12077

Olivine Basalt

22.6 grams

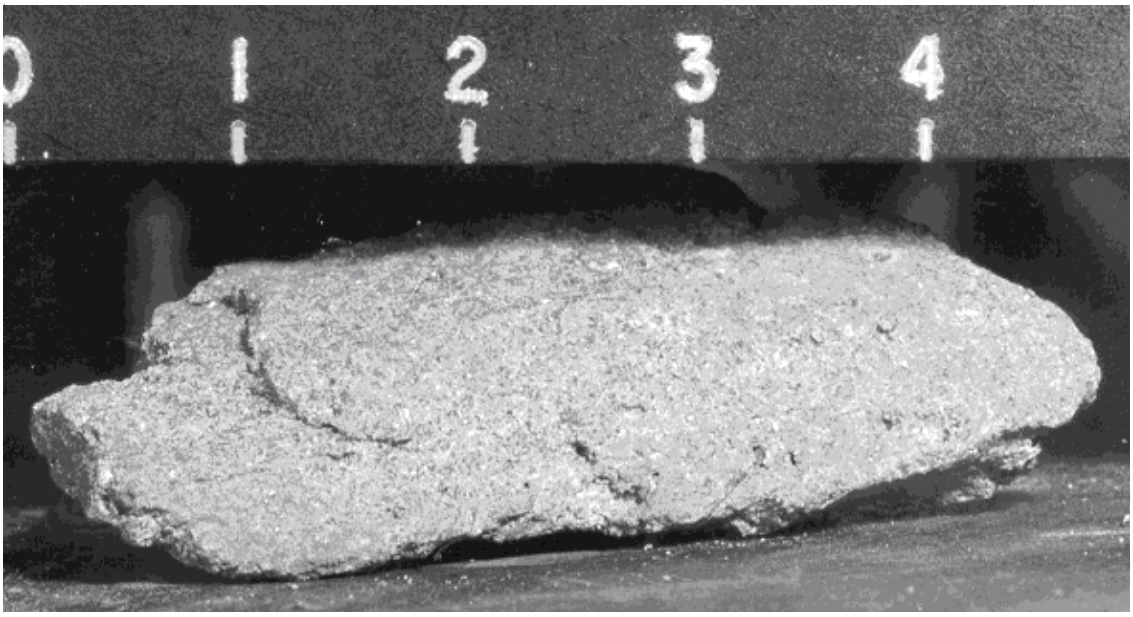

Figure 1: Photo of 12077. Scale is in cm. Sample is 4 cm. NASA # S69-61838.

Introduction

12077 is a fine-grained olivine basalt with a high modal percentage of pyroxene. It has a few micrometeorite carters (figure 1).

Petrography

Neal et al. (1994) describe 12077 as an olivine basalt with large olivine phenocrysts (1 mm) set in a subophitic to variolitic groundmass consisting of intergrown pyroxene, plagioclase, ilmenite, glass (figure 2). Chromite inclusions are reportedly only found in pyroxene, but not in olivine.

Mineralogy

Olivine: Olivine phenocrysts in 12077 have cores Fo_{73} with rims ranging to Fo_{53}. Olivine contains melt inclusions (Neal et al. 1994), is often embayed and is overgrown by pyroxene.

Pyroxene: Pyroxene compositions are shown in figure 3. Pyroxene includes melt inclusions.

Plagioclase: Plagioclase is $An_{92\text{-}88}$.

Metal: Metallic iron grains in 12077 have about 6 wt. % Ni and 1.5 wt % Co (figure 4).

Chemistry

The chemical composition of 12077 has been determined by Neal et al. (1994).

Mineralogical Mode for 12077

	Neal et al. 1994
Olivine	16.6
Pyroxene	61.7
Plagioclase	19.3
Ilmenite	0.4
Chromite +Usp	1.1
mesostasis	0.7
"silica"	- -

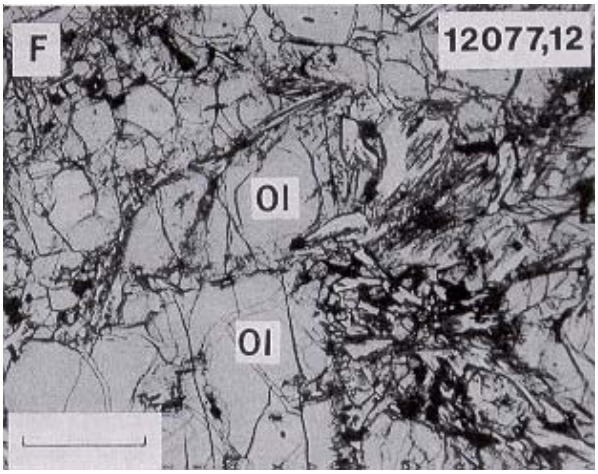

Figure 2: Texture of 12077. Figure 2f from Neal et al. (1994). Scale is 0.5 mm.

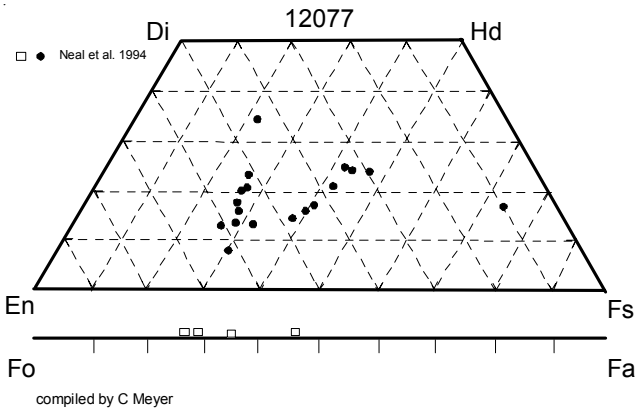

Figure 3 : Pyroxene and olivine composition of 12077 (adapted loosely from Neal et al. 1994).

