15495

Vuggy Porphyritic Pigeonite Basalt

908.9 grams

Figure 1: Photo of 15495. NASA S71-48602. Sample is about 8 cm across.

Introduction

15495 was collected from the rim of Dune Crater – along with 15475, 15476, 15485 and 15499 (Swann et al. 1971). It is a coarse porphyritic mare basalt with about 10% large vugs (figure 1). It has been studied for its magnetic properties, but has not been dated. The orientation of 15495 was documented by photographs, but there are micrometeorite craters on S, T, B and E surfaces indicating that the rock has rolled.

Petrography

There are no publications dedicated to the petrographic description of 15495, which is surprising considering its rather unusual texture. The texture of 15495 and 15476 appear similar (figure 2, 3, 4a,b). Large pyroxene phenocrysts up to 2.5 cm long separate regions of melt that crystallized as fine-grained radiate masses of plagioclase and pyroxene with a variety of textures. You need several thin sections to get a complete picture. Mineral compositions have not been reported.

Cooling History

Ryder (1985) writes: "Cooling rate estimates (for A15 basalts) were made by L. Taylor et al. (1973), Lofgren et al. (1975) and Grove and Walker (1977)." In particular, Lofgren et al. (1975) demonstrated experimentally that the porphyritic texture of the Apollo 15 quartz-normative Apollo 15 basalts can be produced

Mineralogical Mode for 15495

	Sample Catalog Butler 1971
Olivine	
Pyroxene	60
Plagioclase	40
Silica	
Opaques	

Figure 2: Large scale photo of thin section 15495,92 from the data pack. Scale is 1 cm. Large elongate pyroxene crystals separate regions of subophitic matrix.

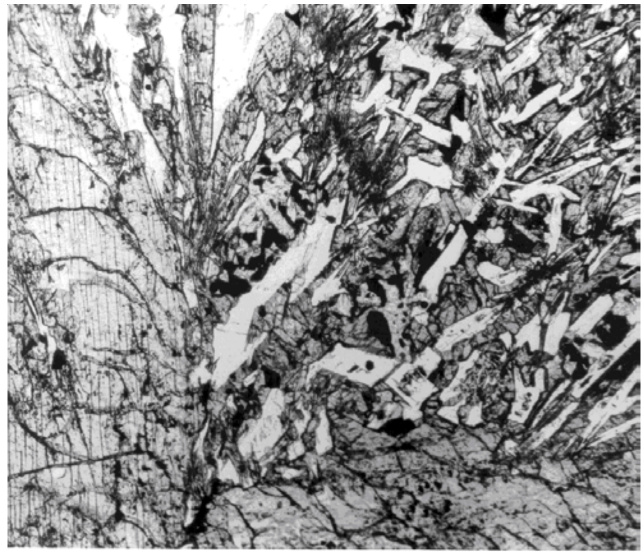

Figure 3: Photomicrograph of thin section 15495,11 showing matrix between large pyroxene phenocrysts. NASA S72-15510. Scale about 3 mm.

Figure 4a: Photomicrographs of thin section 15495,16 by C Meyer @ 30x.

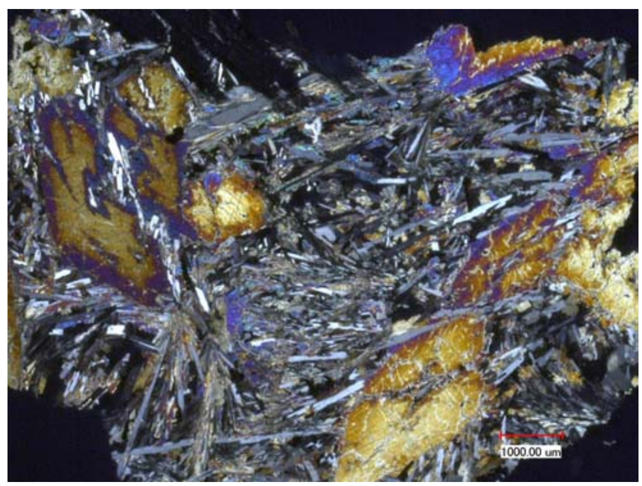

Figure 4b: Photomicrographs of thin section 15495,16 by C Meyer @ 30x (crossed nicols).

with a linear cooling rate. Takeda et al. (1975) studied pyroxene exsolution and concluded cooling rates.

