70255

High-Ti Mare Basalt
277.2 g, 5.5 x 3.5 x 3 cm; 7.5 x 5.5 x 4.5 cm

INTRODUCTION

70255 was described as a blocky, subangular, homogeneous, medium dark gray basalt, containing 1-2% of vugs up to 9mm diameter (Fig. 1). These vugs are lined by irregular mats of ilmenite needles with scarce plagioclase, olivine, and pyroxene crystals. 70255 broke into 70255,0 (larger) and 70255,1 (smaller - Fig. 2) during return to Earth. This sample was collected from the SEP station, approximately 115m east of the lunar module.

PETROGRAPHY AND MINERAL CHEMISTRY

Brown et al. (1975ab) described the petrography of 70255,27 as a Type IA Apollo 17 high-Ti basalt. Although this specific sample was only discussed within the general confines of this textural group, 70255 is a fine- to medium-grained, olivine porphyritic basalt. Modes determined by Brown et al. (1975a) indicate this sample is composed of. 5% olivine; 30.9% opaque minerals; 14.8% plagioclase; 47.7% clinopyroxene; and 1.6% silica.

During the preparation of this catalog, we studied thin sections 70255,28 and ,29. Pyroxene and plagioclase form "bow-tie" intergrowths (up to 0.5mm). Ilmenite (with chromite and rutile exsolution lamellae <0.005mm), rare armalcolite (with ilmenite rims), and Cr-spinel are obvious phenocryst phases (up to 0.9mm), but resorbed olivine phenocrysts (0.5mm) are also present with pyroxene reaction rims. Some

Figure 1: Hand specimen photograph of 70255,0.

Figure 2: Subdivision of 70255,0.

olivines form small (< 0.1mm) cores to larger pyroxenes. The groundmass (0.1-0.3mm) is comprised of plagioclase, pyroxene, ilmenite, and silica. Native Fe and troilite form interstitial phases.

As with the petrography, the mineral chemistry of 70255 has only been discussed within the broad context of the Type IA group of Brown et al. (1975ab). Olivine compositions range from Fo_{68} to $F0_{75}$, exhibiting minor core-to-rim zonation. Pyroxenes are generally calcic (titanaugite to augite), exhibiting Fe enrichment towards the margins. No pigeonite is present. Plagioclase exhibits only minor compositional variations (approximately An_{84-89}).

WHOLE-ROCK CHEMISTRY

The whole-rock chemistry of 70255 has been determined on sub-samples 70255,39 (Warner et al., 1975) and 70255,3 (Rhodes et al., 1976) (Table 1). The major elements are comparable, except the FeO value of Warner et al. (1975) is markedly elevated over that of Rhodes et al. (1976) (20.3 wt% and 18.73 wt %,, resp.). 70255 is classified as a Type A Apollo 17 high-Ti basalt using the classification scheme of Rhodes et al. (1976) and Warner et al. (1979). Trace elements are also comparable, although the analysis of Warner et al. (1975) contains slightly lower abundances of the REE (Fig. 3). Both REE profiles are L,REE-depleted with a slight enrichment of the MREE over the HREE (Fig. 3). The magnitude of the negative Eu anomaly measured by Rhodes et al. (1976) is slightly deeper than that of Warner et al. (1975) ($[Eu/Eu^*]_N$ = 0.48 and 0.52, resp.). The MREE reach ~50 times chondritic values. Hughes and Schmitt (1985) reported a Hf abundance of 9.6 ± 0.3 ppm for 70255,43 with a Zr/Hf ratio of 28.7± 3.3.

ISOTOPES

Nyquist et al. (1976ab) reported the present day Sr isotope composition of 70255,3 (Table 2). No age dating was undertaken and no initial $^{87}Sr/^{86}Sr$ ratio

Table 1: Whole-rock chemistry of 70255.

	,39 1 N	,3 2 X,N		,39 1 N	,3 2 X,N
SiO_2 (wt %)		40.11	Cu		
TiO_2	11.3	11.41	Ni		
Al_2O_3	9.1	9.02	Co	19.5	17.5
Cr_2O_3	0.376	0.34	V	76	
FeO	20.3	18.73	Sc	90	80
MnO	0.249	0.29	La	6.4	7.05
MgO	8.0	7.63	Ce		24.7
CaO	10.6	11.3	Nd		27.3
Na_2O	0.387	0.39	Sm	10.0	11.4
K_2O	0.077	0.04	Eu	2.20	2.23
P_2O_5		0.04	Gd		17.6
S		0.19	Tb		
Nb (ppm)			Dy	18	20.2
Zr			Er		12.1
Hf		9.7	Yb	10.0	11.8
Ta			Lu	1.4	1.48
U			Ga		
Th			F		
W			Cl		
Y			C		
Sr		199	N		
Rb		0.65	H		
Li		10.4	He		
Ba		85.3	Ge (ppb)		
Cs			Ir		
Be			Au		
Zn			Ru		
Pb			Os		

1 = Warner et al. (1975); 2 = Rhodes et al. (1976).

