CLAST POPULATION STATISTICS OF THE LUNAR METEORITE YAMATO-791197 - SAMPLE FROM A NEW SOURCE REGION OF THE LUNAR HIGHLANDS? A. Bischoff and D. Stöffler, Institute of Mineralogy, Correnssstr. 24, 4400 Münster, FRG.

The antarctic meteorite Y791197 is a lunar regolith breccia which is composed of a great variety of lithic and mineral fragments of typical highland composition. The fine-grained fraction of clasts lithified by an intergranular melt forms a densely compacted matrix. To some degree Yamato-791197 is similar texturally and compositionally to ALHA81005, the first known lunar meteorite.

Important information about the nature of the regolith and subregolith basement at the impact site of Y791197 can be obtained by analyzing the type and frequency of mineral and lithic clasts of Y791197. As done for the lunar meteorite ALHA81005 (1), we have determined the clast population of thin section Y791197,73-2. 50 mineral clasts and 195 lithic clasts in the size range of ∿0.1 to 2 mm were mapped and classified petrographically according to the classification for lunar highland rocks (2). The volumes and the proportions of all types of clasts were measured with a Zeiss Mop Videoplan. The result of the modal analysis is given in Table 1.

Y791197,73-2 contains about 32 vol.% clasts larger than ∿0.1 mm. Granulitic and recrystallized rocks and breccias are by far the dominant lithology (54 vol.%). Also most of the plagioclase fragments are recrystallized. Crystalline melt breccias (CMBs) and devitrified impact glasses are common, whereas the amount of still vitric glasses is almost negligible. Like in ALHA81005 cataclastic anorthosites without recrystallization have not been observed: anorthosites have either granoblastic texture or are intra- or intergranularly recrystallized. Similarly, most plagioclase mineral fragments have been affected by shock-metamorphism and secondary annealing: all plagioclase fragments show at least shock-induced undulose extinction or various degrees of intragranular recrystallization.

The crystalline melt breccias (CMBs) are significantly different from those occurring as clasts within Apollo 16 fragmental breccias. Three varieties dominate: most common is a yellow-brown, fragment-laden, feldspathic melt breccia with a very fine-grained to micoporphyritic matrix (opaque-free). A second melt breccia appears dark-brown, fragment-laden and mafic-rich with a very fine-grained matrix. This lithology has not been observed in ALHA81005. The third melt-breccia is identical to the fine-grained subophitic CMBs which are common at all lunar highland sampling sites.

Significant differences between ALHA81005 and Y791197 exist concerning the glass content. In ALHA81005 11 vol.% of the determined lithologies consist of vitric to devitrified (impact) glasses, only 6.5 vol.%, mainly devitrified glasses have been found in Y791197. The irregularly-shaped bodies (layers) of brownish glass, common within the matrix of ALHA81005, are missing in Y791197.

A comparison of the clast population in Y791197 with ALHA81005 is made in Tab. 2. Both lunar samples have about similar abundances of the various types of lithic clasts. The contents of the recrystallized and granulitic types of rocks which have the composition of anorthosite or noritic-gabbroic anorthosite, are almost identical. Slight differences exist regarding the abundances of the mafic and feldspathic CMBs. The mafic CMBs are somewhat more abundant in ALHA81005. A type of dark-brown, fragment-laden, mafic-rich melt breccia with a very fine-grained matrix has not been observed in ALHA81005. Glasses are a conspicuous lithology only in ALHA81005 (1). In particular, the irregularly-shaped, brown layers of impact glass in ALHA81005 are missing in Y791197.

In conclusion, Yamato-791197 was ejected from a lunar highland regolith which is highly feldspathic in composition and free of the KREEP component.

CLAST POPULATION STATISTICS

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Compared to other lunar highland sites, the Yamato site is lithologically similar to the "Old Eastern Highland Rock Suite" as defined by the Apollo 16 North Ray crater ejecta (3) although the compositional similarity to the lunar meteorite ALHA81005 is more distinct. The source region may be the same for both meteorites (e.g., northeastern part of the frontside of the moon (4)) but it can be excluded that the two meteorites are fragments of one piece of rock.

TABLE 1 Type of rock		No. of clasts	area [mm^2]	vol. %
Granulitic anorthosite		21	1.12	4.7
Granulitic breccia		6	2.27	9.5
Granulitic (gabbroic, noritic) anorthosite		3	0.22	0.9
Intragranularly recrystallized cataclastic anorthosite		26	3.00	12.5
Intragranularly recrystallized plagioclase		39	0.79	3.3
Recrystallized polymict "fragmental" breccia (mafic-rich)		12	2.79	11.7
Light-colored, intergranularly recryst. fsp. polymict breccia		1	2.69	11.3
Recrystallized feldspathic rocks and breccias, and granulitic lithologies	Total:	108	12.88	53.9
Feldspathic fine-grained intergranular to microporphyritic CMB	feldspathic	27	2.81	11.8
Feldspathic subophitic to microporphyritic CMB	feldspathic	1	0.22	0.9
Fine-grained, dark-brown, mafic-rich CMB	mafic	4	2.02	8.5
Fine-grained subophitic CMB	mafic	5	0.23	1.0
Subophitic, noritic-anorthositic CMB	mafic	1	0.33	1.4
Crystalline melt breccias	Total:	38	5.61	23.6
Vitric (impact) glass		4	0.10	0.4
Glass spherules		5	0.08	0.3
(Partly) devitrified impact glass		17	1.31	5.5
Impact melt with variolitic texture		2	0.07	0.3
Vitric to devitrified (impact) glasses	Total:	28	1.56	6.5
Plagioclase mineral fragments		35	0.68	2.9
Mafic mineral fragments		15	0.30	1.2
Mineral fragments	Total:	50	0.98	4.1
Polymict fragmental breccias		5	2.26	9.4
Polymict fragmental breccia; great variability of lithic clasts		1	0.50	2.1
Mafic lithic fragments		3	0.09	0.4
Others	Total:	9	2.85	11.9
	Total:	245	23.88	100.0

TABLE 2	Y791197	ALHA81005
Recrystallized and granulitic lithologies (anorthosites and noritic-gabbroic anorthosites)	53.9 ±6	56.5 ±4.5
Feldspathic crystalline melt breccias	12.7 ±4	6.5 ±2
Mafic crystalline melt breccias	10.9 ±4	15.7 ±3.2
Vitric to devitrified (impact) glasses	6.5 ±3	11.0 ±3
(Vitric impact glasses)	(0.4)	(1.5)
Mineral fragments	4.1 ±2	2.1 ±1
Polymict fragmental breccias	11.5 ±4	7.4 ±2.3
Others	0.4 ±<1	1.0 ±1
Total:	100.0	100.2

References: (1) Bischoff A. and Stöffler D. (1984), Lunar and Planet. Sci. XV, 62-63. (2) Stöffler D. et al. (1980), Proc. Lunar Highlands Crust, 51-70. (3) Stöffler D. et al. (1985), JGR, 15th LPSC, in press. (4) Ryder G. and Ostertag R. (1983), GRL 10, 791-794.