Chemistry

The chemical composition of 15495 was reported by Willis et al. (1972), Carron et al. (1972), Laul and Schmitt (1973) and Wanke et al. (1975) (figures 6 and 7).

Laul and Schmitt (1973) also provided trace element analyses of pyroxene, plagioclase and ilmenite separates.

Radiogenic age dating

Papanastassiou and Wasserburg (1973) dated several Apollo 15 basalts. Barnes et al. (1973) reported K, Pb and Sr isotopic data.

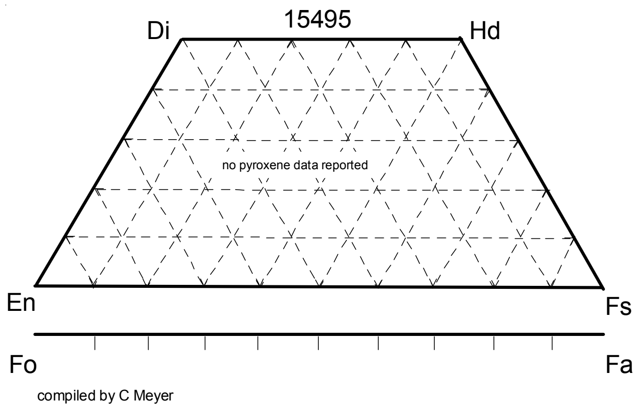

Figure 5: Pyroxene and olivine composition for 15495 not available.

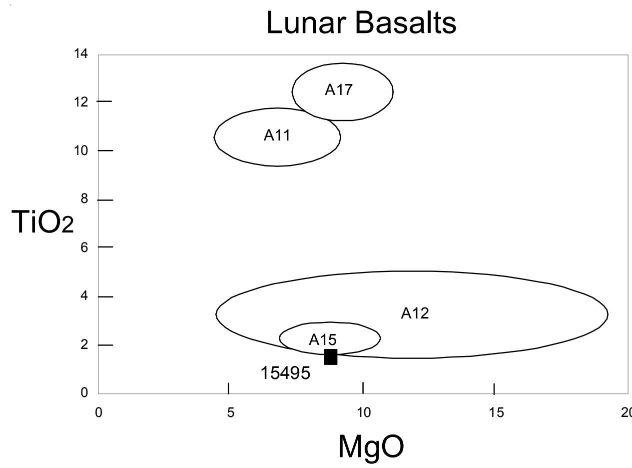

Figure 6: Bulk chemical composition of 15495 compared with other Apollo basalts.

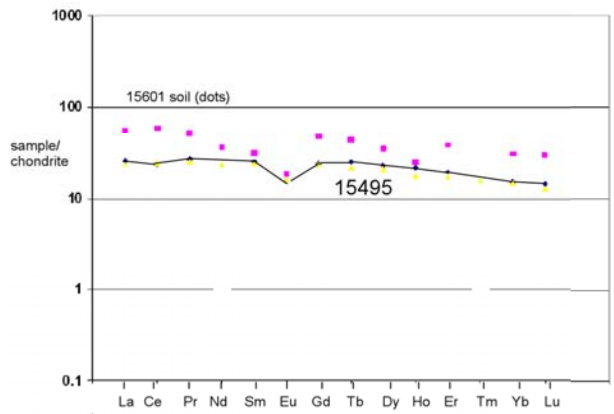

Figure 7: Normalized rare-earth-element diagram for 15495, with 15601 soil for comparison(Wanke et al. 1975).

