DRAFT

12008

Olivine Vitrophyre

58.4 grams

Figure 1: Photo of 12008,0 after dusting. NASA photo # S70-47882. Sample is 2 cm across.

Introduction

12008 is an olivine vitrophyre very similar to 12009 and 12015, but with slightly higher TiO_2 content. The age has been determined to be about 3.2 b.y.

Petrography

Dungan and Brown (1977) describe 12008 as ~15-20% equant subhedral to euhedaral phenocrysts of olivine (0.2 -0.5 mm) heterogeneously distributed in the opaque groundmass as glomerophyric aggregates (Fo_{72}). Small chromite grains with attached metallic iron grains are found in the groundmass or attached to the rims of the olivine phenocrysts. Olivine includes spherical melt inclusions. A second generation of olivine occurs as chains of skeletal microphenocrysts (Donaldson et al. 1975). The fine-grained opaque matrix is made of microlites of aluminous titanaugite, ilmenite and plagioclase (?).

Figure 2: Photomicrograph of thin section 12008,20 showing olivine phenocrysts in nearly opaque groundmass. NASA # S76-29979. Length about 3 mm.

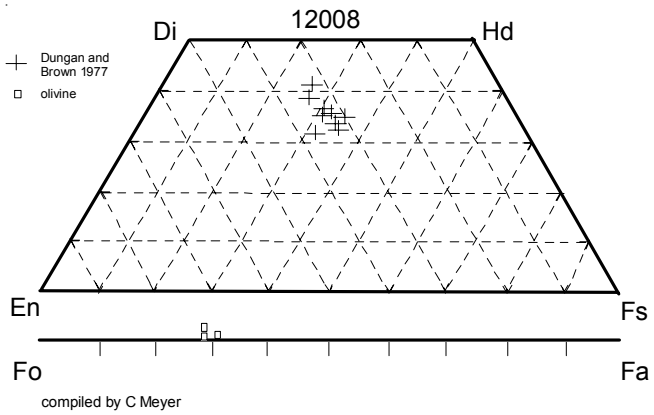


Figure 3: Olivine and pyroxene composition of 12008 (from Dungan and Brown 1977).

Mineralogy

Olivine: Olivine in 12008 is mostly Fo_{72} (Dungan and Brown 1977). Butler (1973) determined the minor element content of olivine.

Pyroxene: Dungan and Brown (1977) reported the composition of dendrites of pyroxene in 12008 (figure 3).

Metal: Brett et al. (1971) determined the Ni content of minute metallic iron grains in 12008 (figure 4).

