10092

Ilmenite Basalt (low K)

46 grams

Figure 1: Photo of 10092,0. NASA S76-25871. Sample is about 3 cm.

Introduction

10092 is a low-K, ilmenite basalt (figure 1). It was originally labeled 10002,22, but because of its size, was renumbered 10092. It was returned in rock box #1003.

Petrography

According to Beaty and Albee (1978), 10092 is similar in texture to 10045 and 10020. These rocks have an overall texture characterized by an open network of randomly-oriented plagioclase laths and ilmenite platelets with dominant pyroxene in between. Minor minerals include a silica phase, ulvospinel, Cr-spinel, troilite and a K-rich glass.

Olivine in 10092 is too Mg-rich to be in equilibrium with the bulk composition, indicating that it may have cumulate origin.

Mineralogical Mode for 10092

	Beaty and Albee 1978
Olivine	4.9
Pyroxene	45
Plagioclase	31
Ilmenite	15.6
Glass	0.14
silica	2.6
troilite	0.23
phosphate	0.06

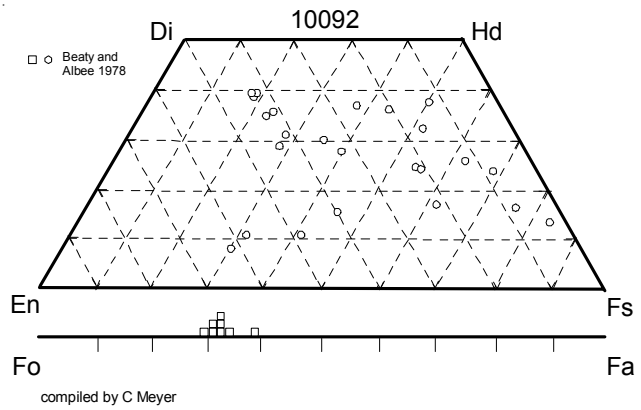

Figure 2: Pyroxene and olivne composition of 10092 (from Beaty and Albee 1978).

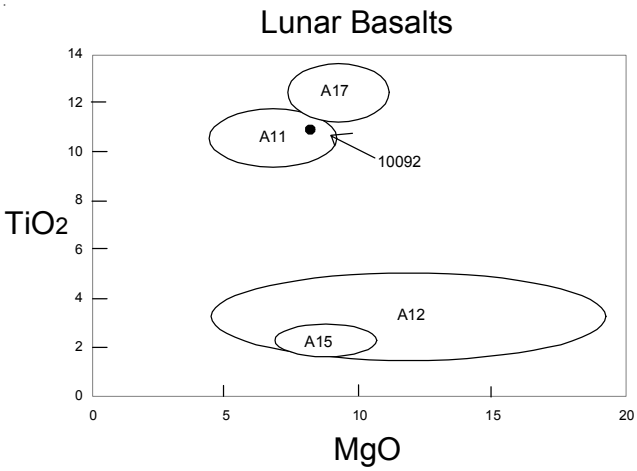

Figure 3: Composition of 10092 compared with that of other Apollo lunar samples.

Mineralogy

Olivine: Olivine is Fo_{72-60}.

Pyroxene: Pyroxene has compositional zoning (figure 2).

Plagioclase: Plagioclase is An_{92-82}.

Ilmenite: Ilmenite has 2.5% MgO (Beaty and Albee 1978).

Chemistry

Rhodes and Blanchard (1980) obtained an analysis of 10092 (table 1, figures 3 and 4).

Radiogenic age dating

10092 has not be dated.

Processing

Apollo 11 samples were originally described and cataloged in 1969 and "re-cataloged" by Kramer et al. (1977). There are 5 thin sections.

List of Photo #s for 10092

S76-25871 – 76 color mug

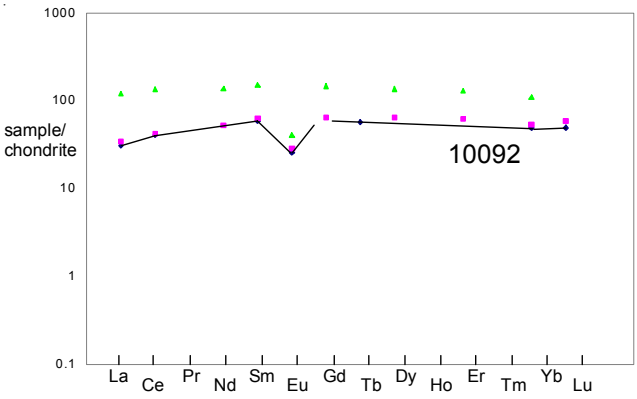

Figure 4: Normalized rare-earth-element composition for low-K basalt 10092 (the line) compared with that of low-K basalt 10020 and high-K basalt 10049 (the dots) (data from Wiesmann et al. 1975).

