

78598 – 224 grams
Vitrophyric Ilmenite Basalt



Figure 1: Two views of 78598. Cube is 1 cm. top is S73-21770; bottom is S73-21771.

Introduction

Although 78598 is a high-Ti basalt, it has lower Ti than most others and is somewhat like basalts from Apollo 11. It is a dense, light grey rock with a few large vugs (figure 1). This interesting rock has not received enough attention.

78598 is from a rake sample collected as part of a large comprehensive sample at station 8, Apollo 17.

Petrography

78598 has a very interesting texture (figure 4). Ilmenite and Ca-rich pyroxene form a fine net in a glassy matrix. Warner et al. (1978) termed 78598 a hypocrystalline ilmenite basalt and gave the composition of the fine-grained pyroxene (figure 3). Olivine and plagioclase failed to nucleate.

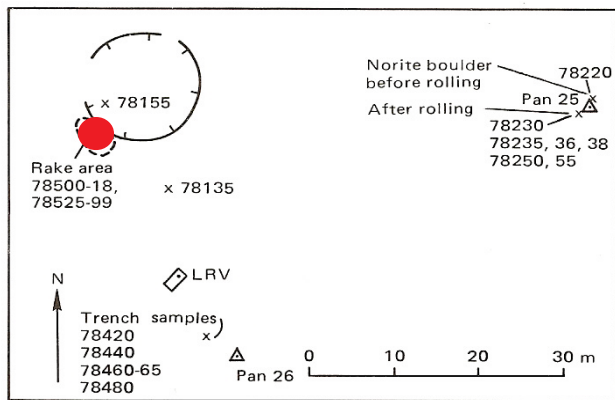


Figure 2: Location where 78598 was found.

Chemistry

Warner et al. (1975) and Neal (2001) have published analyses of 78598 (table 1). These analyses are not in agreement. Note the very low Cr and V content reported by Neal.

Processing

There are 4 thin sections.

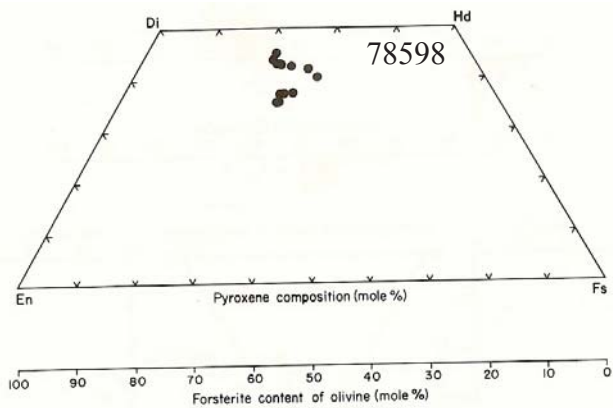
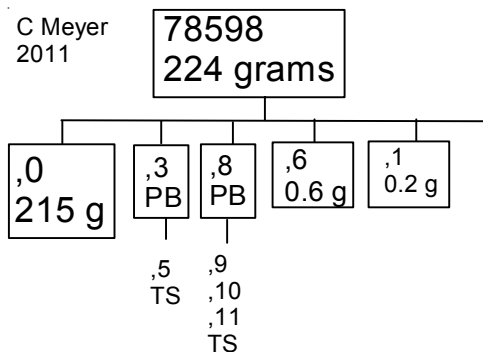


Figure 3: Composition of pyroxene in 78598 (Warner et al. 1978).

Mineralogical Mode

	78598	78586	78587
Olivine	--	4.6	8.1
Pyroxene	49.7	44	41.8
Plagioclase	--	--	27.6
Opauques	11.8	15.3	16.7
Silica	--	--	4.8
Meostasis	38	36.2	0.6



References for 78598

Butler P. (1973) **Lunar Sample Information Catalog Apollo 17**. Lunar Receiving Laboratory. MSC 03211 Curator's Catalog. pp. 447.

Meyer C. (1994) Catalog of Apollo 17 rocks. Vol. 4 North Massif

Muehlberger W.R. and many others (1973) Preliminary Geological Investigation of the Apollo 17 Landing Site. *In Apollo 17 Preliminary Science Report*. NASA SP-330.

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

Warner R.D., Keil K., Prinz M., Laul J.C., Murali A.V. and Schmitt R.A. (1975b) Mineralogy, petrology, and chemistry of mare basalts from Apollo 17 rake samples. *Proc. 6th Lunar Sci. Conf.* 193-220.