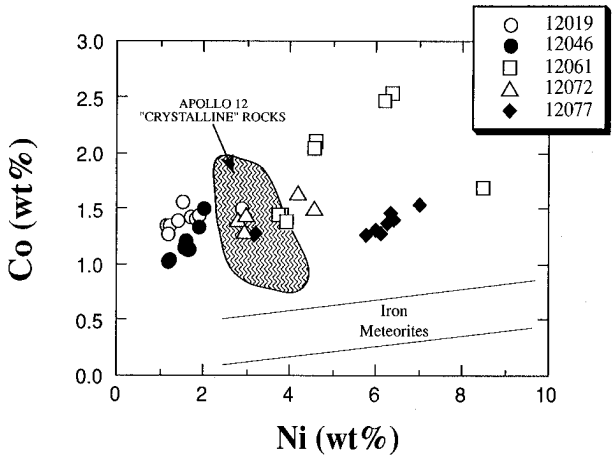

Figure 4: Composition of iron grains in 12077 (from Neal et al. 1994).

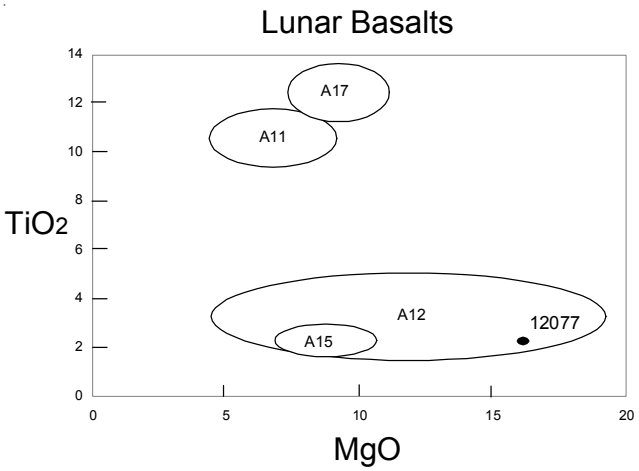

Figure 5: Composition of 12077 compared with other luanr basalts.

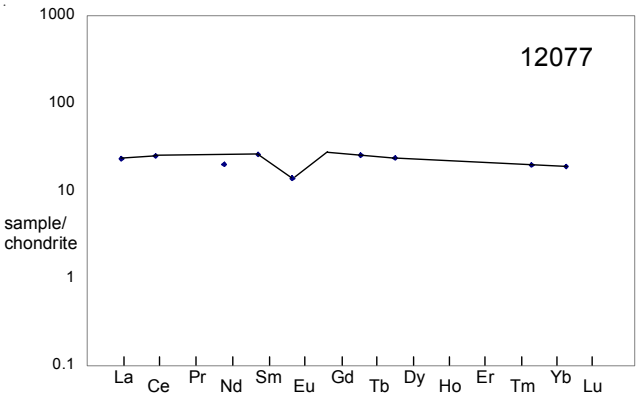

Figure 6: Normalized rare-earth-element diagram for 12077 (data from Neal et al. 1994).

Radiogenic age dating

Not dated.

Other Studies

Bogard et al. (1971) reported the content and isotopic composition of rare gases in 12077.

There are 2 thin sections.

List of Photo #s for 12077

S69-61835 – 61858 B & W mug

Table 1. Chemical composition of 12077.

reference	Neal94	
weight	.62 g	
SiO2 %		
TiO2	2.5	(a)
Al2O3	7.7	(a)
FeO	21.1	(a)
MnO	0.267	(a)
MgO	15.7	(a)
CaO	7.7	(a)
Na2O	0.202	(a)
K2O	0.05	(a)
P2O5		
S %		
sum		
Sc ppm	41.4	(a)
V	197	(a)
Cr	5050	(a)
Co	59.5	(a)
Ni	125	(a)
Cu		
Zn		
Ga		
Ge ppb		
As		
Se		
Rb		
Sr		
Y		
Zr		
Nb		
Mo		
Ru		
Rh		
Pd ppb		
Ag ppb		
Cd ppb		
In ppb		
Sn ppb		
Sb ppb		
Te ppb		
Cs ppm		
Ba		
La	5.5	(a)
Ce	15.1	(a)
Pr		
Nd	9	(a)
Sm	3.8	(a)
Eu	0.8	(a)
Gd		
Tb	0.93	(a)
Dy	5.8	(a)
Ho		
Er		
Tm		
Yb	3.2	(a)
Lu	0.46	(a)
Hf	2.5	(a)
Ta	0.45	(a)
W ppb		
Re ppb		
Os ppb		
Ir ppb		
Pt ppb		
Au ppb		
Th ppm	0.65	(a)
U ppm		
technique	*(a) INAA,*	

References for 12077

Bogard D.D., Funkhouser J.G., Schaeffer O.A. and Zahringer J. (1971) Noble gas abundances in lunar material-cosmic ray spallation products and radiation ages from the Sea of Tranquillity and the Ocean of Storms. *J. Geophys. Res.* **76**, 2757-2779.

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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.

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