CLAST POPULATION STATISTICS OF THE LUNAR METEORITE ALHA81005. A. Bischoff and D. Stöffler, Institute of Mineralogy, Correnssstrasse 24, 4400 Münster, FRG.

The antarctic meteorite ALHA81005 is a glassy lunar highland regolith breccia (e.g. 1-5). The sample contains almost negligible KREEP-components, but some mare basalt, hence Ryder and Ostertag (5) suggested that this sample may originate from an impact site near the northeastern limb of the moon such as the young crater Giordano Bruno.

Important information about the nature of the regolith and subregolith basement at the site of ALHA81005 can be obtained by a study of its lithologies. In this study we have determined the clast population of thin section ALHA81005,8. 460 mineral and lithic clasts in the range of~ 0.13 to 4 mm were mapped and classified petrographically according to the classification for lunar highland rocks (6). The volumes and the proportions of all types of clasts were measured by a Zeiss Mop Videoplan. The result of the modal analysis is given in Table 1.

ALHA81005,8 contains about 30 vol.% clasts larger than ~130 µm. Granulitic and recrystallized rocks, minerals or breccias are by far the dominant lithology (56.4 vol.%). Crystalline melt breccias are common (22.2 vol.%) as well as vitric to devitrified impact glasses (11.0 vol.%). One large clast (~4.5 mm^2) is a polymict fragmental breccia (7.4 vol.%).

Cataclastic anorthosites without recrystallization have not been observed: anorthosites have either a granoblastic texture or are intragranularly recrystallized. Similarly, most plagioclase mineral fragments have been affected by shock-metamorphism and secondary annealing. Not a single clear, homogenous plagioclase mineral fragment (>100 µm) is present: all plagioclase fragments show at least shock-induced undulose extinction and various degrees of recrystallization. Intragranularly recrystallized plagioclases (Table 1) are most likely intensively recrystallized, former plagioclase mineral fragments. Mafic mineral fragments (olivine/pyroxene = 60/40; (5)) are heavily fractured and contain locally disoriented domains due to shock-metamorphism.

The crystalline melt breccias (CMBs) show significant differences from those in Apollo 16 fragmental breccias. The microporphyrithic feldspathic CMBs are extremely fine-grained and appear to contain somewhat higher amounts of mafic materials. Most fine-grained subophitic CMBs contain micropoikilitic domains: mafic minerals within the plagioclase network show a homogeneous extinction over larger areas. In this respect a precise assignment to either the micropoikilitic or to the subophitic CMBs appears impossible. Many impact melt breccias are intensively shocked. Especially, plagioclase in subophitic CMBs are heavily fractured, contain disoriented domains and show undulose extinction. This is probably the reason that Kurat and Brandstätter (7) stated non-metamorphic igneous rocks are rare in ALHA81005,8. No coarse-grained, subophitic CMB has been observed.

Different varieties of glasses occur. We observed nearly colorless glasses in the fusion crust, spherules, and irregularly-shaped bodies (layers) within the matrix; however, most matrix glasses are brownish. Devitrified and partly devitrified glasses are common.

ALHA81005 is a rather consolidated breccia (Type B-C; (8)). However, the high abundances of vitric and devitrified glasses are not due to the lithification process that converted the loose regolith material into the ALHA81005-breccia. Most glasses probably formed prior to the lithification event in the lunar regolith.

