74235

Aphanitic High-Ti Basalt
59.04 g, 4.3 x 3.4 x 3.3 cm

INTRODUCTION

74235 was described as a grayish black, angular aphanite (Apollo 17 Lunar Sample Information Catalog, 1973). It contains no zap pits, but several vesicles (0.5 to 3 cm, dominantly ~ l cm) and minor vugs. The surface is generally smooth to gently lumpy inside vesicles, but hackly on the rest of the rock (Fig. 1). There are a few penetrative fractures and the specimen has an angular, blocky shape (Fig. 1). This basalt was collected from Station 4.

PETROGRAPHY AND MINERAL CHEMISTRY

Brown et al. (1975) classified thin section 74235,41 as a Type IA Apollo 17 high-Ti basalt containing 10.1% olivine, 22.3% opaques, 0.1% plagioclase,

Figure 1: Hand specimen photograph of 74235,0.

15.6% clinopyroxene, and 51.9% mesostasis. The specific petrography of 74235,41 was not mentioned by Brown et al. (1975), who described this basalt only within the general Typ IA grouping. Also, the only minerals chemistry specifically reported for 74235 by these authors was for the olivines, which range from FO_{68} to FO_{75}.

O'Hara and Humphries (1975) described 74235 as containing ~10% each of microphenocrysts of olivine and armalcolite. The texture is comprised of spherulitic patches of pyroxene and opaques glass. The former appear to have crystallized around original pyroxene microphenocrysts.

No thin section was available during the preparation of this catalog.

WHOLE-ROCK CHEMISTRY

Detailed whole-rock chemistry of 74235 has been reported by Rose et al. (1975), Shih et al. (1975), and Rhodes et al. (11976) (Table 1). Rhodes et al. (1976) only reported the major elements, describing 74235 as a Type A Apollo 17 high-Ti basalt, and Shih et al. (1975) only reported the trace elements. The TiO_2 composition of 74235 have been reported as 12.39 wt% (Rose et al., 1975) and 12.17 wt% (Rhodes et al., 1976). The MG# ranges from 45.4 (Rose et al., 1975) to 43.5 (Rhodes et al., 1976). Only Shih et al. (1975) reported the REE composition of 74235 (Fig. 2). This is LREE-depleted with a maximum at Gd. The HREE exhibit a decrease from Gd to Yb (Lu was riot reported by Shih et al., 1975 - Table 1), but are still more abundant (relative to chondrites). However, this analysis delineates a negative Ce anomaly and as the REE were analyzed by isotope dilution, the errors associated with the reported REE abundances are low. The significance of this anomaly is at present unclear. A negative Eu anomaly is present [$(Eu/Eu^*)_N = 0.49$]

Gibson et al. (1976) reported the whole-rock sulphur abundance for 74235. This was given as 2030 ± 30 µgS/g with an equivalent wt% Fe° of 0.086.

