15678 FINE-GRAINED OLIVINE-NORMATIVE MARE BASALT ST. 9A 7.50 g

INTRODUCTION: 15678 is a fine-grained, olivine porphyritic mare basalt which is slightly vuggy and fractured and has an eroded surface (Fig. 1). In chemistry the sample is a fairly average Apollo 15 olivine-normative mare basalt. It has an ^{40}Ar-^{39}Ar plateau age of 3.38 ± 0.05 b.y. Zap pits are abundant on two sides but less obvious on others. Glass splashes, welded dust, and other coatings are also present. 15678 was collected as part of the rake sample from Station 9A.

Figure 1. Pre-chip view of 15678. S-71-49858

PETROLOGY: 15678 is a fine-grained, olivine-phyric mare basalt (Fig. 2). The olivine phenocrysts are small (less than 1 mm), scattered and anhedral. The dominant phase, pyroxene, occurs as small granular grains, enclosed in and interstitial to irregular pyroxene laths, i.e., a subophitic to ophitic texture. Dowty et al. (1973b) reported a mode of 55% pyroxene, 30% plagioclase, 7% olivine, 7% opaque minerals, 1% miscellaneous, and no silica phase. Dowty et al. (1973a) adjusted the mode to 8% olivine and 6% opaque minerals. Dowty et al. (1973c) tabulated microprobe analyses of pyroxenes, olivines, plagioclases, Si-K glass, and Fe-metals; Nehru et al. (1973) tabulated microprobe analyses of spinel group minerals and ilmenites. Nehru et al. (1974) included 15678 in their general discussion of opaque minerals but added no specific data or comment. The metal grains contain 1.4 to 2.5% Co and 2.0 to 11.2% Ni; the ilmenites contain 0.90 to 2.43% MgO. The mineral chemistry is similar to that of many other fine-grained Apollo 15 olivine-normative basalts (Fig. 3).

CHEMISTRY: Bulk analyses are listed in Table 1 and the rare-earths shown in Figure 4. The major element chemistry is that of an average Apollo 15 olivine-normative mare basalt; the rare earths are somewhat lower than average.

Fig. 2a

Fig. 2b

Figure 2. Photomicrographs of 15678,6. Widths about 3 mm.
a) transmitted light; b) crossed polarizers.

RADIOGENIC ISOTOPES AND GEOCHRONOLOGY: Husain et al. (1972) reported an ^{40}Ar-^{39}Ar age of 3.28 ± 0.06 b.y. and a K-Ar age of 2.51 b.y. Husain (1974) reported the stepwise-heating Ar isotopic data and revised the ^{40}Ar-^{39}Ar plateau age to 3.38 ± 0.05 b.y. and the K-Ar age to 2.607 ± 0.039 b.y. 40.2% of the $^{40}Ar^*$ had been lost, resulting in the low K-Ar ages.

RARE GAS AND EXPOSURE: Husain et al. (1972) used their Ar isotopic data to calculate a ^{38}Ar-Ca exposure age of 150 ± 20 m.y. This was revised to 164 ± 7 m.y. by Husain (1974).