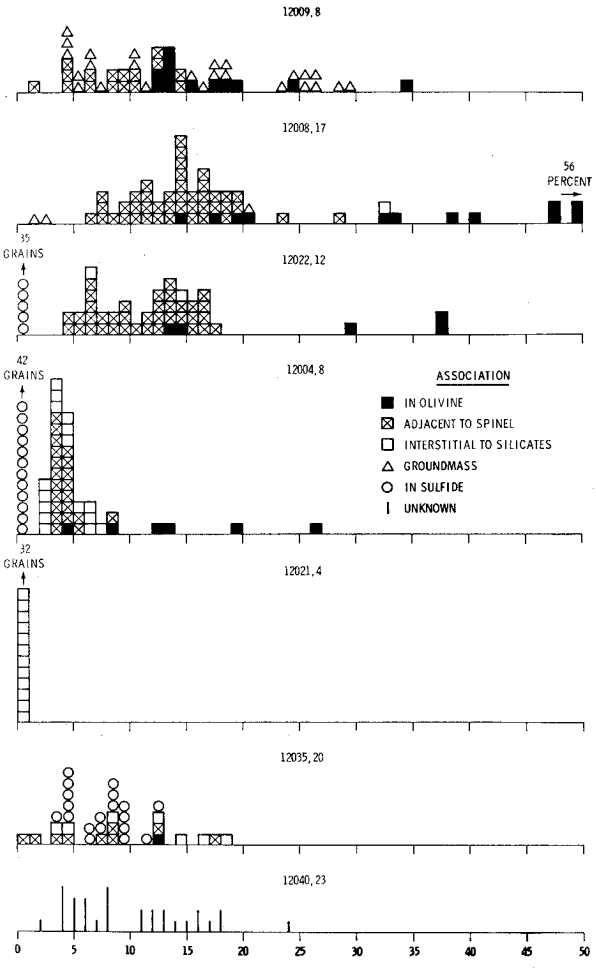


Figure 4: Histogram of Ni conentrations of metal grains in 7 lunar samples (lifted from Brett et al. 1971).

Mineralogical Mode for 12008

	Neal et al. 1994
Olivine	38.2
Pyroxene	20.4
Plagioclase	2
Ilmenite	4.7
Chromite +Usp	0.6
Mesostasis	33.9
"silica"	

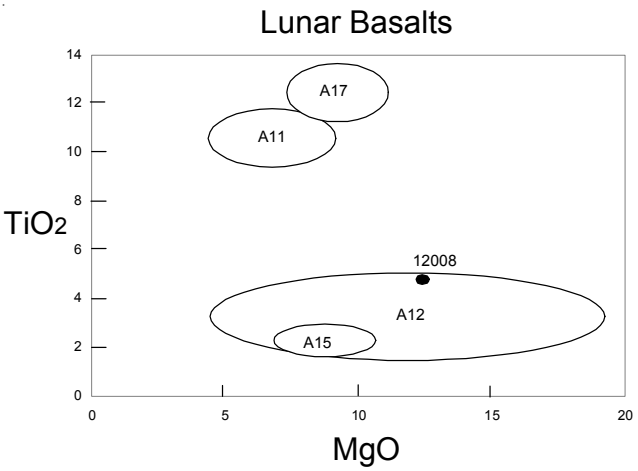


Figure 5: Composition of 12008 compared with other lunar basalts.

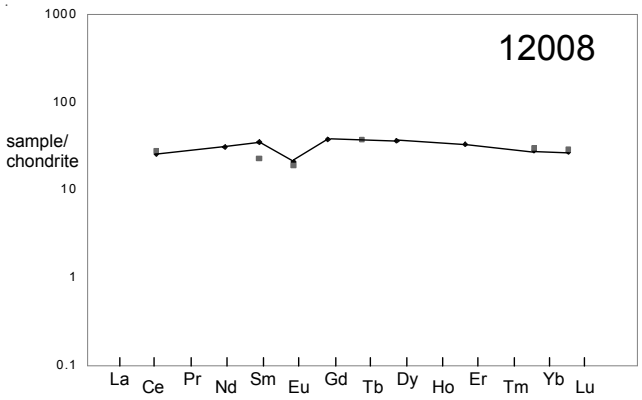


Figure 6: Rare-earth-element data for 12008 normalized by chondritic abundance (from Nyquist et al. 1977).

Chemistry

The chemical composition of 12008 was determined by Rhodes et al. (1977), Jarosowich et al. (1977) (figure 5). Trace elements were determined by Nyquist et al. (1977) and Anders et al. (1971) (figure 6).

Radiogenic age dating

Stettler et al. (1973) determined an age for 12008 by total Argon 39/40 (see table). The high temperature release represented a lower age (see figure in 12051).

Cosmogenic isotopes and exposure ages

Stettler et al. (1973) determined an ^{38}Ar exposure age of 50 m.y.

Other Studies

Clayton et al. (1971) reported oxygen isotope analysis of olivine and matrix of 12008.