Cosmogenic isotopes and exposure ages

Eldridge et al. (1972) and O'Kelley et al. (1972) determined the cosmic ray induced activity of ^{22}Na = 29 dpm/kg., ^{26}Al = 69 dpm/kg., ^{46}Sc = 3 dpm/kg., ^{54}Mn = 25 dpm/kg. and ^{56}Co = 11 dpm/kg. for 15495.

Other Studies

Nagata et al. (1973), Collinson et al. (1972) and Banerjee and Mellema (1974) were the first to report magnetic properties.

Huffman et al. (1974) used Mossbauer spectra to discern the Fe distribution among phases.

Becker and Clayton (1975) determined that ^{15}N was produced by spallation reactions caused by cosmic rays.

Thode and Rees (1972) determined sulfur isotopes.

Processing

An end piece (,35) was cut into strips. A second large piece (,61) was cut from the side and is on public display at the US Postal Service. There are 16 thin sections.

Table 1. Chemical composition of 15495.

					Cuttitta73					
reference	Laul 73		O'Kelley72		Carron72		Willis72		Wanke 75	
weight	214 mg				Christian72					
SiO2 %					47.98	(c)	48	(d)	48.99	(e)
TiO2	1.6	(b)			2	(c)	1.8	(d)	1.52	(e)
Al2O3	8.4	(b)			8.97	(c)	9.57	(d)	9.28	(e)
FeO	22	(b)			20.74	(c)	20.07	(d)	19.3	(e)
MnO	0.274	(b)			0.29	(c)	0.261	(d)	0.26	(e)
MgO	8	(b)			8.96	(c)	8.42	(d)	9.67	(e)
CaO	10.6	(b)			10.26	(c)	10.43	(d)	10.44	(e)
Na2O	0.27	(b)			0.31	(c)		(d)	0.33	(e)
K2O	0.062	(b)	0.06	(a)	0.07	(c)	0.062	(d)	0.047	(e)
P2O5					0.08	(c)	0.09	(d)	0.06	(e)
S %									0.065	(e)
sum										
Sc ppm	46	(b)			36	(c)			46	(e)
V	240	(b)			152	(c)				
Cr	3975	(b)			1984	(c)	3490	(d)	3880	(e)
Co	55	(b)			44	(c)			44.5	(e)
Ni					26	(c)			47	(e)
Cu					12	(c)			27.2	(e)
Zn									1.3	(e)
Ga					4.2	(c)			3.27	(e)
Ge ppb									50	(e)
As									5.5	(e)
Se									0.06	(e)
Rb					1.3	(c)	<2	(d)	0.77	(e)
Sr					105	(c)	114	(d)	108	(e)
Y					33	(c)	32.2	(d)	25	(e)
Zr	200	(b)			100	(c)	126	(d)	85	(e)
Nb					10	(c)	7.7	(d)	4.7	(e)
Mo										
Ru										
Rh										
Pd ppb									10	(e)
Ag ppb										
Cd ppb										
In ppb										
Sn ppb										
Sb ppb										
Te ppb										
Cs ppm									0.032	(e)
Ba	70	(b)			92	(c)			68	(e)
La	5.5	(b)			10	(c)			6.03	(e)
Ce									14	(e)
Pr									2.4	(e)
Nd										
Sm	3.6	(b)							3.71	(e)
Eu	0.8	(b)							0.87	(e)
Gd									5.1	(e)
Tb	0.59	(b)							0.91	(e)
Dy									5.5	(e)
Ho									1.2	(e)
Er									3.1	(e)
Tm										
Yb	2.2	(b)			4.6	(c)			2.46	(e)
Lu	0.35	(b)							0.35	(e)
Hf	2.5	(b)							2.31	(e)
Ta	0.4	(b)							0.31	(e)
W ppb									168	(e)
Re ppb									1.8	(e)
Os ppb										
Ir ppb										
Pt ppb										
Au ppb									0.26	(e)
Th ppm			0.6	(a)					0.43	(e)
U ppm			0.16	(a)					0.136	(e)

technique: (a) radiation counting, (b) INAA, (c) "microchemical", (d) XRF, (e) mixed