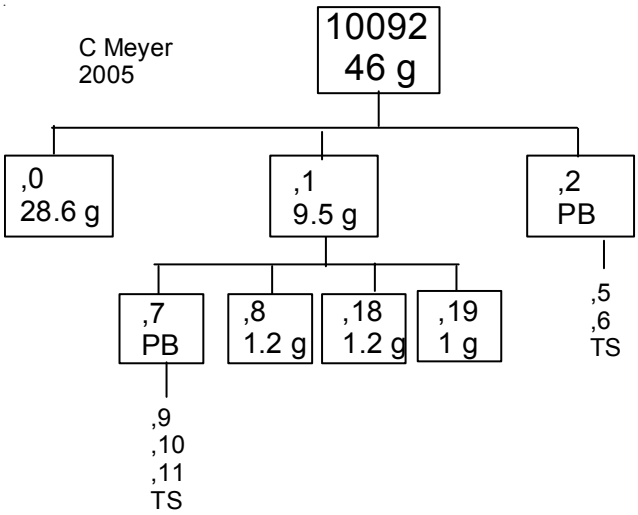

Table 1. Chemical composition of 10092.

reference	Rhodes80		Beaty 78		Neal2001	
weight						
SiO2 %	38.85	(a)	38.05	(c)		
TiO2	10.87	(a)	12.74	(c)		
Al2O3	9.44	(a)	9.66	(c)		
FeO	19.35	(a)	18.38	(c)		
MnO	0.3	(a)	0.23	(c)		
MgO	8.52	(a)	8.9	(c)		
CaO	10.99	(a)	11.38	(c)		
Na2O	0.34	(b)	0.33	(c)		
K2O	0.06	(a)	0.02	(c)		
P2O5	0.07	(a)	0.03	(c)		
S %			0.11	(c)		
sum						
Sc ppm	82				85.6	(d)
V					96	(d)
Cr	2930	(b)	3010	(c)	2446	(d)
Co	19.3				21.4	(d)
Ni					3.6	(d)
Cu					43.7	(d)
Zn					72.7	(d)
Ga					3.64	(d)
Ge ppb						
As						
Se						
Rb					0.81	(d)
Sr					144	(d)
Y					92	(d)
Zr					210	(d)
Nb					18.2	(d)
Mo					0.06	(d)
Ru						
Rh						
Pd ppb						
Ag ppb						
Cd ppb						
In ppb						
Sn ppb						
Sb ppb					20	(d)
Te ppb						
Cs ppm					0.03	(d)
Ba					73.2	(d)
La	7.3	(b)			8.03	(d)
Ce	25	(b)			24.9	(d)
Pr					4.41	(d)
Nd					23.2	(d)
Sm	8.9	(b)			9.15	(d)
Eu	1.48	(b)			1.57	(d)
Gd					13.4	(d)
Tb	2.1	(b)			2.37	(d)
Dy					16	(d)
Ho					3.34	(d)
Er					9.73	(d)
Tm					1.39	(d)
Yb	8.1	(b)			9.03	(d)
Lu	1.22	(b)			1.23	(d)
Hf	6.8	(b)			7.56	(d)
Ta	1.4	(b)			1.18	(d)
W ppb					70	(d)
Re ppb						
Os ppb						
Ir ppb						
Pt ppb						
Au ppb						
Th ppm					0.68	(d)
U ppm					0.22	(d)

technique: (a) XRF, (b) INAA, (c) elec. Probe, (d) ICP-MS

References for 10092

Beaty D.W. and Albee A.L. (1978) Comparative petrology and possible genetic relations among the Apollo 11 basalts. *Proc. 9th Lunar Planet. Sci. Conf.* 359-463.

James O.B. and Jackson E.D. (1970) Petrology of the Apollo 11 ilmenite basalts. *J. Geophys. Res.* **75**, 5793-5824.

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

Neal C.R. (2001) Interior of the moon: The presence of garnet in the primitive deep lunar mantle. *J. Geophys. Res.* **106**, 27865-27885.

Rhodes J.M. and Blanchard D.P. (1980) Chemistry of Apollo 11 low-K mare basalts. *Proc. 11th Lunar Planet. Sci. Conf.* 49-66.

Schmitt H.H., Lofgren G., Swann G.A. and Simmons G. (1970) The Apollo 11 samples: Introduction. *Proc. Apollo 11 Lunar Science Conf.* 1-54.