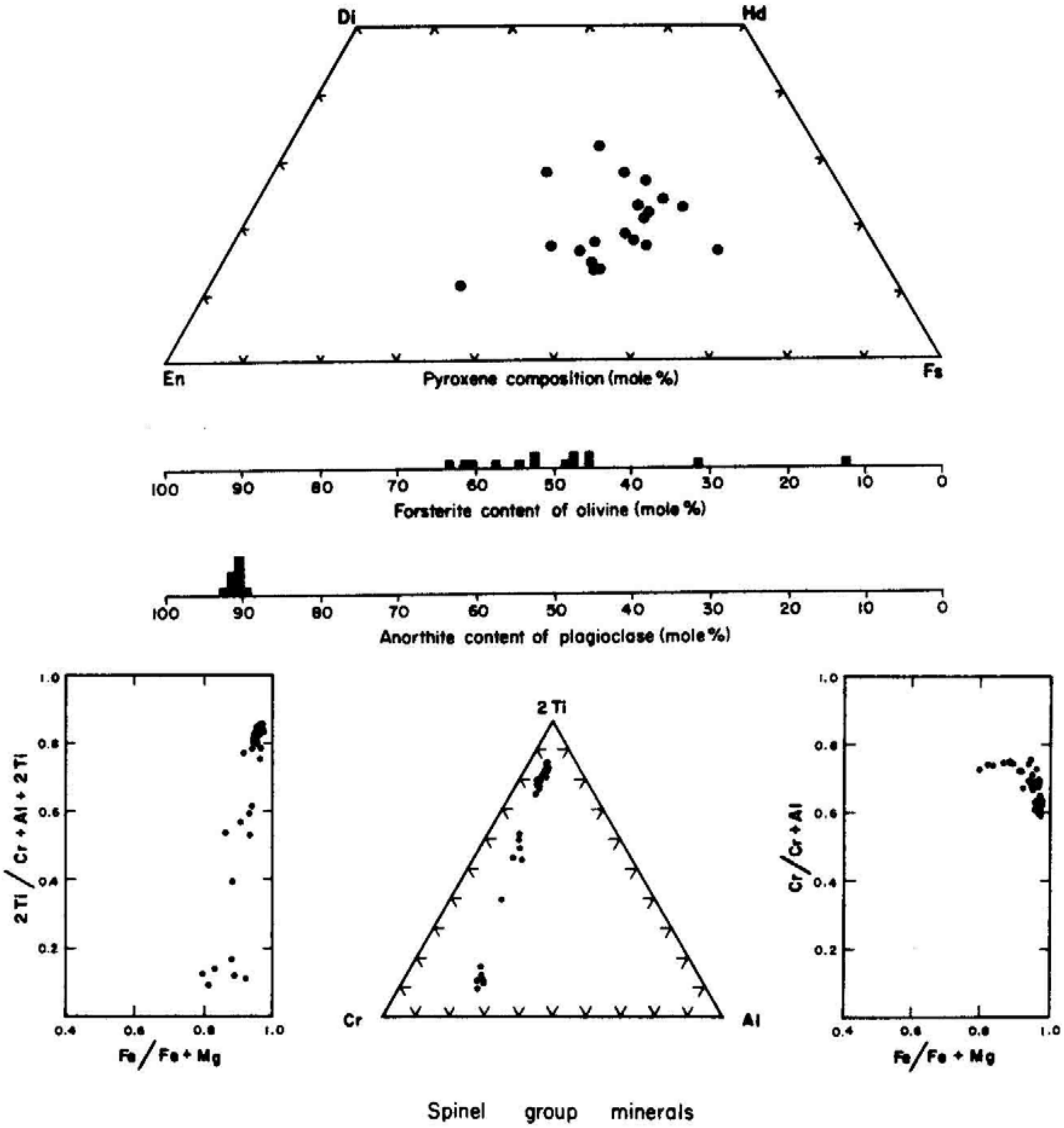

Figure 3. Compositions of minerals in 15678
(Dowty et al., 1973b).

TABLE 15678-1. Bulk rock chemical analyses

		,3	,4
Wt %	SiO2	46.0	
	TiO2	2.56	
	Al2O3	8.90	
	FeO	22.0	
	MgO	9.76	
	CaO	10.1	9.2
	Na2O	0.264	
	K2O	0.039	0.042
	P2O5		
(ppm)	Sc	42.8	
	V		
	Cr	4230	
	Mn	2160	
	Co	49	
	Ni		
	Rb	0.6	
	Sr		
	Y		
	Zr		
	Nb		
	Hf	2.0	
	Ba		
	Th		
	U		
	Pb		
	La	4.05	
	Ce	10.5	
	Pr		
	Nd	8.6	
	Sm	2.97	
	Eu	0.82	
	Gd	4.0	
	Tb	0.68	
	Dy	4.9	
	Ho	0.87	
	Er	2.9	
	Tm		
	Yb	2.02	
	Lu	0.277	
	Li		
	Be		
	B		
	C		
	N		
	S		
	F		
	Cl		
	Br		
	Cu		
	Zn		
(ppb)	I		
	At		
	Ga		
	Ge		
	As		
	Se		
	Mo		
	Tc		
	Ru		
	Rh		
	Pd		
	Ag		
	Cd		
	In		
	Sn		
	Sb		
	Te		
	Cs	29	
	Ta		
	W		
	Re		
	Os		
	Ir		
	Pt		
	Au		
	Hg		
	Tl		
	Bi		
		(1)	(2)

References and methods:

(1) Helmke et al. (1973); INAA, RNAA, AAS.
(2) Husain (1974); Ar istopes, irradiation.