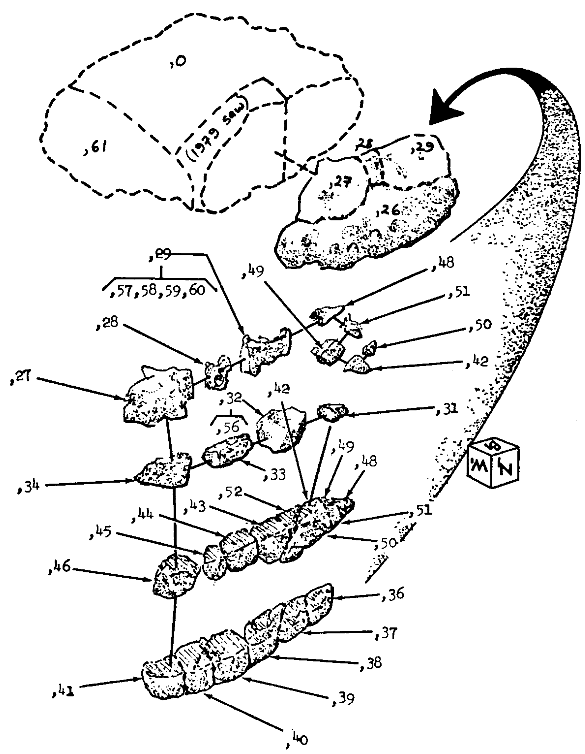

Figure 8: Exploded parts diagram for 15495.

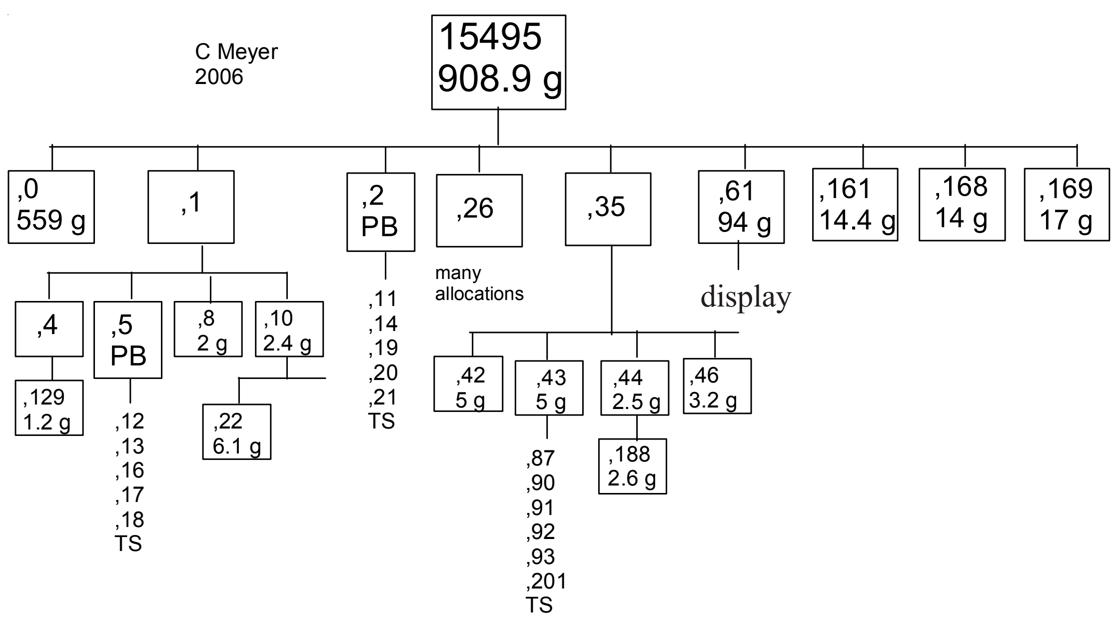

Table 2	U ppm	Th ppm	K ppm	Rb ppm	Sr ppm	Nd ppm	Sm ppm	technique
Barnes et al. 1973	0.172	0.6331		1.032	108.4			IDMS
O'Kelley et al. 1972	0.16	0.6	495					counting
Wanke et al. 1975	0.136	0.43		0.77	108		3.7	RNAA

