15682

Pigeonite Basalt

50.6 grams

Figure 1: Photo of 15682 showing micrometeorite craters. Sample is 5 cm across. NASA S71-49893.

Introduction

Lunar sample 15682 was collected by rake about 20 meters from Hadley Rille (Swann et al. 1971). It has a rounded top surface with well preserved micrometeorite craters. It is a typical Apollo 15 pigeonite basalt, and has been dated at 3.44 b.y.

Petrography

Dowty et al. (1973) described 15682 and provided mineral analyses. 15682 has a texture similar to that of 15476 (figure 2 a, b) from Dune Crater. It is a pigeonite basalt; while the other small rake samples from this location were almost all olivine-normative basalts. The pyroxene phenocrysts are skeletal and chemically zoned (figure 3). Spherulitic bundles of plagioclase laths, ilmenite and fine pyroxene crystals occur in the matrix. Metallic Ni-Co-Fe grains, ulvospinel and cristobalite are reported (Ryder 1985).

Lofgren et al. (1975, 1976) and Grove and Walker (1977) studied effects of cooling rate in controlled experiments on synthetic mixtures with the composition of Apollo 15 pigeonite basalts and were able to experimentally reproduce these textures.

Please note that this basalt suffers from extreme iron enrichment at the end stages of crystallization (figure 3). It also suffers from some disfiguring skin disease (figure 1)!

Chemistry

The chemical composition of 15682 has been determined by Hubbard et al. (1973) and Helmke et al. (1973) (figures 4 and 5).

Radiogenic age dating

Papanastassiou and Wasserburg (1973) determined the age by internal Rb/Sr isochron technique (figure 6). Nyquist et al. (1973) also determined the Sr isotope composition.

Processing

There are only 2 thin sections of 15682.

