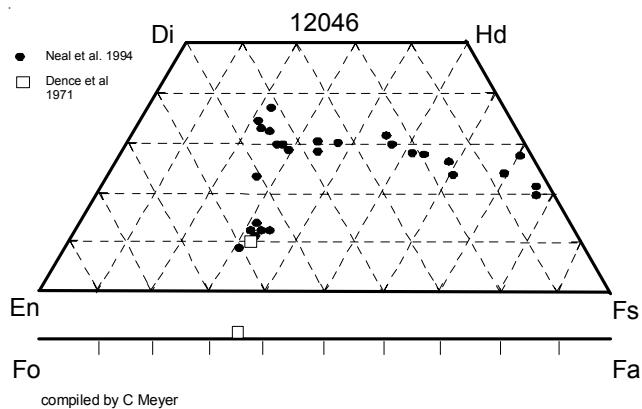


Figure 4: Pyroxene compositions of 12046 as determined by Neal et al. (1994).

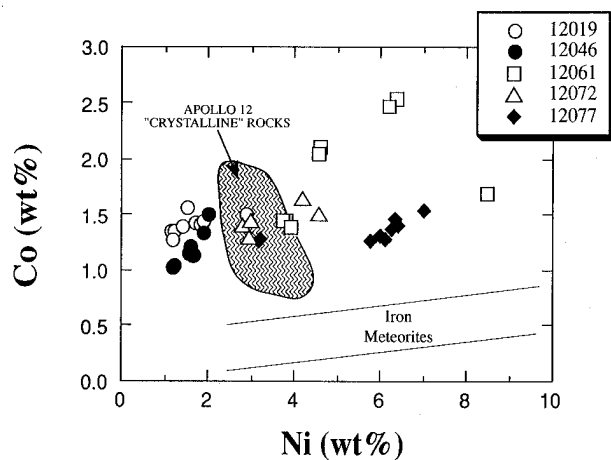


Figure 5: Composition of iron grains in Apollo 12 rock (from Neal et al. 1994).

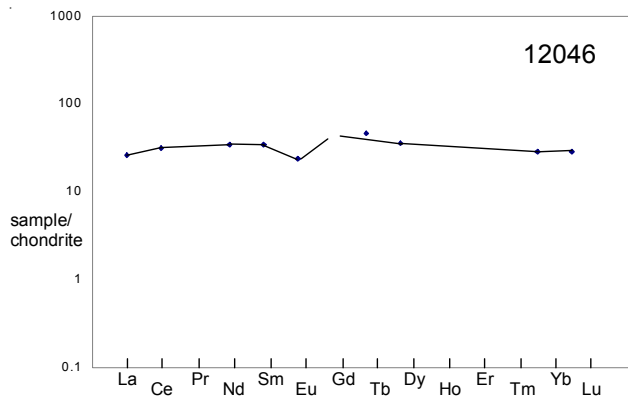


Figure 6: Normalized rare-earth-element composition of 12046 (data by Neal et al. 1994).

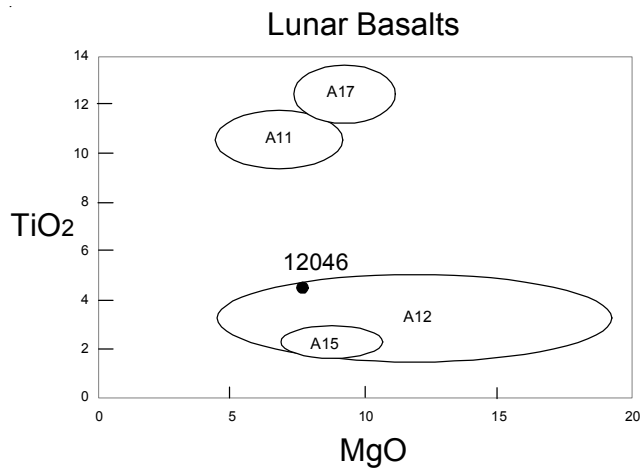


Figure 7: Composition of 12046 compared with other lunar basalts.

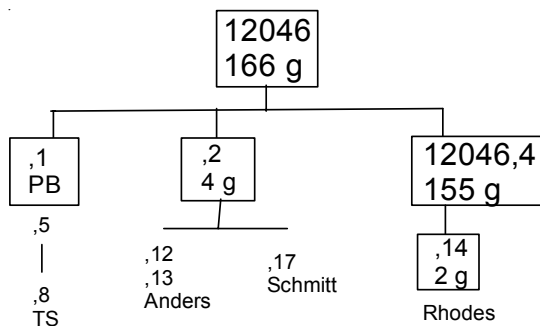


Figure 8. Display for 12046. S70-17297

Table 1. Chemical composition of 12046.

reference	Neal94	
weight	.547 g	
SiO ₂ %		
TiO ₂	4.6	(a)
Al ₂ O ₃	10.5	(a)
FeO	20.2	(a)
MnO	0.259	(a)
MgO	7.3	(a)
CaO	10.6	(a)
Na ₂ O	0.293	(a)
K ₂ O	0.063	(a)
P ₂ O ₅		
S %		
sum		
Sc ppm	60.2	(a)
V	138	(a)
Cr	2010	(a)
Co	31	(a)
Ni		
Cu		
Zn		
Ga		
Ge ppb		
As		
Se		
Rb		
Sr	158	(a)
Y		
Zr		
Nb		
Mo		
Ru		
Rh		
Pd ppb		
Ag ppb		
Cd ppb		
In ppb		
Sn ppb		
Sb ppb		
Te ppb		
Cs ppm		
Ba	72	(a)
La	6.2	(a)
Ce	19.3	(a)
Pr		
Nd	15.8	(a)
Sm	5.2	(a)
Eu	1.32	(a)
Gd		
Tb	1.7	(a)
Dy	8.8	(a)
Ho		
Er		
Tm		
Yb	4.7	(a)
Lu	0.7	(a)
Hf	3.7	(a)
Ta	0.49	(a)
W ppb		
Re ppb		
Os ppb		
Ir ppb		
Pt ppb		
Au ppb		
Th ppm	0.67	(a)
U ppm		
technique	(a) INAA	

References for 12046

Dence M.R., Douglas J.A.V., Plant A.G. and Traill R.J. (1971) Mineralogy and peterology of some Apollo 12 samples. *Proc. Second Lunar Sci. Conf.* 285-299.

James O.B. and Wright T.L. (1972) Apollo 11 and 12 mare basalts and gabbros: Classification, compositional variations and possible petrogenetic relations. *Geol. Soc. Am. Bull.* **83**, 2357-2382.

LSPET (1970) Preliminary examination of lunar samples from Apollo 12. *Science* **167**, 1325-1339.

Neal C.R., Hacker M.D., Snyder G.A., Taylor L.A., Liu Y.-G. and Schmitt R.A. (1994a) Basalt generation at the Apollo 12 site, Part 1: New data, classification and re-evaluation. *Meteoritics* **29**, 334-348.

Neal C.R., Hacker M.D., Snyder G.A., Taylor L.A., Liu Y.-G. and Schmitt R.A. (1994b) Basalt generation at the Apollo 12 site, Part 2: Source heterogeneity, multiple melts and crustal contamination. *Meteoritics* **29**, 349-361.