Analyses by: N = INAA; X = XRF.

Table 2: Sr isotope composition of 70255,3.
Data from Nyquist et al. (1976).

	70255,3
wt. (mg)	49
Rb (ppm)	0.652
Sr (ppm)	199
$^{87}Rb/^{86}Sr$	0.0095 + 3
$^{87}Sr/^{86}Sr$	0.69979 + 13
T_B	5.0 + 1.1
T_L	5.5 + 1.1

B = Model age relative to BABI
L = Model age relative to LUNI

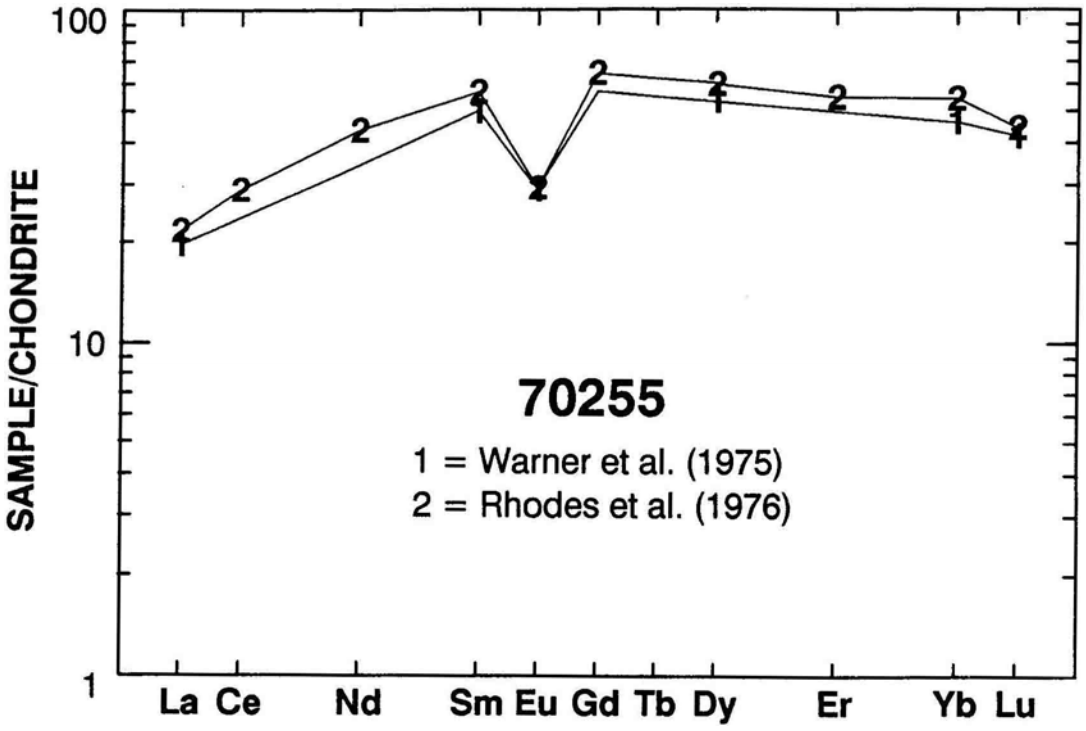

Figure 3: Chondrite -normalized rare-earth element profiles of 70255.

determined. No Sm-Nd or Pb isotope work has been undertaken on this sample. Schaeffer and Schaeffer (1977ab) determined the crystallization age of 70255,36 by $^{39}Ar/^{40}Ar$ dating technique. These authors report a crystallization plateau age of 3.84+ 0.02 Ga and a total K-Ar age of 3.67 + 0.01 Ga. No stable isotope work has been conducted upon 70255.

Analysis of cosmic ray induced radionuclides have been conducted by Keith et at. (1974ab), LSPET (1973), and Yokoyama et al. (1974). Abundances are reported in Table 3. Yokoyama et al. (1974) indicated that 70255 is unsaturated with respect to $^{26}A1$.

EXPERIMENTAL

Usselman et al. (1975) used experiments which reproduced high-Ti basalt textures and mineralogy to calculate the cooling rate of 70255. These authors concluded that 70255 cooled at a rate of 2-5 °C per hour.

PROCESSING

Of the original 277.2g of 70255,0, a total of 224.9g remains. Most of the sub-samples used in research have come from 70255,1, which has now been entirely subdivided. Five thin sections have been made, the numbers being 70255,4-5 and ,27-29.

Table 3: Cosmic ray abundances in 70255.
Data from LSPET (1973) and Keith et al. (1974).

Th (ppm)	0.31 + 0.03
U (ppm)	0.107 + 0.008
K (%)	0.048 + 0.004
^{26}Al (dpm/kg)	49 + 6
^{22}Na (dpm/kg)	72 + 7
^{54}Mn (dpm/kg)	137 + 15
^{56}Co (dpm/kg)	211 + 19
^{46}Sc (dpm/kg)	63 + 6
^{48}V (dpm/kg)	< 30
Th/U	2.9
K/U	4500