RADIOGENIC ISOTOPES

Nyquist et al. (1975) and Nunes et al. (1974) reported whole-rock

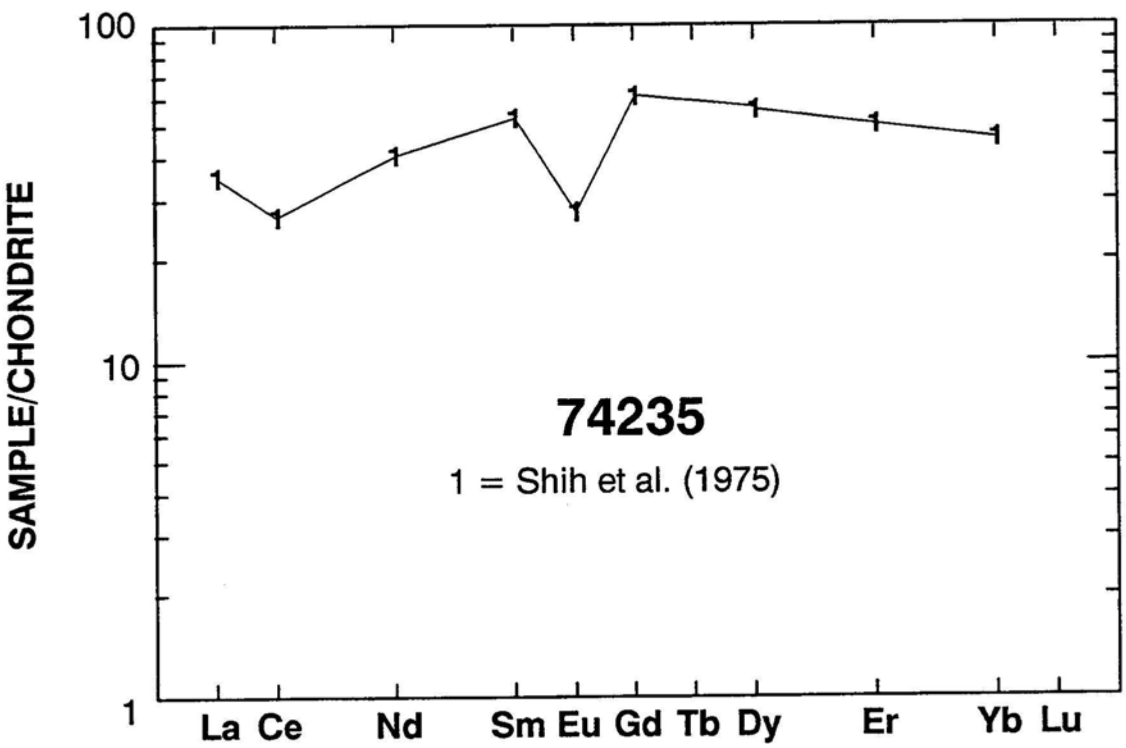

Figure 2: Chondrite-normalized rare-earth-element profiles of 74235.

Table 1: Whole-rock chemistry of 74235.

	Sample ,23 Method N,I Reference 1	Sample ,18 Method X Reference 2	Sample ,21 Method X Reference 3
SiO_2		39.42	38.62
TiO_2		12.39	12.17
Al_2O_3		9.21	8.61
Cr_2O_3		0.47	0.51
FeO		18.55	19.31
MnO		0.27	0.28
MgO		8.67	8.35
CaO		10.85	10.70
Na_2O		0.37	0.40
K_2O		0.08	0.07
P_2O_5		0.05	0.05
S			0.15
K (ppm)	560		
Nb		<10	
Zr	263	362	
Hf			
Ta			
U	0.126		
Th			
W			
Y		160	
Sr	186	194	
Rb	0.612	<1	
Li	13.3	12	
Ba	82.2	405	
Cs			
Be		<1	
Zn		3.7	
Pb		5.6	
Cu		29	
Ni		<1	
Co	19.1	30	
V		61	
Sc	71.4	76	
La	11.4	<10	
Ce	22.8		
Nd	25.3		

Table l: (Concluded).

	Sample ,23 Method N,I Reference 1	Sample ,18 Method X Reference 2	Sample ,21 Method X Reference 3
Sm	10.5		
Eu	2.10		
Gd	16.6		
Tb			
Dy	18.8		
Er	11.1		
Yb	9.85		
Lu			
Ga		8.3	
F			
Cl			
C			
N			
H			
He			
Ge (ppb)			
Ir			
Au			
Ru			
Os			

Analysis by: N = INAA; X = XRF; I = Isotope dilution.

References: 1 = Shih et al. (1975); 2 = Rose et al. (1975); 3 = Rhodes et al. (1976).

Rb-Sr and U-Th-Pb systematics (respectively) for 74235 (Tables 2 and 3). These were included in a much larger isotopic study of Apollo 17 high-Ti basalts. Nunes et al. (1974) also reported single-stage ages of 4514-4593 Ma for 74235 (Table 3).

COSMOGENIC RADIONUCLIDES AND EXPOSURE AGES

The cosmogenic radionuclide, exposure ages, and noble gas determinations have been reported by Eberhardt et al. (1975), Morgeli et al. (1977) and Eugster et al. (1977). Morgeli et al. (1977) and Eugster et al. (1977) reported the same analyses. Eugster et al. (1977) concluded that 74235 experienced at least a two-stage exposure. These results, combined with other station 4 samples, suggested that the Shorty crater impact occurred < 30Ma. Eberhardt et al. (1975) reported 8^{1} Kr-Kr and ^{38}Ar-^{37}Ar exposure ages of 188 ± 20 and 180 ± 20, respectively. Eugster et al. (1977) conducted a more extensive study and reported He, Ne, Ar, Kr, and Xe data for 74235 (Table 4).

EXPERIMENTAL

74235 has been used in two experimental studies. Usselman et al. (1975) deduced experimentally the cooling rate of 74235 to be between 150-250°C/hr. O'Hara and Humphries (1975) used 74235 in a study of armalcolite crystallization.

Table 2: Rb-Sr composition of 74235.
Data from Nyquist et al. (1975).

Sample	74235,23
wt (mg)	52
Rb (ppm)	0.612
Sr (ppm)	186
$^{87}Rb/^{86}Sr$	0.0095 ± 3
$^{87}Sr/^{86}Sr$[b]	0.69970 ± 5
TB	4.4 ± 0.5
TL	4.9 ± 0.5

b = Uncertainties correspond to last two figures and are 2 sigma - normalized to $^{88}Sr/^{86}Sr$ = 8.37521; B = Model age assuming I = 0.69910 (BABI + JSC bias); L = Model age assuming I = 0.69903 (Apollo 16 anorthosites for T = 4.6 Ga).