Mineralogical Mode of 15682

	Dowty et al. 1973
Olivine	- -
Pyroxene	62
Plagioclase	22
Opaque	7
Silica	0.6

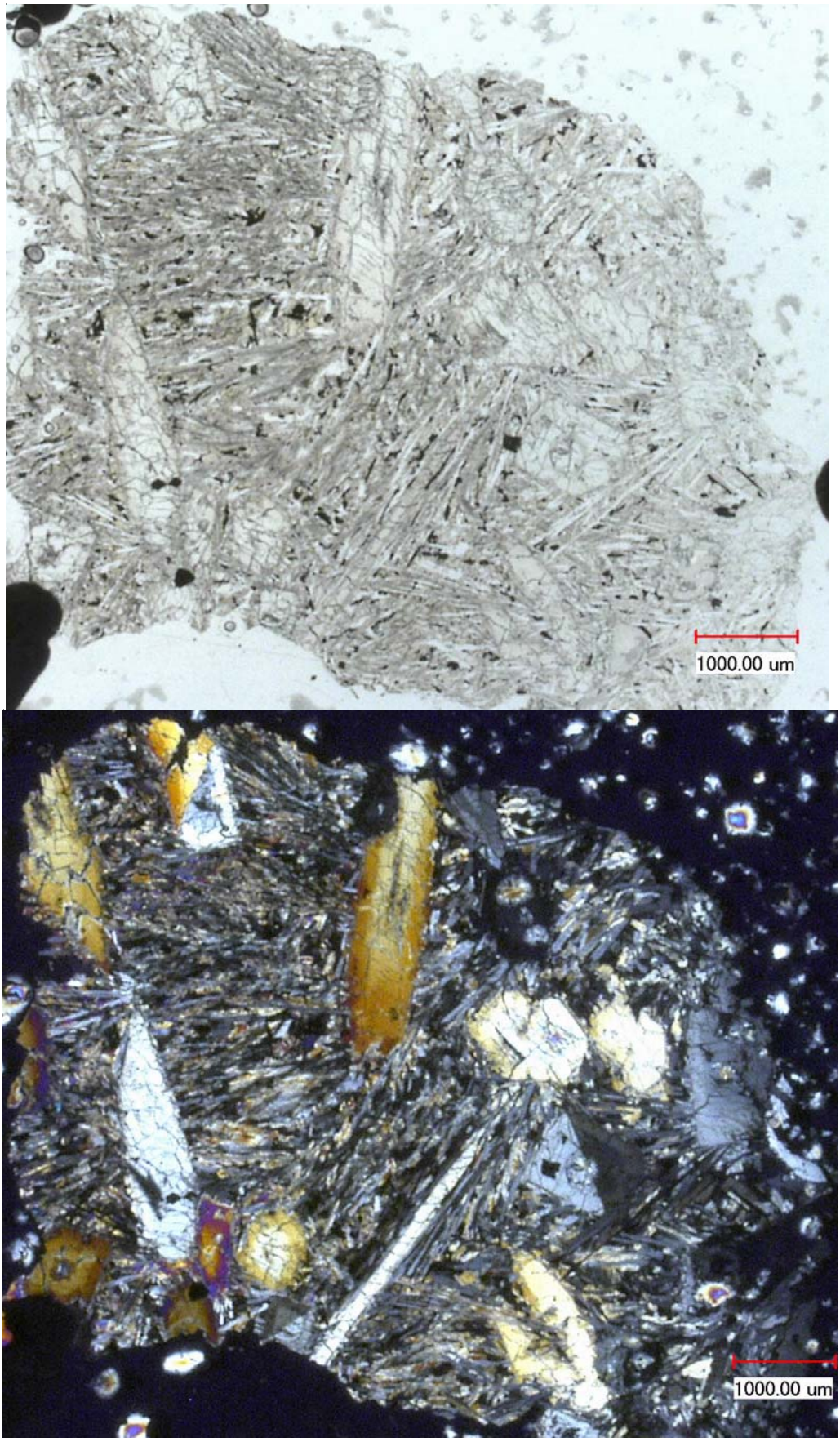

Figure 2: Photomicrographs of thin section 15682,6 by C Meyer @ 30x.

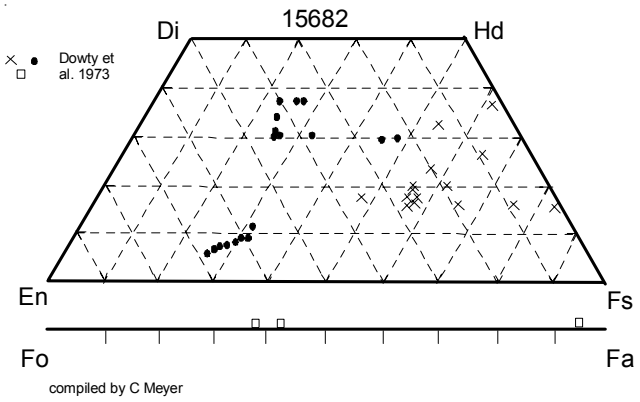

Figure 3: Pyroxene and olivine composition of 15682 (from Dowty et al. 1973).

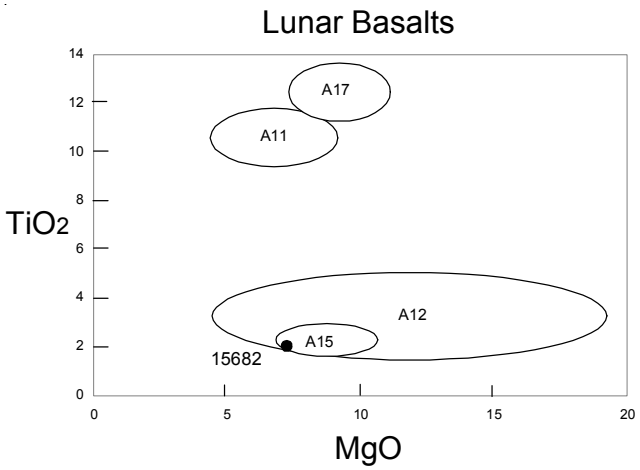

Figure 4: Chemical composition of 15682 compared with that of other lunar basalts.

