15641 MEDIUM-GRAINED OLIVINE-NORMATIVE MARE BASALT ST. 9A 6.90 g

INTRODUCTION: 15641 is a medium-grained, olivine-bearing mare basalt which is vuggy but not vesicular (Fig. 1). Yellow-green olivines are conspicuous macroscopically; they do not generally form phenocrysts. In chemistry, the sample is a fairly average member of the Apollo 15 olivine-normative mare basalt group. Most of the surface is fresh, but there is one patch of about 1 cm 2 which is pitted with glassy patches. 15641 was collected as part of the rake sample at Station 9A.

Figure 1. Pre-chip view of 15641. S-71-49557

PETROLOGY: 15641 is a medium-grained, olivine-bearing mare basalt (Fig. 2). Most olivines and pyroxenes are less than 1 mm across but a few anhedral olivines, containing silicate liquid inclusions, are up to 2 mm. The pyroxenes enclose small olivines. Plagioclases are ophitic to lathy and enclose small pyroxenes and olivines. A residue includes glass, fayalite, cristobalite, and troilite. According to Dowty et al. (1973b) the sample is like 15610 but has less residue. They reported a mode of 51% pyroxene, 26% plagioclase, 17% olivine, 4% opaques, 0.3% silica (actually cristobalite), and 0.7% miscellaneous. The mode in Dowty et al. (1973a) is slightly different: 0.2% silica and 0.8% miscellaneous. Dowty et al. (1973c) tabulated microprobe analyses of pyroxene, olivine, plagioclase, and Fe-metal, and Nehru et al. (1973) tabulated analyses of spinel group minerals and ilmenite. Nehru et al. (1974) noted that boundaries between chromites and their ulvospinel mantles included both sharp and gradual varieties. The metal grains contain 1.4 to 1.6% Co and 6.2 to 9.1% Ni (but up to 33% Ni in some cases). The ilmenites contain 0.33 to 1.07% MgO. The chemistry of minerals (Fig. 3) is typical for Apollo 15 olivine-normative mare basalts.

CHEMISTRY: A bulk rock analysis (Table 1, Fig. 4) shows 15641 to be a member of the Apollo 15 olivine-normative mare basalt group, perhaps an Mg-rich one. A defocussed beam microprobe bulk analysis is reasonably consistent but suggests that the sample is a fairly average member of the group.

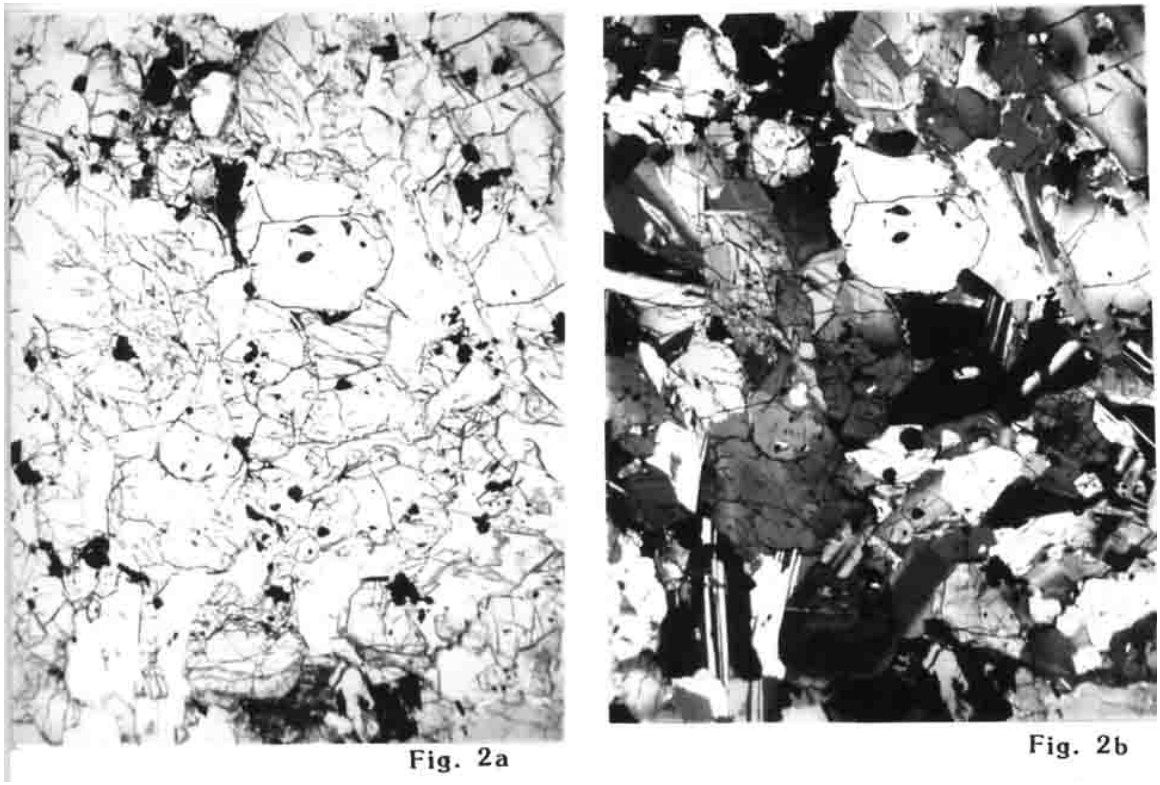

Figure 2. Photomicrographs of 15641,3.
Widths about 3 mm. a) transmitted light; b) crossed polarizers.