<u>PROCESSING AND SUBDIVISIONS</u>: Chipping produced ,1 (a few pieces), and ,2 to ,4. ,2 was partly used in making thin sections ,6 and ,7; other pieces were used for analyses. ,0 is now 6.11 g.

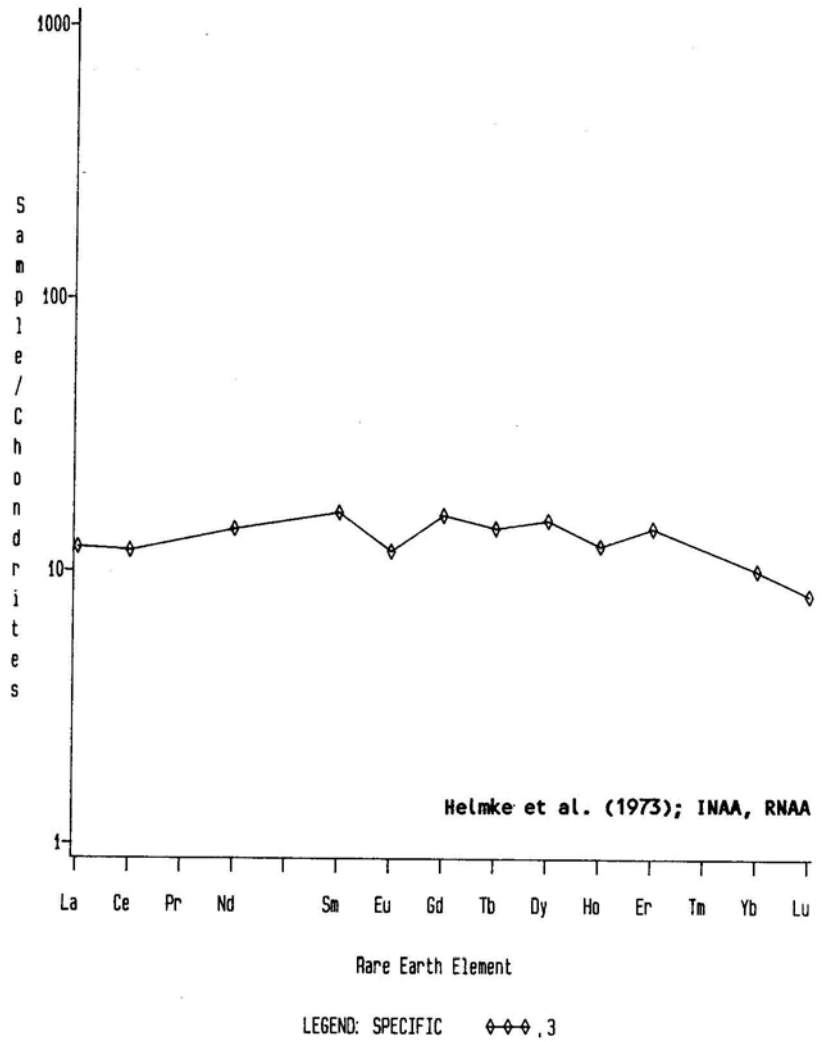

Figure 4. Rare earths in 15678.

TABLE 15678-2. Defocussed beam microprobe bulk analysis (Dowty et al., 1973a,b)

Wt %	SiO2	45.5
	TiO2	2.64
	Al2O3	9.4
	FeO	22.6
	MgO	9.0
	CaO	10.3
	Na2O	0.38
	K2O	0.05
	P2O5	0.08
ppm	Cr	3290
	Mn	2325