List of Photo #s of 12008

S69-63190 – 63213	color mug
S70-47876 – 47833	B & W mug
S70-44092	color
S70-49238 – 49243	TS color
S70-46343	reflected TS ,17
S70-46567	reflected TS ,19
S70-44557	reflected TS, 14
S70-44572	reflected TS, 15
S70-46349	reflected TS ,20
S76-29979	TS ,20
S70-47875 – 47878	processing
S94-035798	processing

Summary of Age Data for 12008

	Ar/Ar	Rb/Sr
Stettler et al. 1973	3.18 ± 0.07 b.y	
	3.09 ± 0.07	

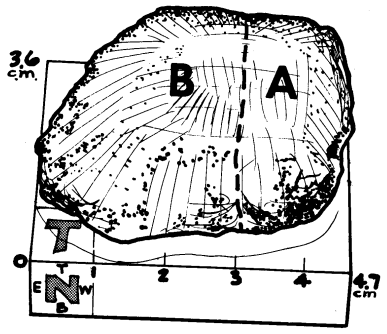
Table 1. Chemical composition of 12008

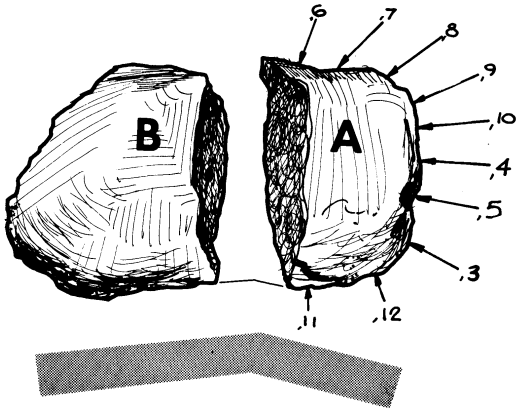
reference	Rhodes77		Jarosowich77		Nyquist77		Anders71	
weight			.5 g		38 mg			
SiO2 %	42.75	(a)	42.58	(b)				
TiO2	4.45	(a)	4.82	(b)				
Al2O3	7.98	(a)	8.49	(b)				
FeO	21.94	(a)	22.4	(b)				
MnO	0.3	(a)	0.28	(b)				
MgO	12.33	(a)	11.99	(b)				
CaO	8.97	(a)	9.1	(b)				
Na2O	0.25	(d)	0.24	(b)				
K2O	0.05	(a)	0.14	(b)	0.054	(c)		
P2O5	0.07	(a)	0.05	(b)				
S %	0.08	(a)						
sum								
Sc ppm	52.4	(d)						
V								
Cr	4200	(d)						
Co	51	(d)					60	(e)
Ni								
Cu								
Zn							1.04	(e)
Ga							3.2	(e)
Ge ppb								
As								
Se							0.139	(e)
Rb					0.681	(c)	0.62	(e)
Sr	130	(a)			133	(c)		
Y	45	(a)						
Zr	117	(a)						
Nb	5.9	(a)						
Mo								
Ru								
Rh								
Pd ppb								
Ag ppb							1.17	(e)
Cd ppb							1.3	(e)
In ppb								
Sn ppb								
Sb ppb								
Te ppb							50	(e)
Cs ppm							0.028	(e)
Ba	51	(c)			49.6	(c)		
La								
Ce	16.9	(d)			15.4	(c)		
Pr								
Nd					13.9	(c)		
Sm	3.35	(d)			5.14	(c)		
Eu	1.06	(d)			1.17	(c)		
Gd					7.39	(c)		
Tb	1.39	(d)						
Dy					8.88	(c)		
Ho								
Er					5.27	(c)		
Tm								
Yb	4.9	(d)			4.55	(c)		
Lu	0.71	(d)			0.657	(c)		
Hf	3.8	(d)						
Ta								
W ppb								
Re ppb								
Os ppb								
Ir ppb							0.06	(e)
Pt ppb								
Au ppb							0.074	(e)
Th ppm								
U ppm								

technique: (a) XRF, (b) wet, (c) IDMS, (d) INAA, (e) RNAA

THE CHIPPING OF LUNAR ROCK 12008

DRWG COMPLETED 7-27-70





C Meyer
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