12007

Pigeonite Basalt

65.2 grams

Figure 1: Freshly-broken, hackly surface of 12007 showing elongate pyroxene crystal. NASA photo# S76-25877. Edge of cube at top is 1 cm.

Introduction

12007 is a coarse-grained pigeonite basalt (figue 1).

Petrography

Lunar basalt 12007 is a relatively coarse-grained pigeonite basalt ("microgabbro") with about 15 % zoned pyroxene phenocrysts set in ophitic to variolitic groundmass of plagioclase, pyroxene, ilmenite and cristobalite with minor ulvöspinel, troilite, metallic iron, fayalite, tranquillityite, apatite and two immiscible glasses (Baldridge et al. 1979). The groundmass is relatively coarse-grained (~1 mm) in this rock (figure 2). Pyroxene phenocrysts range up to 3.2 mm in length and are extensively zoned. Ilmenite occurs as irregular plates about 1 mm in size.

Mineralogy

Pyroxene: The composition of pyroxene in 12007 is given in Baldridge et al. (1979)(figure 3).

Plagioclase: Baldridge et al. (1979) report plagioclase composition ranging An_{92-80}, with the average An_{84}.

Silica: Both tridymite (large laths) and cristobalite (interstitial) are present.

Mineralogical Mode for 12007

	Neal et al. 1994	Baldridge et al. 1979
Olivine	0	
Pyroxene	48.2	48.2
Plagioclase	39.8	39.8
Ilmenite	2.9	4
Chromite +Usp	0.6	0.2
mesostasis	0.4	0.1
"silica"	7.3	7.3

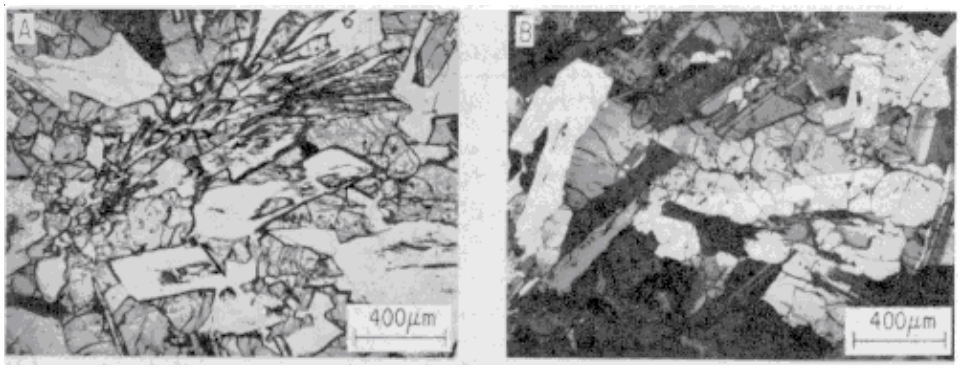


Figure 2: Photomicrographs of thin sections of 12007 (from Baldridge et al. 1979).

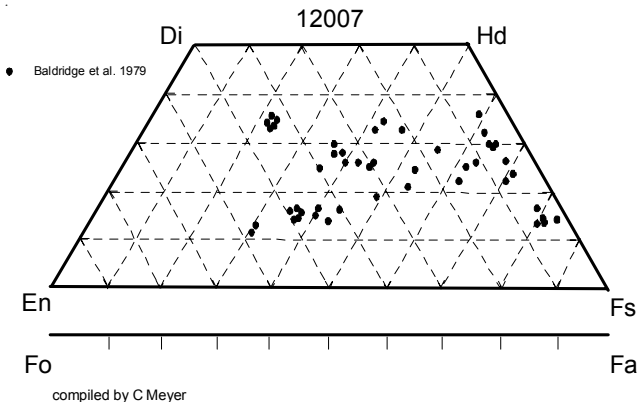


Figure 3: Pyroxene composition for 12007 (adapted from Baldridge et al. 1979).

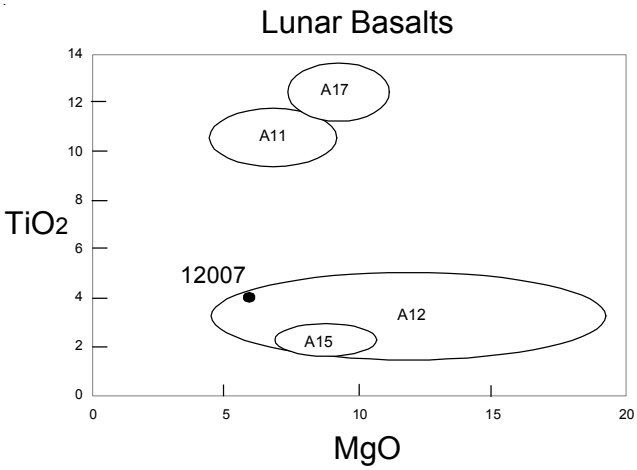


Figure 4: Composition of 12007 compared with that of other lunar basalts.

