CLAST POPULATION OF LUNAR REGOLITH BRECCIA DHOFAR 287B.

Svetlana Demidova[1], Mikhail A. Nazarov[1,2], Mahesh Anand[2], and Lawrence A. Taylor[2], [1]Institute of Geochemistry and Analytical Chemistry, Moscow 119991, Russia (demidova@geokhi.ru), [2]Planetary Geosciences Institute, University of Tennessee, Knoxville, TN 37996, USA (lataylor@utk.edu).

Introduction: Dhofar 287 is a lunar meteorite found in the hot desert of Oman. The main portion (95%) of the stone is a mare basalt (Dh-287A); a minor, adjacent portion (<5%) is a regolith breccia (Dh-287B) [1]. It has been suggested that on the Moon Dh-287A may have been a clast within the breccia 287B [1]. Here we report on the clast population of the regolith breccia. The rock is dominated by several mare basalt litologies. No typical highland material was found but a KREEP component is present. Dhofar 287 may have been ejected from a mare region some distance from a highland terrain.

Results: The Dh-287B regolith breccia is clast-rich and composed mainly of course-grained mineral fragments and intergrowths (0.2-1 mm) cemented by fine-grained (<100 μm) monomineralic debris and minor impact melt. Rare lithic clasts, from 0.1 to 1 mm, can be subdivided into (1) crystalline rocks; (2) vitrophyric rocks; and (3) impact-melt breccias. Glass spherules and fragments are also present. Four fragments of the **crystalline rocks** were studied. They are granular to ophitic, fine-grained basalts. Two of them contain pyroxene ($En_{24-46}Wo_{21-34}$) and feldspar (An_{81-86}), with minor olivine (Fo_{41}), ilmenite, and silica. In mineral chemistry and bulk composition, the clasts are close to Dh-287A (Fig. 1). These are also Na-rich, low-Ti basalts, but they are poorer in MG# and olivine as compared to Dh287A [1,2]. The other two crystalline rocks are VLT basalts, consisting of pyroxene, ranging from augite (En_{31-40}; Wo_{35-40}) to Fe-rich pigeonite and augite (En_{12-32}; Wo_{12-30}) and Ca-rich plagioclase (An_{93-99}). These differ from Dh-287A and other crystalline rocks. In contrast to Luna 24 and Apollo 17 VLT basalts, the clasts are lower in MG# (Fig. 1). The low-Na content distinguishes these clasts from other basaltic rocks in this meteorite.

A beautiful clast of a **vitrophiric basalt** consists of pyroxene phenocrysts set within a partially devitrified glassy matrix. Pyroxene is normally zoned from pigeonite ($Wo_{9-10}En_{61-62}$) or augite ($Wo_{31-36}En_{36-38}$) to Fe-rich augite ($Wo_{27}En_{16}$). In bulk composition, the clast is poorer in MG# and slightly lower in Ti compared to Dh-287A (Fig. 1). This basalt clast is most similar to the Apollo 12 pigeonite basalts, but a high-Na content (0.5 wt.% Na_2O) distinguishes it from low-Ti lunar basalts.

Two clasts of **impact-melt breccias** were also found. One is composed from mineral fragments embedded in a fine-grained impact-melt matrix. These minerals are similar in composition to those in Dh-287A. In addition, the matrix composition is similar to the Dh-287A bulk, but is poorer in MG#. Another impact melt cements mineral fragments in breccia matrix and it is similar in composition, but is higher in MG# (Fig. 1). The third clast is rich in an impact-melt matrix that has a composition of typical KREEP norites (wt.%): SiO_2 46.3; TiO_2 1.84; Al_2O_3 17.5; FeO 10.5; MgO 9.32; CaO 11.5; Na_2O 0.64; K_2O 0.47; P_2O_5 0.40.

The **glass spherules and fragments** are commonly devitrified. The majority of them are of a restricted picritic composition remarkably similar to that of Apollo 15 green glass (Fig. 1). Rare glasses are compositionally close to Dh-287A or VLT basalts. One glass fragment of a monzodioritic composition was found (wt.%): SiO_2 49.8; TiO_2 4.12; Al_2O_3 9.85; FeO 15.6; MgO 6.21; CaO 8.84; Na_2O 0.91; K_2O 0.96; P_2O_5 1.24.

The population of **mineral fragments** includes pyroxene, feldspar, olivine, and minor chromite, ilmenite apatite, silica, FeNi metal, and troilite. Rare fragments of a faylite + K-rich glass mesostasis also occur. Mineral chemistries (Figs. 2-4) demonstrate that a good proportion of the mineral fragments was derived from the Dh-287A basaltic lithology. However, there also exists many plagioclase fragments, which are certainly higher in An compared to feldspar of Dh-287A [2] (Fig. 2). Pyroxene fragments are certainly richer in MG# and poorer in Ca relatively to pigeonite and augite of Dh-287A and other rocks of the Dh-287B breccia (Fig. 3). In contrast, olivine fragments are similar in MG# to olivine of Dh-287A (Fig. 4). Only one fragment of Mg-rich olivine (Fo79) was found. There are no also significant differences in chromite and ilmenite chemistry between Dh-287A and Dh-287B, the regolith breccia. The same is also true for the FeNi metal compositions: 0.2-55 wt% Ni and 0.6-2.4 wt% Co in the regolith breccia and 1.3-31 wt% Ni and 0.5-4.9 wt% Co in the 287A basalt.