A comparison of the clast population in ALHA81005 with the feldspathic fragmental breccias of the Apollo 16 landing site is made in Figs. 1 and 2 (9). With respect to lithic clasts ALHA81005 is similar to Station 11 rake and soil samples (near North Ray crater) but distinctly different from the Stations in the Cayley plains although granulitic lithologies and cataclastic anorthosites are more abundant in ALHA than the average of Station 11 samples (Fig. 1). Regarding the abundance of glass particles (including devitrified ones) ALHA81005 resembles more Station 13 fragmental breccias which appear to have a certain regolith component than Station 11 fragmental breccias (Fig. 2) which originate from greater depth. Mafic melt rocks, minor components in Station 11 fragmental breccias, are more abundant in ALHA81005; also fragmental breccias from Station 13 are richer in mafic melt breccias that the bulk of Station 11 breccias (Figs. 1 and 2) In conclusion, the lithological composition of ALHA81005 (excluding glassy regolith components) is very similar to Station 13 fragmental breccias but somewhat richer in metamorphic lithologies (granulites and recrystallized cataclastic anorthosites) and poorer in KREEP-components compared to the North Ray basement. For these reasons we believe that the ALHA81005 site is part of the "eastern" province of the lunar highlands in accordance with orbital chemical data (10).

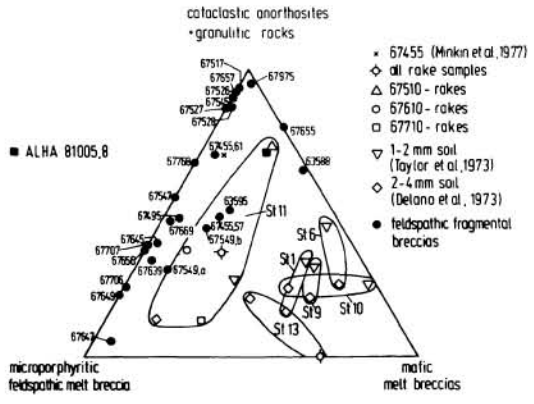

Fig. 1

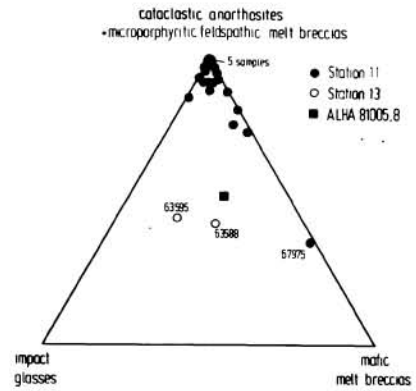

Fig. 2

CLAST POPULATION STATISTICS

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TABLE 1

Type of rock	No. of clasts	area [mm2]	vol. %
Granulitic anorthosite	51	5.020	8.5
Granulitic breccia	16	11.917	20.1
Granulitic (grabbroic, noritic) anorthosite	22	2.715	4.6
Mafic granulite	2	0.550	0.9
Intragranularly recryst. catacl.anorthosite	131	10.425	17.6
Intragranularly recrystallized plagioclase	115	2.836	4.8
Recrystallized and granulitic minerals, rocks and breccias Total:	337	33.463	56.5
Microporphyritic feldspathic CMB	13	3.887	6.5
Micropoikilitic CMB	5	0.768	1.3
Subophitic, fine-grained CMB	26	7.253	12.2
Intergranular to subophitic CMB	1	1.173	2.0
Granular mafic melt breccia	1	0.088	0.15
Melt breccia with variable texture from subophitic to finely granular	1	0.045	0.08
Crystalline melt breccias Total:	47	13.214	22.23
Vitric (impact) glass	17	0.870	1.5
Glass spherule	3	0.250	0.4
(Partly) devitrified impact glass	12	2.008	3.4
Impact melt with variolitic texture	2	3.362	5.7
Vitric to devitrified (impact) glass Total:	34	6.490	11.0
Plagioclase mineral fragment	16	0.465	0.8
Mafic mineral fragment	20	0.748	1.3
Mineral fragments Total:	36	1.213	2.1
Polymict fragmental breccia	1	4.401	7.4
Mafic, lithic fragment	3	0.098	0.2
Cataclastic (noritic, gabbroic) rock	1	0.274	0.5
Shocked fragmental, feldspathic breccia	1	0.200	0.3
Others Total:	6	4.973	8.4
Total:	460	59.353	100.23

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