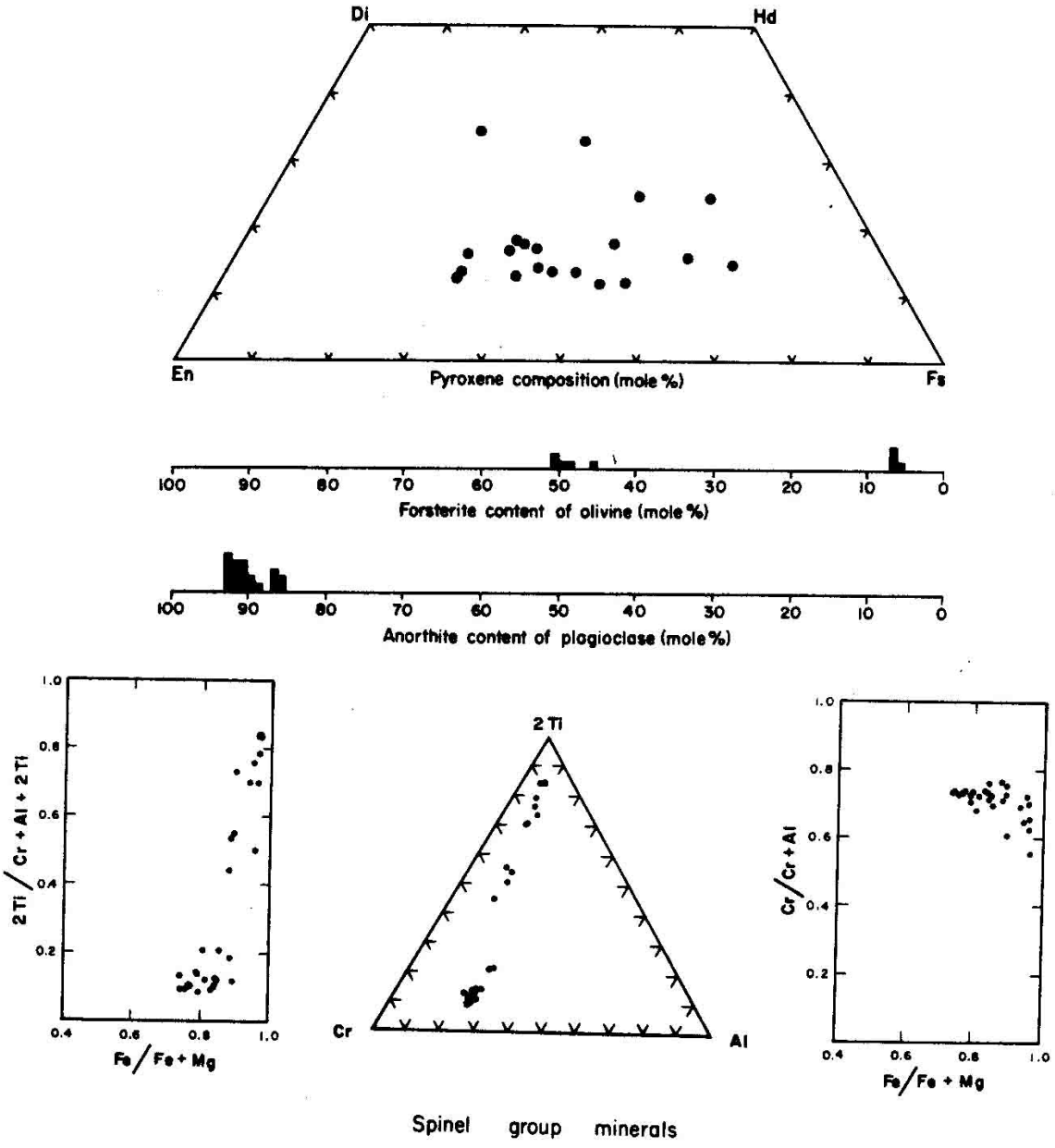

Figure 3. Chemistry of minerals in 15641
(Dowty et al., 1973b).