Fayalite: Fayalite occurs as intergrowths with cristobalite or high-K glass. The intergrowth with cristobalite may be due to breakdown of pyroxferroite (Baldridge et al. 1979).

Tranquillityite: Tranquillityite forms fine-grained, acicular aggregates < 1 micron in size.

Chemistry

Rhodes et al. (1977) determined the chemical composition (figures 4 and 5).

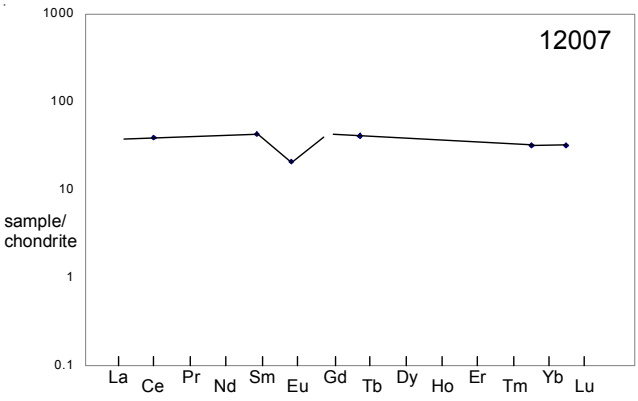
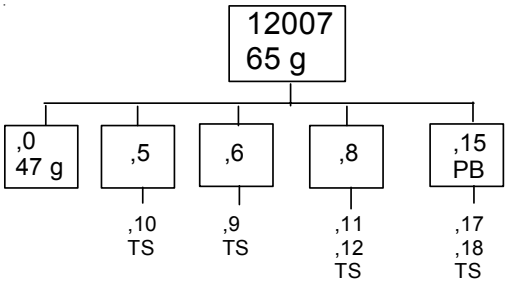


Figure 5: Normalized rare-earth-element diagram for 12007 (data from Rhodes et al. 1977).

Radiogenic age dating

Not dated.



List of Photo #s for 12007

S69-61788 – 61810 B & W mug
S69-63134 – 63157 color mug
S70-37331 – 37336 B & W
S76-25877 – 25878 color pic.

Table 1. Chemical composition of 12007.

reference	Rhodes77		Baldridge79		Neal2001	
weight						
SiO2 %	46.42	(c)	48.03	(d)		
TiO2	3.9	(c)	3.82	(d)		
Al2O3	11.28	(c)	12.13	(d)		
FeO	19.05	(c)	17.85	(d)		
MnO	0.28	(c)	0.22	(d)		
MgO	5.86	(c)	5.67	(d)		
CaO	11.52	(c)	12.07	(d)		
Na2O	0.32	(a)	0.4	(d)		
K2O	0.08	(c)	0.04	(d)		
P2O5	0.1	(c)	0.08	(d)		
S %	0.1	(c)	0.12	(d)		
sum						
Sc ppm	52.3	(a)			56	(e)
V					152	(e)
Cr	1980	(a)			2438	(e)
Co	26	(a)			31.6	(e)
Ni					4.4	(e)
Cu					18	(e)
Zn					26	(e)
Ga					3.65	(e)
Ge ppb						
As						
Se						
Rb					1.75	(e)
Sr	142	(c)			135	(e)
Y	51	(c)			54	(e)
Zr	156	(c)			146	(e)
Nb	10	(c)			10	(e)
Mo					0.51	(e)
Ru						
Rh						
Pd ppb						
Ag ppb						
Cd ppb						
In ppb						
Sn ppb						
Sb ppb						
Te ppb						
Cs ppm					0.05	(e)
Ba	91	(b)			90	(e)
La					8.26	(e)
Ce	23.6	(a)			22.7	(e)
Pr					3.5	(e)
Nd					17	(e)
Sm	6.4	(a)			5.7	(e)
Eu	1.2	(a)			1.21	(e)
Gd					7.8	(e)
Tb	1.48	(a)			1.35	(e)
Dy					8.87	(e)
Ho					1.86	(e)
Er					5.44	(e)
Tm					0.72	(e)
Yb	5.3	(a)			4.75	(e)
Lu	0.77	(a)			0.63	(e)
Hf	6.4	(a)			4.24	(e)
Ta					0.54	(e)
W ppb					140	(e)
Re ppb						
Os ppb						
Ir ppb						
Pt ppb						
Au ppb						
Th ppm					1.2	(e)
U ppm					0.31	(e)
technique	*(a) INAA, (b) IDMS, (c) XRF, (d) e probe, (e) ICP-MS*					

References for 12007

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