LUNAR METEORITE DHOFAR 310: A POLYMICT BRECCIA WITH DEEP-SEATED LUNAR CRUSTAL MATERIAL. S. I. Demidova[1], M. A. Nazarov[1], G. Kurat[2], F. Brandstatter[2] and T. Ntaflos[3] [1]Institute of Geochemistry and Analytical Chemistry, Moscow 119991, Russia (demidova@geokhi.ru), [2]Naturhistorisches Museum, A-1014 Vienna, Austria, [3]Univ. Wien - Geozentrum, Department of Geological Sciences, Althanstr. 14, A-1090 Vienna, Austria.

Introduction: Dhofar 310 is a new lunar highland meteorite found in the desert of Oman nearby Dh 302, 303, 305, 306 and 307. This is the first lunar meteorite that contains material derived from a deep location of the lunar crust.

Results: Dhofar 310 is a small stone weighing 10.8 g. The meteorite is a clast-rich impact melt breccia containing numerous mineral fragments and clasts of feldspathic rocks embedded in a devitrified glassy matrix. Clasts of granulites and possible igneous rocks are abundant and have mainly anorthositic, troctolitic and gabbronoritic compositions. Minor lithologies are impact melt breccias, pyroxenites and dunites. Rare glass veins and fragments are present. One of the glass fragments is of a KREEPy composition (TiO_2 2.63, Na_2O 0.76, K_2O 0.16, and P_2O_5 0.27 (wt%)). Major minerals show a huge compositional range: feldspar $An_{93-98}Or_{0-0.2}$; olivine Fo_{34-88}; orthopyroxene $En_{54-89}Wo_{1-5}$; clinopyroxene $En_{25-77}Wo_{5-46}$ Accessory minerals are Ti-rich chromite, ulvospinel, pleonaste, ilmenite (2-7 wt% MgO), armalcolite, silica, troilite, FeNi metal (2-32 wt% Ni; 0.4-3.0 wt% Co). Composition of the impact melt matrix is: SiO_2 43.6, TiO_2 0.12, Al_2O_3 29.2, Cr_2O_3 0.06, FeO 2.84, MnO 0.05, MgO 5.79, CaO 17.8, Na_2O 0.39 and K_2O 0.01 (wt%). There is one unique fragment in Dh 310. This is a fragment of *spinel pyroxenite*. The clast, about 150 µm in size, consists of Al-rich orthopyroxene, $En_{89}Wo_1$ (~7 wt% Al_2O_3), minor Mg,Al-spinel (MG#80, Cr/(Cr+Al)=0.04 at.), and a single plagioclase grain (An_{97}). Mineral chemistry is similar to that of rare spinel cataclasites described from Apollo 15 and 17 highland breccias [1]. However, in contrast to the cataclasites, the Dh 310 pyroxenite does not contain any olivine.

Discussion: Dh 310 was found nearby to Dh 302, 303, 305, 306 and 307, which are possibly paired but nevertheless the meteorites appear to be distinct [2-4]. In clast population and trace element contents Dh 310 is most similar to Dh 305 and 307 which contain also abundant troctolite lithologies and rare dunitic and pyroxenitic clasts. However, Dh 310 appears to have a more polymict composition than the others and contains the main lunar non-mare lithologies, including KREEP. The presence of spinel pyroxenite indicates that the rock contains lithologies excavated from deep units of the lunar crust. The Al-rich orthopyroxene – spinel association points to high-pressure conditions [1]. Depth estimates based on the mineral chemistry show that the pyroxenite must have been derived from a depth of >20 km in the lunar crust or the uppermost lunar mantle. Thus, lunar meteorites can contain material of deep origin and should be searched for other high-pressure phase associations related to the lunar interior.

Acknowledgements: This study was supported by RFBR (grant 02-05-64981) and Austrian Academy of Sciences and FWF.

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