Discussion: The main lithology present in the Dh287B breccia is a **low-Ti basalt** that differs from typical lunar low-Ti basalts with their high-Na content (0.45-0.55 wt% Na_2O). The same basic lithology is present in this breccia as in the Dh-287A basalt, with some crystalline and vitrophiric rocks, glasses and mineral fragments. Impact-melt constituents of the breccia are also related to the lithology. The chemical variations within the rock suite are most probably re-

lated to olivine fractionation. The textural variations point to different cooling rates of such melts, possibly related to several lave eruptions. A **VLT basalt** component is minor, but it is easily distinguishable and represented by lithic and glassy clasts. The population of mineral fragments includes Ca-rich feldspar that could probably indicate a presence of a coarse-grained VLT rock. In contrast to typical VLT basalts of Luna 24 and Apollo 17, the Dh-287B VLT component is distinctly poorer in MG#. **The picritic glass** is also a minor but characteristic component of the Dh-287B breccia. This suggests that there may be primitive magma eruptions with fire-fountaining conditions in the region sampled by Dh-287B. Non-mare material is presented only by a KREEP impact melt breccia and a monzodioritic glass. Typical highland rocks are insignificant, if present at all. The chemistry of mineral fragments suggests that the breccia should contain a certain amount of a course-grained gabbroic rock consisting mainly of Mg-rich low-Ca pyroxene and Ca-rich feldspar. Such phases are absent in Dh-287A and lithic clasts. The nature of the component is not clear.

Conclusion: The Dh287 regolith breccia is dominated by different mare basalt lithologies. The main lithology represents a low-Ti, Na-rich basalt suite, which is compositionally different from known mare basalt families. No typical highland components were found, but KREEP material is present. Thus, it is reasoned that this meteorite was probably ejected from a region located distal to highland terrains, possibly from the nearside of the Moon.

References: [1] Taylor L. et al. (2001) *MAPS, 33,* A171. [2] Anand M. et al. (2002) This volume.

Fig. 1 Bulk chemistry

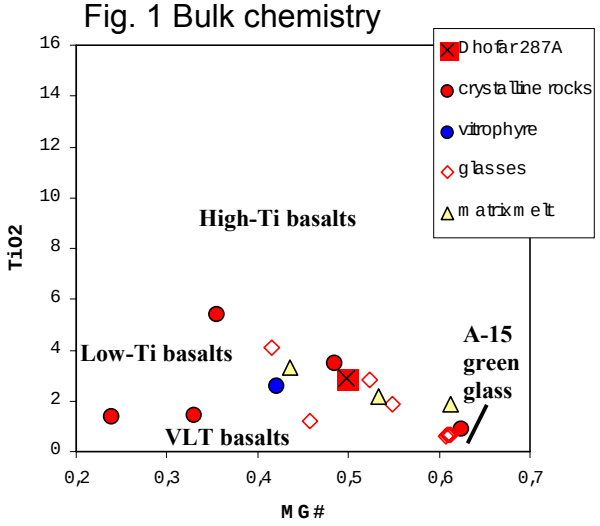

Fig. 2 Plagioclases

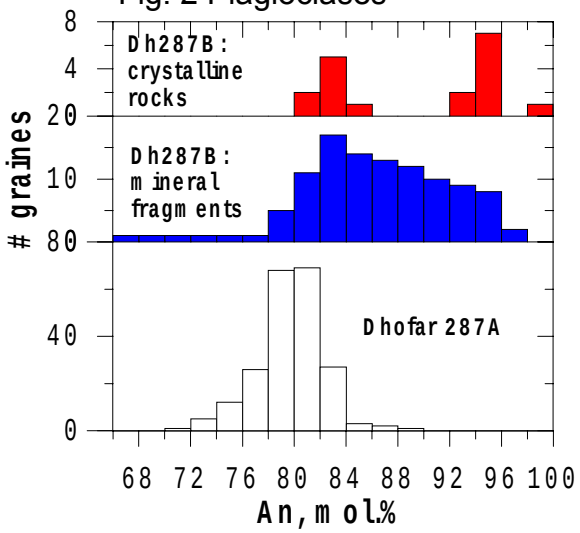

Fig. 3 Pyroxenes

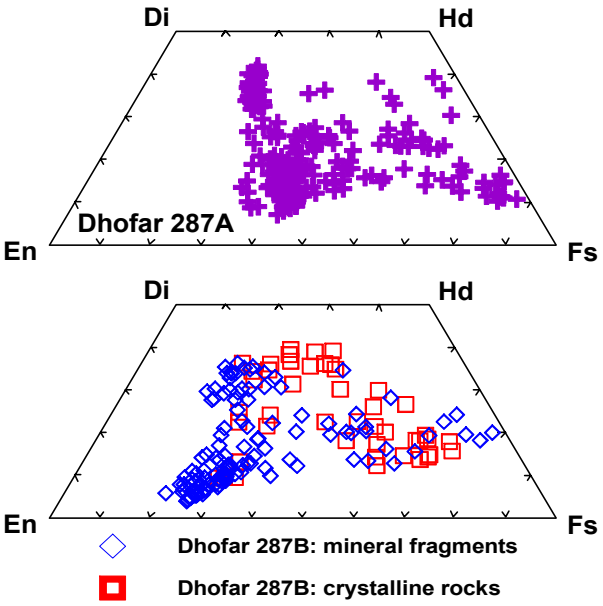

Fig 4 Olivines