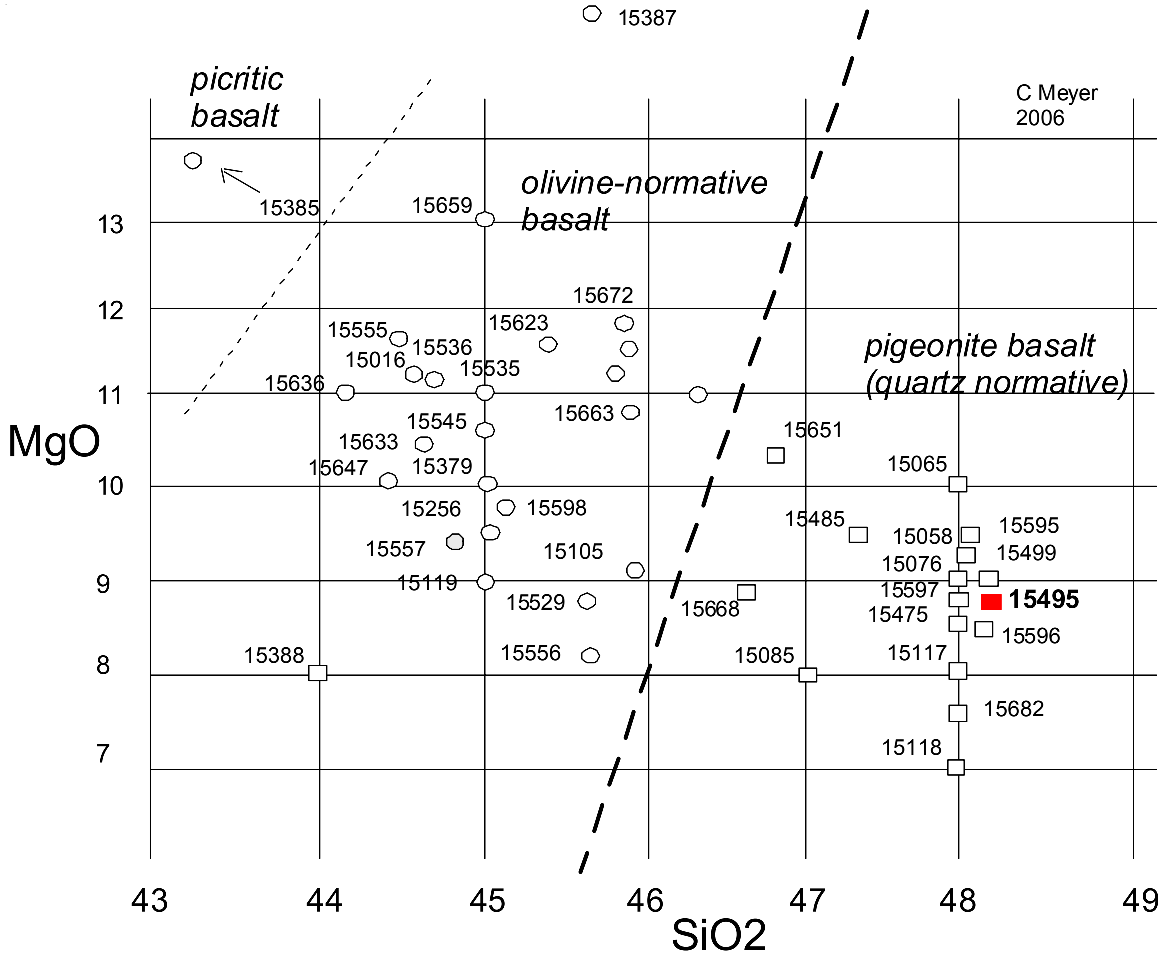

Figure 9: The big picture.

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