PETROLOGY AND MINERAL CHEMISTRY OF ALHA 81005; S.B. Simon, J.J. Papike and C.K. Shearer, Institute for the Study of Mineral Deposits, South Dakota School of Mines and Technology, Rapid City, SD 57701

This unique meteorite, which was originally classified as an anorthositic breccia (1) is better described as a regolith breccia with abundant feldspathic lithic clasts. The breccia has been strongly shocked, which has resulted in the melting of the matrix, destroying most of the debris commonly found in a regolith breccia, and erasing the primary textures of most of the lithic clasts.

We have used our lunar classification system in the determination of the modal petrology (Table 1) of this sample. Norites, troctolites, and gabbros are the most abundant lithic types. Some are shocked and recrystallized whereas others are not. Lithic clasts present in lesser amounts are anorthositic fragments, feldspathic fragmental breccias, RNB/POIK's, and several small fragments that have possible basaltic textures. The largest clast that appears to have retained its original igneous texture is a 0.5 mm spinel troctolite fragment which contains calcic (An_{97}) plagioclase laths, olivine (Fo_{77-80}), and spinel (with 10 wt.% FeO and 5 wt.% Cr_2O_3). Plagioclase dominates the mineral fragment population in the matrix.

In Figure 1, the compositions of plagioclase grains found in the matrix are compared to those from lithic clasts. The ranges and relative abundances are nearly identical, indicating that the matrix grains were derived from lithologies very similar to those that are found in the breccia. This is not the case for polymict eucrites, for which it has been shown (2,3,4) that the matrix mineral population could not be completely derived from the lithic clasts. Pyroxenes (Fig. 2) and olivines (Fig. 3) exhibit wider compositional ranges than feldspar. Most of the pyroxenes are more Mg-rich than eucritic pyroxenes, in agreement with the preliminary analysis (1). Pyroxene compositions further support a lunar highland origin for this breccia. Figure 4 is a plot of Ti vs. Al in pyroxenes, and the distribution approximates that for highland pyroxene while exhibiting large differences from mare and meteoritic pyroxene (5). Figure 5 is a plot of wt.% MnO vs. wt.% FeO in pyroxenes from ALHA 81005 and from Pasamonte. The ALHA 81005 pyroxenes clearly define a trend which is non-eucritic and falls within the range for lunar rocks.

TABLE 1. MODAL PETROLOGY OF ALHA 81005

	SMALL CLASTS (20-200 μm)	LARGE CLASTS (200-2000 μm)
LITHIC FRAGMENTS		
Basalt	1.3	1.7
ANT	1.8	12.9
Brecciated ANT	2.2	6.9
Feldspathic Frag. Breccia	0.2	1.3
RNB/POIK	0.4	1.2
FUSED SOIL COMPONENT		
Dark Matrix Breccia	1.0	0.5
Agglutinate	3.2	2.0
MINERAL FRAGMENTS		
Mafic	2.2	0
Plagioclase	6.7	1.9
Maskelynite	0	0.9
Opaque	0.1	0
GLASS FRAGMENTS		
Orange/black	0	0
Yellow/green	0.2	0
Colorless	0.6	0
Brown	0.2	0
MISCELLANEOUS		
Devitrified glass	2.8	3.0
Others	0.1	0
TOTAL	23.0	32.3
MATRIX (<20 μm)	44.7	

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In conclusion, the petrographic, modal and mineral chemical data strongly indicate that this meteorite is a breccia from the lunar highlands.

REFERENCES. (1) Antarctic Meteorite Newsletter (1982) Vol. No. 4, (2) Grossman et al. (1981) Geochim. Cosmochim. Acta 31, 1637-1665, (3) Wooden et al. (1981) Lunar and Planetary Science XII, 1203-1205, (4) Simon et al. (1982) Meteoritics 17, 149-162,(5) BVSP, Basaltic Volcanism on the Terrestrial Planets, p. 358.

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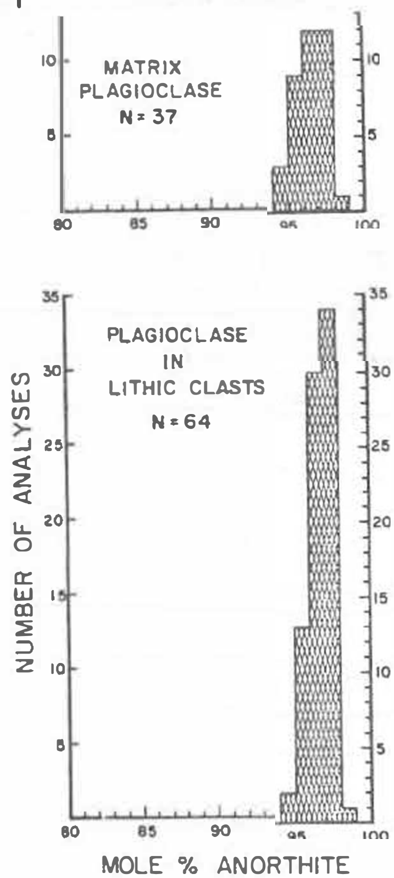

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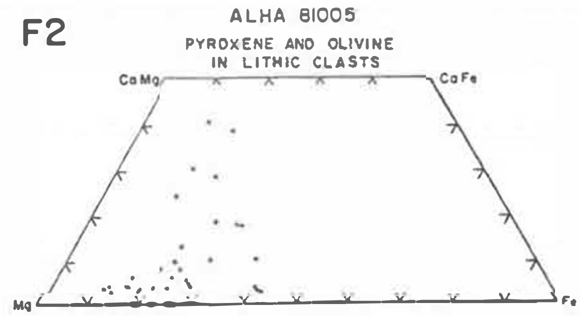

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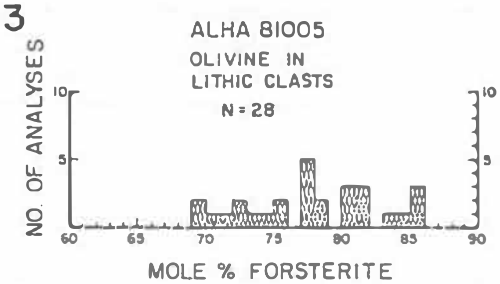

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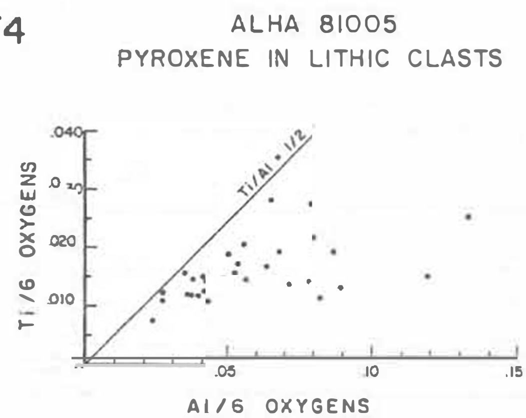

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