71539

High-Ti Mare Basalt
10.90 g

INTRODUCTION

See "Rake Sample Descriptions" and "Table of Rake Samples", as well as Fig. 1.

PETROGRAPHY AND MINERAL CHEMISTRY

Warner et al. (1978) reported the petrography and mineral chemistry of 71539. During the preparation of this catalog we examined thin section 71539, 5 and found it to be a well crystallized, sub-ophitic, medium-grained (0.3-0.7mm) basalt (Fig. 2). The sample is dominated by plagioclase and pink pyroxene which is overlain by ilmenite (Fig. 2). Ilmenite phenocrysts often exceed lmm in length and exhibit "sawtooth" margins; blocky ilmenite is a groundmass phase. No rutile and chromite exsolution lamellae were observed in the ilmenites. No olivine or armalcolite was observed. Native Fe and troilite (both < 0.1mm) are disseminated throughout and interstitial SiO_2 is present.

WHOLE-ROCK CHEMISTRY

Murali et al. (1977) reported the whole-rock composition of 71539, 1 in a study of Apollo 17 rake samples (Table 1). 71539 is classified as a Type A Apollo 17 high-Ti basalt, based on the classification of Rhodes et al. (1976) and Warner et al. (1979). This sample contains 8.6 wt% TiO_2 with a MG# of 33.5. Murali et al. (1977) distinguished 71539 by its low V, TiO_2, MgO, and Cr_2O_3 contents and suggested that it formed part of a distinct compositional group. The REE profile (Fig. 3) is LREE-depleted with the HREE exhibiting a slight depletion relative to the MREE. However, the $(La/Yb)_N$ ratio is < 1. A negative Eu anomaly is present [(Eu/Eu*)N = 0.55).

ISOTOPE CHEMISTRY

Paces et al. (1991) reported whole-rock Rb-Sr and Sm-Nd data for 71539, 6 (Tables 2 and 3). In addition, these same authors reported Rb-Sr and Sm-Nd data for mineral separates from 71539, 6 (Tables 4 and 5). Paces et al. (1991) report an internal isochron age of 3.75 0.07 Ga for this sample. 71539

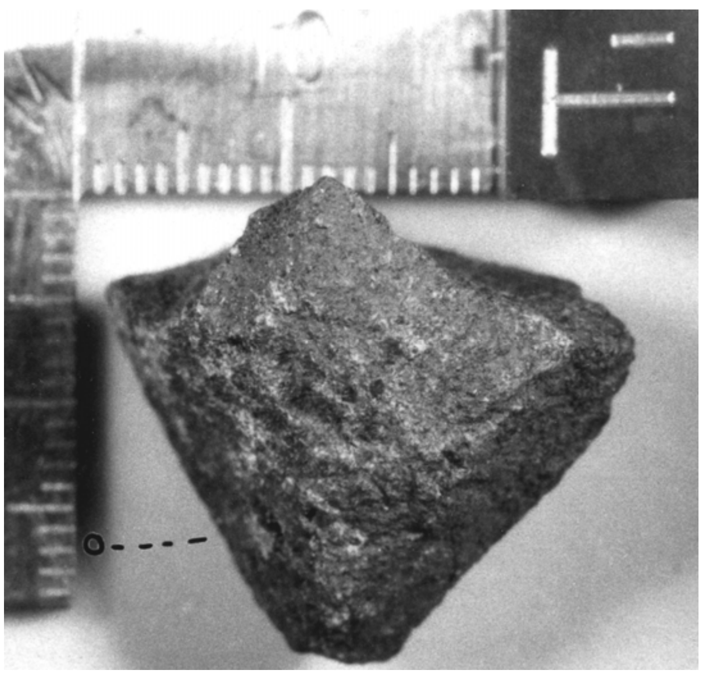

Figure 1: Hand specimen photograph of 71539,0. Small divisions on scale are in millimeters.