TRACKS: Poupeau 9t al. (1972) measured solar flare tracks in feldspars from 25 surface locations. Solar flare irradiation is correlated with the rounded, dust-coated, pitted surface. Track densities range from 0.7 to more than 20 x 10^7 cm^2. A sectioned surface has a density of 10 to 3.5 x $10^7/cm^2$ tracks in the outer millimeter, and 0.7 x $10^7/cm^2$ at 5.8 mm depth.

TABLE 15641-1. Bulk rock

		,13
Wt %	SiO2	
	TiO2	1.9
	Al2O3	8.8
	FeO	21.9
	MgO	12
	CaO	9.2
	Na2O	0.252
	K2O	0.034
	P2O5	
(ppm)	Sc	37
	V	212
	Cr	4110
	Mn	2080
	Co	52
	Ni	75(a)
	Rb	
	Sr	
	Y	
	Zr	
	Nb	
	Hf	2.3
	Ba	55(b)
	Th	
	U	
	Pb	
	La	4.4
	Ce	
	Pr	
	Nd	
	Sm	3.1
	Eu	0.77
	Gd	
	Tb	0.6
	Dy	3.5
	Ho	
	Er	
	Tm	
	Yb	1.9
	Lu	0.26
	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	
	Ta	390
	W	
	Re	
	Os	
	Ir	
	Pt	
	Au	
	Hg	
	Tl	
	Bi	
		(1)

References and methods:

(1) Ma et al. (1978); INAA

Notes:

(a) ±20 ppm
(b) ±35 ppm

PROCESSING AND SUBDIVISIONS: Chipping produced ,1 (3 chips) and ,2 (1 chip). ,2 was partly used to produce thin sections ,3 and ,8. ,0 was allocated in toto for the track work and was returned, the largest piece being numbered ,9. In 1977, ,9 was further chipped to produce ,13 for chemical analyses and to make thin section ,19. ,9 at 3.98 g is the largest piece.

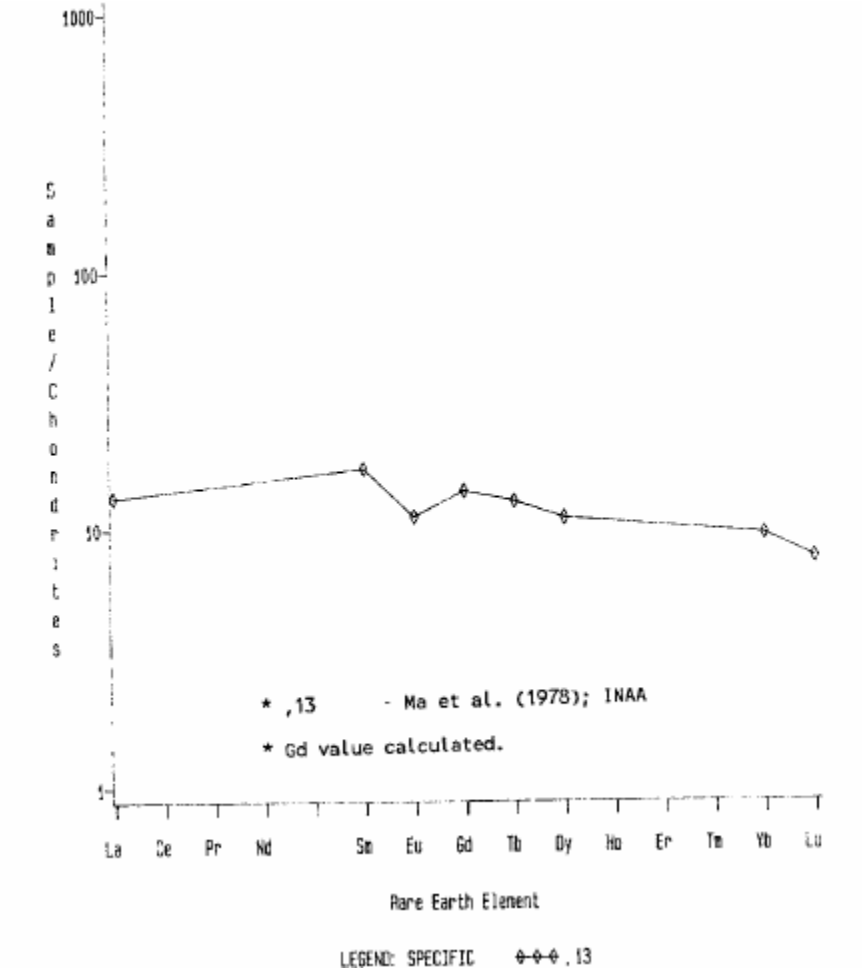

Figure 4. Rare earths in 15641.

TABLE 15641-2. Defocussed beam bulk analysis (Dowty et al., 1973a,b).

Wt%	SiO2	44.4
	TiO2	2.18
	Al2O3	10.1
	FeO	21.3
	MgO	10.2
	CaO	9.7
	Na2O	0.37
	K2O	0.06
	P2O5	0.07
ppm	Cr	3015
	Mn	1860