71096

High-Ti Mare Basalt
1.368 g, 1 x 1 x 1.7 cm

INTRODUCTION

71096 (Fig. 1) was described as a brownish gray, medium- to coarse-grained, homogeneous basalt (Apollo 17 Lunar Sample Information Catalog, 1973). This sample is riddled with marialitic cavities rich in euhedral crystals of ilmenite, pyroxene, and plagioclase. This basalt has an angular to blocky shape with penetrative fracturing, and was collected from Station 1A.

PETROGRAPHY AND MINERAL CHEMISTRY

Neal et al. (1989) described 71096 as a fine-grained, olivine porphyritic Apollo 17 ilmenite basalt, with a well crystallized groundmass. Both olivine and ilmenite form microphenocryst phases. This is at variance with the initial description in the Apollo 17 Lunar Sample Information Catalog (1973), probably because of the difficulty in judging grain size due to the abundance of miarolitic cavities. Olivine phenocrysts (up to 1 mm) usually have a small pyroxene overgrowth, although occasionally these may become extensive such that olivine forms only the core. Plagioclase and pink pyroxene (rarely up to l mm), and ilmenite (up to 1.4mm) dominate the sample. Rutile and chromite exsolution lamellae (<0.005mm) are common in ilmenite. Pyroxene

Figure 1: Hand specimen photograph of 71098,0.

and plagioclase are commonly intergrown in "bowtie" structures. llmenite-free armalcolite inclusions (~0.1mm) are found in pyroxene. Silica, native Fe, and troilite form interstitial phases. Point counting reveals that 71096 is comprised of. 44.0% pyroxene; 24.6% plagioclase; 21.3% ilmenite; 7.1% olivine; 1.3% native Fe and troilite; and 0.2% silica.

The larger olivine phenocrysts exhibit some core-to-rim variation, but the greatest compositional variation is between grains (Fo_{57-70}). Plagioclase exhibits a relatively large compositional range (An_{78-94}), with the most An-rich compositions being in the cores of grains. Pyroxene compositions range from pigeonite to titanaugite (Fig. 2), with zonation towards more Fe-rich compositions. Al/Ti ratios are constant at ~2, and Cr_2O_3 contents decrease with decreasing pyroxene MG#. Ilmenite exhibits a wide range in compositions (MG# = 2-18) relative to armalcolite (MG# = 36-41), with the greatest range occurring between grains in both cases, rather than core-to-rim.

WHOLE-ROCK CHEMISTRY

Neal et al. (1990) described 71096 as a Type A Apollo 17 high-Ti basalt (using the classification of Rhodes et al., 1976 and Warner et al., 1979), containing 13.0 wt% TiO_2 (Table 1) with a MG# of 41.4. The REE profile (Fig. 3) is LREE-depleted, but with an overall convex-upward shape. A negative Eu anomaly is present ($[Eu/Eu^*]_N = 0.51$).

PROCESSING

Of the original 1.368g of 71096,0, only 0.77g remains. 0.6g was irradiated as 71096,5 for INAA; the irradiated sample was then used in the preparation of thin section 71096,4.

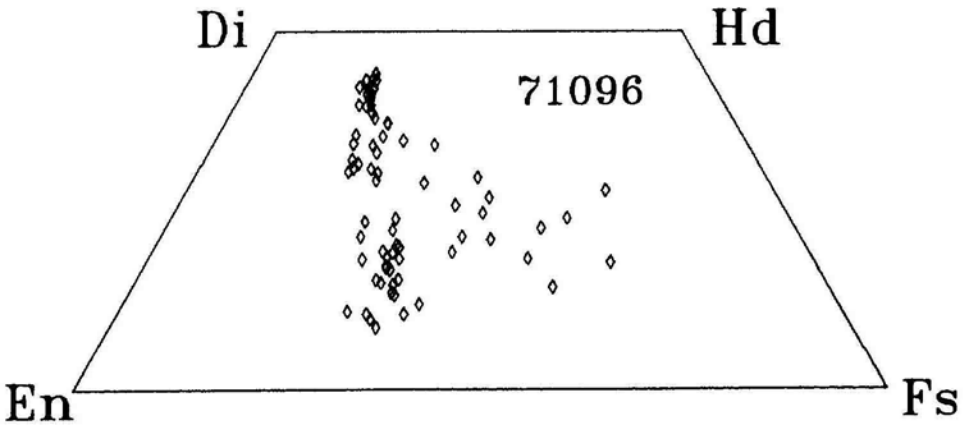

Figure 2: Pyroxene compositions of 71096 represented on a pyroxene quadrilateral.

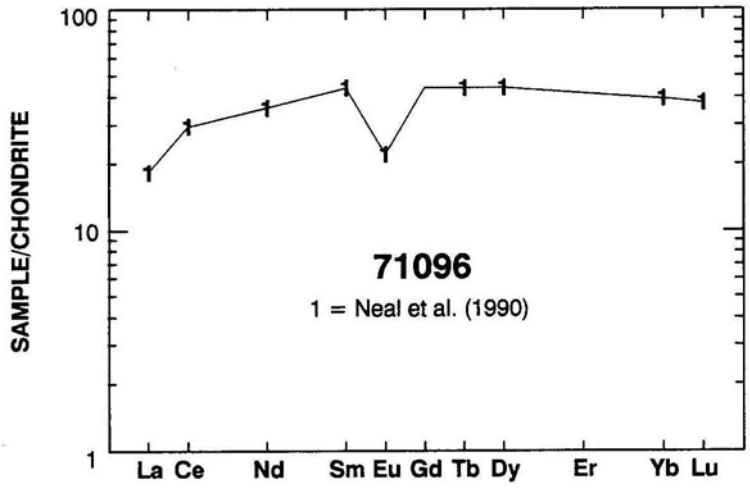

Figure 3: Chondrite -normalized rare-earth element profile of 71096.

Table 1: Whole-rock chemistry of 71096.
Data from Neal et al. (1990).

	71096,5 N		71096,5 N
SiO_2 (wt %)		Cu	
TiO_2	13.0	Ni	30
Al_2O_3	7.91	Co	22
Cr_2O_3	0.232	V	105
FeO	19.9	Sc	79
MnO	0.258	La	6.13
MgO	7.9	Ce	26
CaO	9.9	Nd	23
Na_2O	0.36	Sm	9.10
K_2O	0.06	Eu	1.73
P_2O_5		Gd	
S		Tb	2.61
Nb (ppm)		Dy	18.2
Zr	94	Er	
Hf	8.38	Yb	8.84
Ta	2.02	Lu	1.30
U	0.23	Ga	
Th	0.41	F	
W		Cl	
Y		C	
Sr	183	N	
Rb		H	
Li		He	
Ba	66	Ge (ppb)	
Cs	0.36	Ir	
Be		Au	
Zn		Ru	
Pb		Os	

Analysis by: N = INAA.