Warner R.D., Keil K., Nehru C.E. and Taylor G.J. (1978) Catalogue of Apollo 17 rake samples from Stations 1a, 2, 7, and 8. Spec. Publ. #18, UNM Institute of Meteoritics, Albuquerque. 88 pp.

Wolfe E.W., Bailey N.G., Lucchitta B.K., Muehlberger W.R., Scott D.H., Sutton R.L and Wilshire H.G. (1981) The geologic investigation of the Taurus-Littrow Valley: Apollo 17 Landing Site. US Geol. Survey Prof. Paper, 1080, pp. 280.

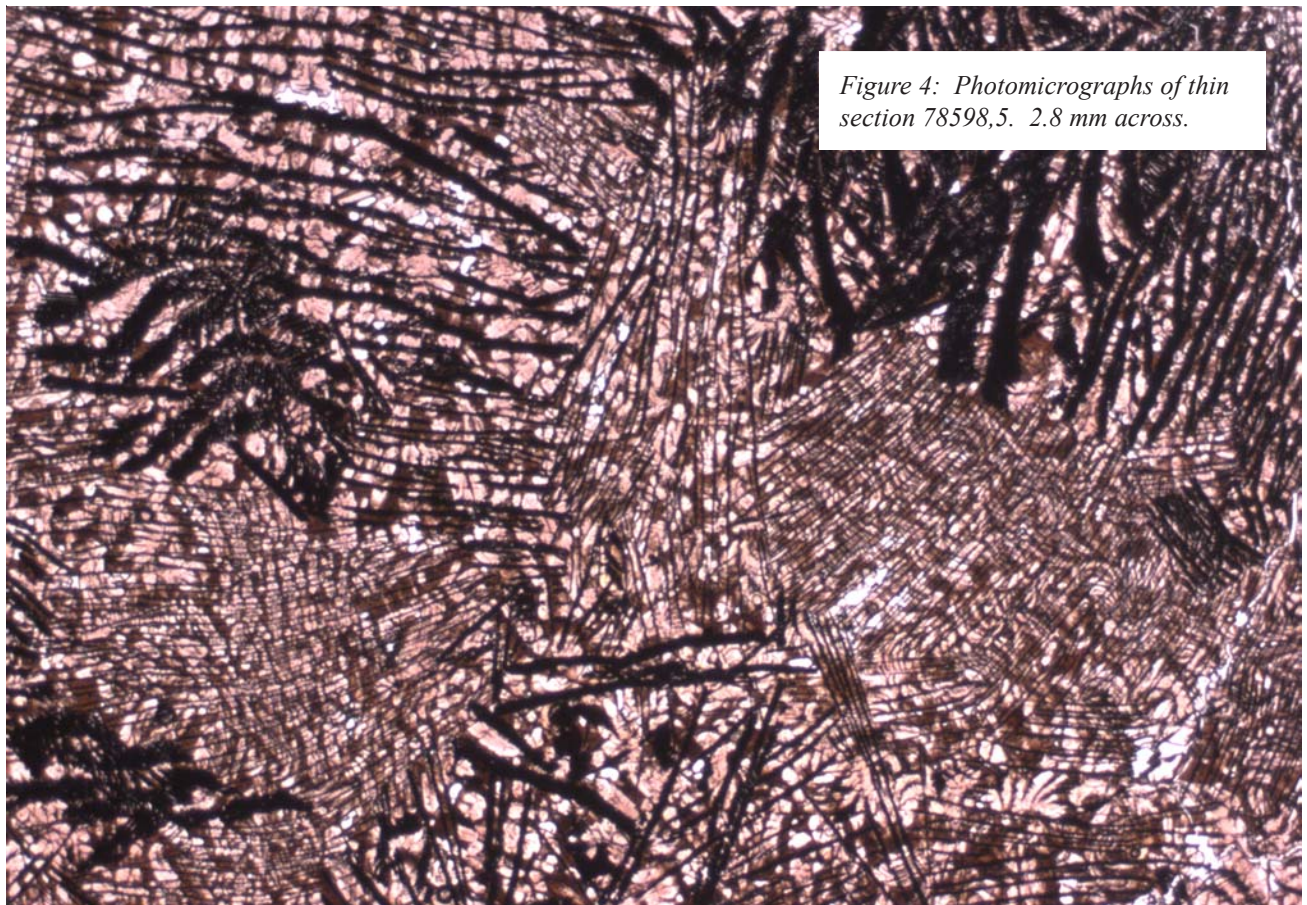
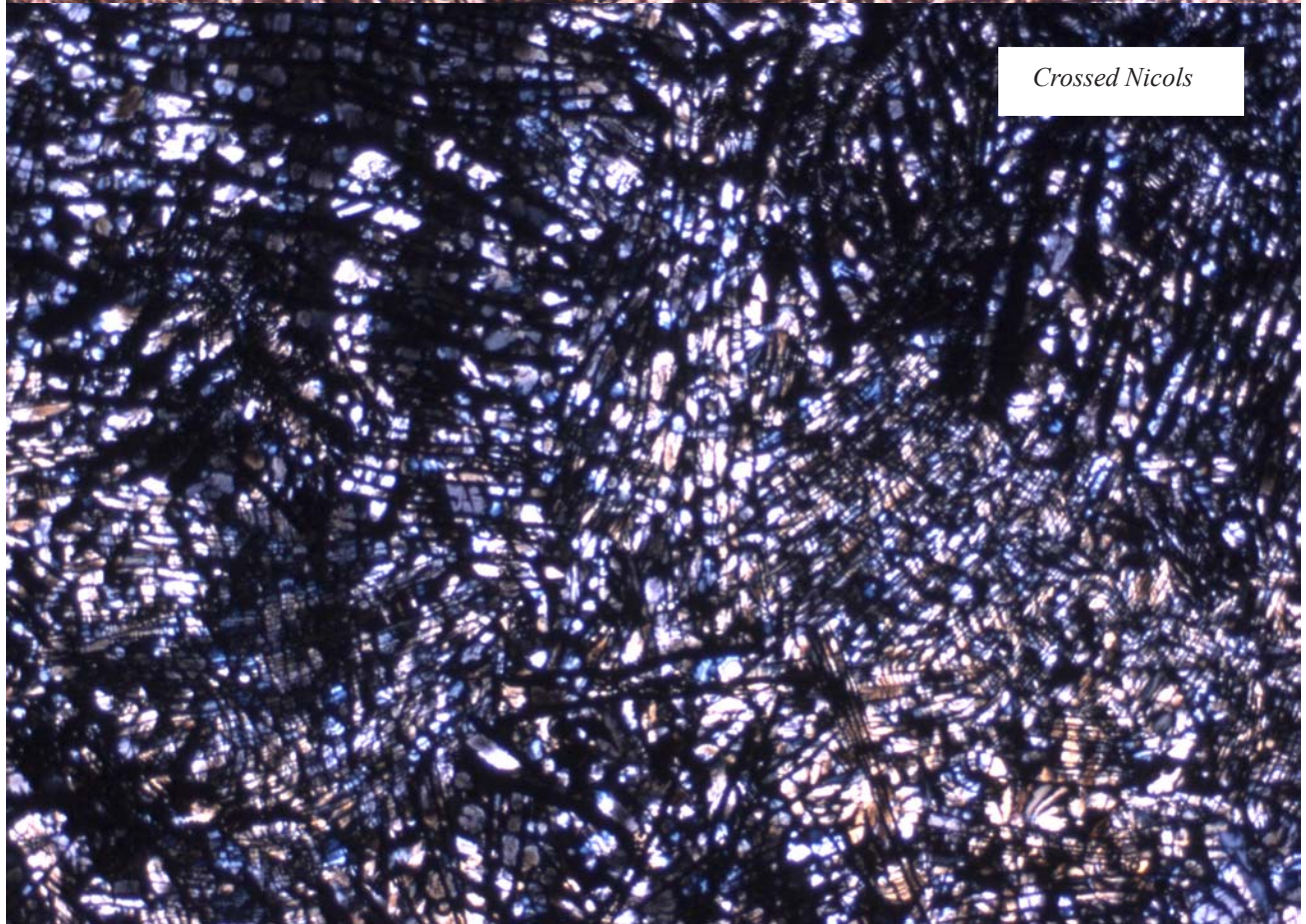