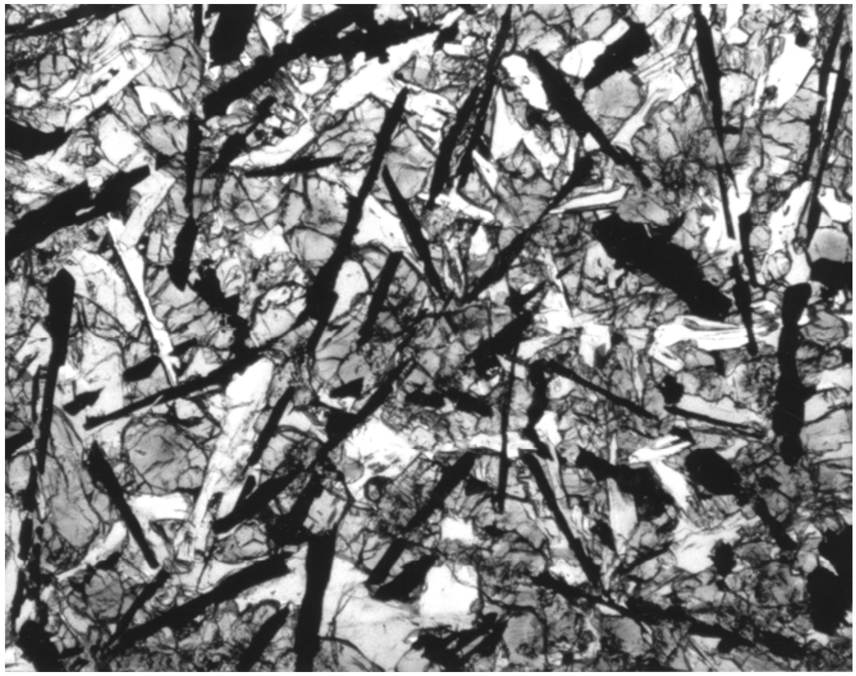

Figure 2: Photomicrograph of 71539, 5 showing ilmenite phenocrysts set in a sub-ophitic matrix.
Field of view= 2.5 mm.

was studied as part of a larger isotopic investigation of the Apollo 17 high-Ti basalts.

PROCESSING

Of the original 10, 90g of 71539,0, a total of -10.14g remains. 71539,1 was used for INAA and the thin section ,5 was taken from this irradiated sample.

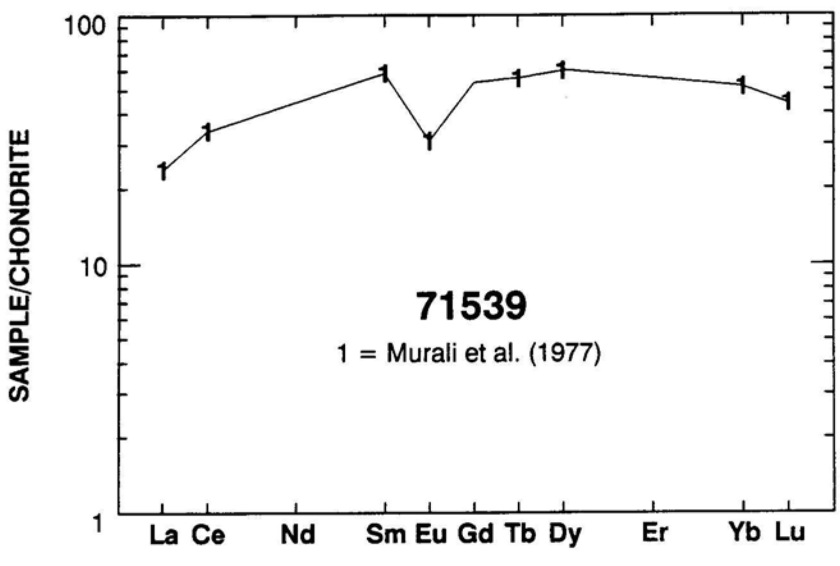

Figure 3: Chondrite-normalized rare-earth element plot of 71539. Data from Murali et al. (1977).

Table 1: Whole-rock chemistry of 71539.
Data from Murali et al. (1977).

	Sample 71539,1 Method N		Sample 71539,1 Method N
SiO_2 (wt %)		Cu	
TiO_2	8.6	Ni	
Al_2O_3	9.8	Co	13.5
Cr_2O_3	0.186	V	36
FeO	19.1	Sc	73
MnO	0.258	La	8.0
MgO	5.4	Ce	30
CaO	12.1	Nd	
Na_2O	0.47	Sm	12.1
K_2O	0.081	Eu	2.44
P_2O_5		Gd	
S		Tb	3.3
Nb (ppm)		Dy	21
Zr		Er	
Hf	9.9	Yb	11.5
Ta	1.8	Lu	1.52
U		Ga	
Th		F	
W		Cl	
Y		C	
Sr		N	
Rb		H	
Li		He	
Ba		Ge (ppb)	
Cs		Ir	
Be		Au	
Zn		Ru	
Pb		Os	

Analysis by: N = INAA.

Table 2: Rb-Sr data for 71539,6
Data from Paces et al. (1991).

Rb (ppm)	0.787
Sr (ppm)	229
$^{87}Rb/^{86}Sr$	0.009892 ± 98
$^{87}Sr/^{86}Sr$	0.699776 ± 14
$I(Sr)^a$	0.699235 ± 19
$T_{LUNI}{}^b$(Ga)	5.2

[a]Initial Sr isotopic ratios calculated at 3.75 Ga using ^{87}Rb decay constant = $1.42 \times 10^{-11} yr^{-1}$.