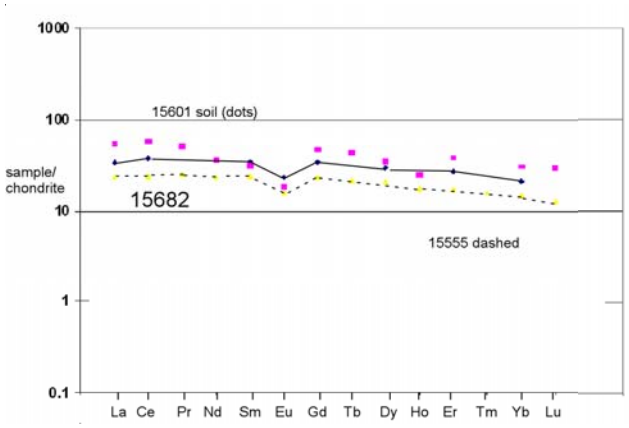

Figure 5: Normalized rare-earth-element diagram for 15682 (data by Rhodes et al. 1973 and Helmke et al. 1973). 15601 and 15555 for comparison.

Summary of Age Data for 15682

	Rb/Sr
Papanastassiou and Wasserburg 1972	3.44 ± 0.07 b.y.

Caution: Old Rb decay constant (1.39).

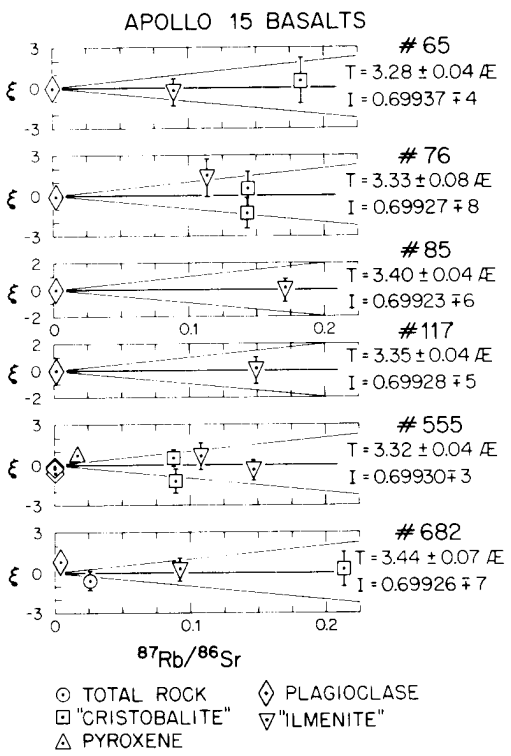

Figure 6: Rb/Sr isochrons for Apollo 15 basalts (from Papanastassiou and Wasserburg 1973).