Table 3: U-Th-Pb systematics of 74235. Data from Nunes et al. (1974).

	1	2	3	4	5
wt (mg)	235.9	191.3	235.9		
U	0.1200				
Th	0.4004				
Pb	0.2786				
$^{232}Th/^{238}U$	3.45				
$^{238}U/^{204}Pb$	444				
$^{206}Pb/^{204}Pb$		178.9	339.7		
$^{207}Pb/^{204}Pb$		111.3	208.6		
$^{208}Pb/^{204}Pb$		174.7			
$^{206}Pb/^{204}Pb$		215.0	464.8		
$^{207}Pb/^{204}Pb$		133.0	283.7		
$^{208}Pb/^{204}Pb$		205.9			
$^{207}Pb/^{206}Pb$		0.6186	0.6105		
$^{208}Pb/^{206}Pb$		0.9579			
$^{206}Pb/^{238}U$				1.001	1.027
$^{207}Pb/^{235}U$				82.32	84.85
$^{207}Pb/^{206}Pb$				0.5966	0.6003
$^{208}Pb/^{232}Th$				0.2491	
$^{206}Pb/^{238}U$				4514	4593
$^{207}Pb/^{235}U$				4549	4580
$^{207}Pb/^{206}Pb$				4565	4574
$^{208}Pb/^{232}Th$				4557	

1 = Elemental concentrations; 2,3 = @ - Observed ratios, * - corrected for analytical blank; 4,5 = a - corrected for blank and primordial Pb, b - single stage ages in Ma.

Table 4: Rare gas and cosmogenic rare gas abundances in 74235.
Data from Eugster et al. (1977).

Rare Gases

^{4}He	^{20}Ne (10^{-8} cm^{3} STP/g)	^{40}Ar	$^{4}He/^{3}He$	$^{20}Ne/^{22}Ne$	$^{22}Ne/^{21}Ne$	$^{36}Ar/^{38}Ar$	$^{40}Ar/^{36}Ar$
10100	17.8	2850	161	0.827	1.16	0.638	202
±400	±1.1	±300	±2	±0.018	±0.02	±0.010	±4

^{86}Kr (10^{-12} cm^{3} STP/g)	$^{78}Kr/^{76}Kr$ x 100	$^{80}Kr/^{86}Kr$ x 100	$^{81}Kr/^{86}Kr$ x 100	$^{82}Kr/^{86}Kr$ x 100	$^{83}Kr/^{86}Kr$ x 100	^{84}/Kr/^{86}Kr x 100
53	109.7	249.1	0.533	472.3	635	543
±11	±2.0	±3.0	±0.060	±3.0	±25	±20

^{132}Xe (10^{-12} cm^{3} STP/g)	$^{124}Xe/^{132}Xe$ x 100	$^{126}Xe/^{132}Xe$ x 100	$^{128}Xe/^{132}Xe$ x 100	$^{129}Xe/^{132}Xe$ x 100	$^{130}Xe/^{132}Xe$ x 100	$^{131}Xe/^{132}Xe$ x 100	$^{134}Xe/^{132}Xe$ x 100	$^{136}Xe/^{132}Xe$ x 100
33	14.2	19.8	39.1	120.0	31.3	185.5	35.0	29.1
±7	±3.5	±0.6	±0.7	±1.5	±0.5	±3.0	±0.3	±1.0

Cosmogenic Noble Gas Concentrations

^{3}He	^{21}Ne	^{38}Ar	^{78}Kr	^{81}Kr	^{83}Kr	^{126}Xe	^{131}Xe
10^{-8} cm^{3} STP/g			10^{-12} cm^{3} STP/g				
62.7	18.6	22.1	57	0.282	300	6.44	39.4
±2.5	±1.1	±2.5	±12	±0.060	±60	±1.30	±8.0

Data Relevant to the Cosmogenic Component of Ne and Kr

$^{22}Ne/^{21}Ne$	$^{78}Kr/^{83}Kr$ x 100	$^{80}Kr/^{83}Kr$ x 100	$^{81}Kr/^{83}Kr$ x 100	$^{82}Kr/^{83}Kr$ x 100	$^{84}Kr/^{83}Kr$ x 100	$^{81}Kr/P^{81}$ (Ma)	^{81}Kr-Kr (Ma)
1.152	18.9	41.5	0.094	71.4	38	0.231	175
±0.012	±0.3	±0.6	±0.010	±6.0	±7	±0.050	±25

Isotopic Ratios of Cosmogenic Xe

$^{124}Xe/^{126}Xe$	$^{128}Xe/^{126}Xe$	$^{129}Xe/^{126}Xe$	$^{130}Xe/^{126}Xe$	$^{131}Xe/^{126}Xe$
71±18	170±7	192±25	95±5	611±30