Figure 4: Photomicrographs of thin section 78598,5. 2.8 mm across.



Crossed Nicols

Table 1. Chemical composition of 78598.

reference weight	Neal2001	Warner78	Warner75
SiO ₂ %			
TiO ₂		8.9	(b)
Al ₂ O ₃		10	(b)
FeO		18.5	(b)
MnO		0.25	(b)
MgO		5.2	(b)
CaO		11.5	(b)
Na ₂ O		0.44	(b)
K ₂ O		0.08	(b)
P ₂ O ₅			
S %			
sum			
Sc ppm	81	(a) 72	(b)
V	111	(a) 20	(b)
Cr	3361	(a) 1368	(b)
Co	20	(a) 15	(b)
Ni	1.86	(a)	
Cu	43	(a)	
Zn	88	(a)	
Ga	3.77	(a)	
Ge ppb			
As			
Se			
Rb	0.65	(a)	
Sr	183	(a)	
Y	102	(a)	
Zr	230	(a)	
Nb	23	(a)	
Mo			
Ru			
Rh			
Pd ppb			
Ag ppb			
Cd ppb			
In ppb			
Sn ppb			
Sb ppb	30	(a)	
Te ppb			
Cs ppm	0.03	(a)	
Ba	81	(a)	
La	6.31	(a) 7.8	(b)
Ce	23.7	(a) 30	(b)
Pr	4.06	(a)	
Nd	23.2	(a) 30	(b)
Sm	9.85	(a) 11.6	(b)
Eu	1.96	(a) 2.4	(b)
Gd	15.5	(a)	
Tb	2.67	(a) 3	(b)
Dy	17.5	(a) 19	(b)
Ho	3.42	(a)	
Er	9.84	(a)	
Tm	1.35	(a)	
Yb	9.42	(a) 10.3	(b)
Lu	1.39	(a) 1.5	(b)
Hf	8	(a) 9.7	(b)
Ta	1.56	(a) 1.8	(b)
W ppb	90	(a)	
Re ppb			
Os ppb			
Ir ppb			
Pt ppb			
Au ppb			
Th ppm	0.32	(a)	
U ppm	0.11	(a)	

technique: (a) ICP-MS, (b) INAA

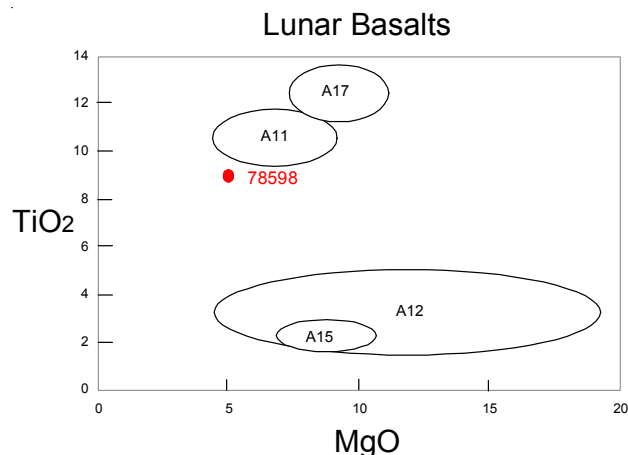


Figure 5: Composition of lunar basalts.

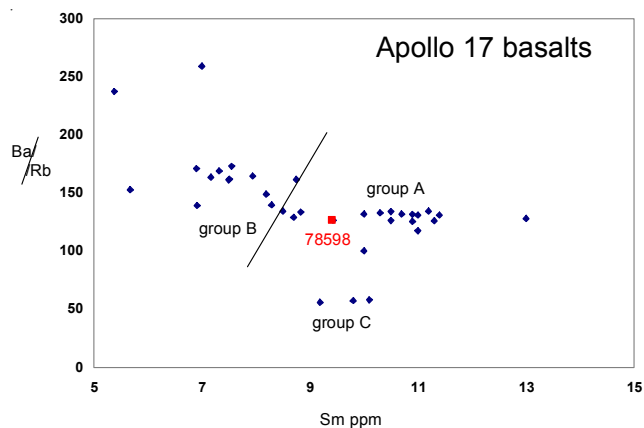


Figure 6: Trace element characteristics of Apollo 17 basalts.

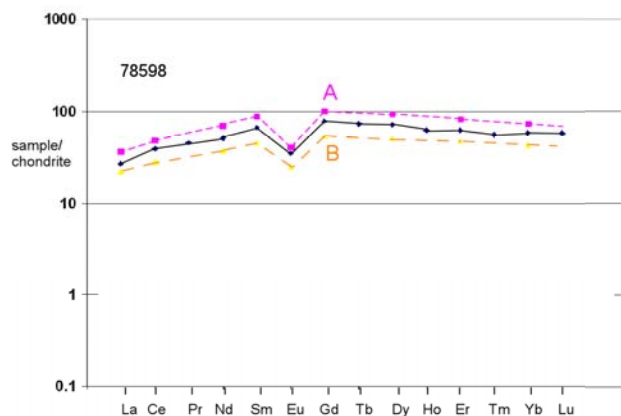


Figure 7: Normalized rare-earth-element diagram for 78598 compared with A and B types of Apollo 17 basalt.