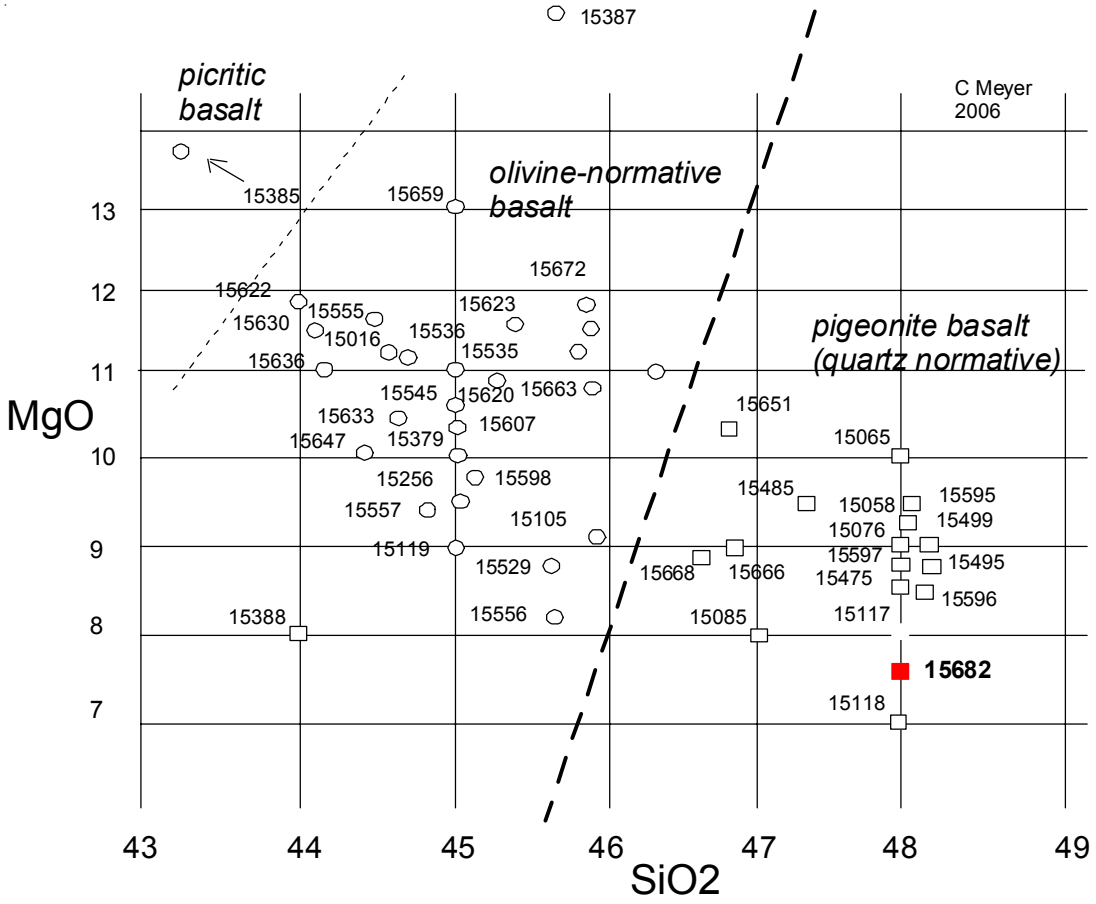

Figure 7: The big picture.

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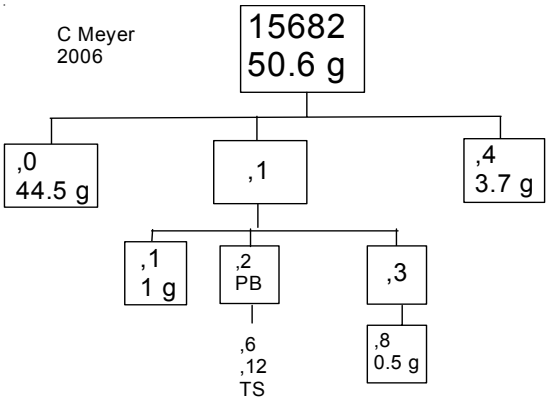
Table 1. Chemical composition of 15682.

reference	Rhodes73		Weismann75 Hubbard73		Dowty73		Helmke73	
weight								
SiO2 %					48	(b)	48.5	(c)
TiO2			2.27	(a)	2.15	(b)	2.13	(c)
Al2O3					10.5	(b)	9.88	(c)
FeO			18.2	(a)	21	(b)	20.6	(c)
MnO					0.26	(b)	0.26	(c)
MgO			7.96	(a)	7.3	(b)	7.17	(c)
CaO					11.3	(b)	10.6	(c)
Na2O			0.34	(a)	0.45	(b)	0.351	(c)
K2O	0.068	(a)			0.09	(b)	0.061	(c)
P2O5					0.08	(b)		
S %								
sum								
Sc ppm							42.7	(c)
V								
Cr							2980	(c)
Co							42	(c)
Ni								
Cu								
Zn								
Ga							3.8	(c)
Ge ppb								
As								
Se								
Rb	1.15	(a)					1.1	(c)
Sr	130	(a)						
Y								
Zr			110	(a)				
Nb								
Mo								
Ru								
Rh								
Pd ppb								
Ag ppb								
Cd ppb								
In ppb								
Sn ppb								
Sb ppb								
Te ppb								
Cs ppm							0.06	(c)
Ba	88.1	(a)						
La	8.04	(a)					6.89	(c)
Ce	22.8	(a)					17.8	(c)
Pr								
Nd	16.3	(a)					13.7	(c)
Sm	5.08	(a)					4.43	(c)
Eu	1.31	(a)					1.1	(c)
Gd	6.8	(a)					6	(c)
Tb							0.95	(c)
Dy	7.26	(a)					6.6	(c)
Ho							1.49	(c)
Er	4.28	(a)					3.8	(c)
Tm								
Yb	3.45	(a)					2.9	(c)
Lu			0.612	(a)			0.41	(c)
Hf			2.9	(a)			2.8	(c)
Ta								
W ppb								
Re ppb								
Os ppb								
Ir ppb								
Pt ppb								
Au ppb								
Th ppm								
U ppm	0.213	(a)						

technique: (a) IDMS, (b) broad beam elec. Probe, (c) mixed AA, INAA, RNAA



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