[b]Model age relative to I(Sr) = LUNI = 0.69903 (Nyquist et al., 1974; Shih et al., 1986).
$T_{LUNI} = 1/\lambda * 1n[((^{87}Sr/^{86}Sr - 0.69903)^{87}Rb/^{86}Sr) + 1]$.

Table 3: Sm-Nd data for 71539,6.
Data from Paces et al. (1991).

Sm (ppm)	13.4
Nd (ppm)	32.5
$^{147}Sm/^{144}Nd$	0.25018 ± 50
$^{143}Nd/^{144}Nd$	0.514306 ± 11
$I(Nd)^a$	0.508094 ± 23
$\varepsilon_{Nd}{}^b$	6.7 ± 0.6
$T_{CHUR}{}^c$(Ga)	4.7

[a]Initial Nd isotopic ratios calculated at 3.75 Ga using ^{147}Sm decay constant = $6.54 \times 10^{-12} yr^{-1}$.

[b]Initial ε_{Nd} calculated at 3.75 Ga using present-day chondritic values of $^{143}Nd/^{144}Nd$ = 0.512638 and $^{147}Sm/^{144}Nd$ = 0.1967.

[c]Model age relative to CHUR reservoir using present-day chondritic values listed above.
$T_{CHUR} = 1/\lambda * [((^{143}Nd/^{144}Nd - 0.512638)/(^{147}Sm/^{144}Nd - 0.1967)) + 1]$.

Table 4: Rb-Sr results for 71539,6 whole rock and mineral separates used for internal isochrons.
Data from Paces et al. (1991).

	Rb (ppm)	Sr (ppm)	$^{87}Rb/^{86}Sr$[a]	$^{87}Sr/^{86}Sr$[b]
WR	0.787	229	0.009893 ± 98	0.699776 ± 14
Plg1	0.260	623	0.001199 ± 11	0.699336 ± 22
Plg2	0.594	536	0.003192 ± 31	0.699382 ± 20
NMag1[c]	0.188	253	0.002139 ± 21	0.699360 ± 21
Px1	0.121	58.7	0.005917 ± 59	0.699564 ± 22
Mag1[c]	0.573	103	0.01602 ± 32	0.700119 ± 20
Ilm1	1.23	104	0.03395 ± 98	0.701188 ± 20
Ilm2	0.642	128	0.01444 ± 98	0.700033 ± 20

[a]Uncertainties (corresponding to last decimal places) reported for parent/daughter ratios reflect the magnitude of the blank correction, mass spectrometer precision and corrections for the quality of spiking.

[b]Normalized to $^{86}Sr/^{88}Sr = 0.1194$. Quoted errors include 2-sigma run precision for whole rock analyses plus an additional uncertainty of 0.00001(2-sigma) reflecting corrections for fractionation and spike contributions in total-spiked mineral separates. Nd was measured as the metal ion.

[c]Non-pure mineral separates consisting of predominantly "nonmagnetic" plagioclase and pyroxene in NMag and "magnetic" pyroxene and ilmenite in Mag.

Table 5: Sm-Nd results for 71539,6 whole rock and mineral separates used for internal isochrons.
Data from Paces et al. (1991).

	Sm (ppm)	Nd (ppm)	^{147}SM/^{144}Nd[a]	^{143}Nd/^{144}Nd[b]
WR	13.4	32.5	0.25018 ± 50	0.514306 ± 11
Plg1	2.08	5.70	0.2204 ± 22	0.513565 ± 19
Plg2	5.91	15.2	0.2352 ± 24	0.513899 ± 20
NMag1[c]		9.20		0.513868 ± 20
Px1	5.12	9.22	0.3362 ± 17	0.516428 ± 18
Mag1[c]				0.514780 ± 16
Ilm1	18.4	38.3	0.2900 ± 14	0.515283 ± 22
Ilm2		22.4		0.514350 ± 19

[a]Uncertainties (corresponding to last decimal places) reported for parent/daughter ratios reflect the magnitude of the blank correction, mass spectrometer precision and corrections for the quality of spiking.

[b]Normalized to ^{146}Nd/^{144}Nd = 0.7219. Quoted errors include 2-sigma run precision for whole rock analyses plus an additional uncertainty of 0.00001(2-sigma) reflecting corrections for fractionation and spike contributions in total-spiked mineral separates. Nd was measured as the metal ion.

[c]Non-pure mineral separates consisting of predominantly "nonmagnetic" plagioclase and pyroxene in NMag and "magnetic" pyroxene and ilmenite in Mag.