LUNAR METEORITE DHOFAR 961, MAFIC IMPACT-MELT BRECCIA: PETROGRAPHIC COMPONENTS AND POSSIBLE PROVENANCE.

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In a companion abstract [1], a case is made on the basis of geochemistry for possible origin of the Dhofar 961 lunar meteorite in the South Pole-Aitken (SPA) basin. The bulk composition is appropriately mafic and Th-rich for this region of the Moon, and the lithophile trace-element signature differs from that of well-known materials from the Moon's Procellarum KREEP Terrane [2]. Other relatively mafic, brecciated lunar meteorites have been shown to be mixtures of highlands (nonmare) materials and mare basalt [3]. In this abstract, we describe clasts in this complex meteorite to determine (1) the composition of impact-melt and other lithic clast components, (2) if a mare origin for mafic components is indicated, and (3) if the components could reasonably come from the compositionally distinctive SPA basin.

In our polished section of Dhofar 961, large (up to cm-sized) lithic clasts of fine-grained, subophitic impact-melt breccia (IMB) containing olivine phenocrysts dominate the section (~60 vol. %). Other texturally distinctive lithic clasts account for ~8%, and smaller mineral and lithic clasts welded together by minute amounts of glass comprise the remaining ~32%. Thin (5-20 μm) impact-glass veins occur along contacts between breccia matrix and the large lithic clasts. Small lithic clasts in the matrix are subrounded. The matrix contains several subrounded lithic clasts of basaltic-textured lithologies and several of a feldspathic granulite lithology. We have not observed KREEP-rich or granitic components in this section [cf. 4]. FeNi-metal is common and several large grains (~5.5% Ni; ~300 μm) occur in the mafic melt breccia.

The composition of the IMB clasts average ~12.5% FeO and 17% Al_2O_3, with very low TiO_2 (0.5%). Although a few small lithic clasts in the section appear to be basaltic (aluminous and very low Ti), it is not clear that the IMBs have a basaltic precursor component; if they do, it is unlike the main Apollo and Luna basalt groups. Values of Mg' among lithic clasts range from ~48 to 77, but the prominent IMB clasts have Mg' of 56-64. Dhofar 961 is dominantly, but not exclusively, composed of ferroan components. Exceptions are feldspathic magnesian granulites.

Compositionally, SPA basin is a potential source for Dhofar 961. The mafic components and ferroan composition compare well with Lunar Prospector gamma-ray data for the interior of SPA basin [5,6]. Although a noritic mafic mineralogy was advocated by [7], mineral models of [8] indicate abundant high-Ca pyroxene and minor olivine. Pigeonite is common in Dhofar 961 and could be an important part of the solution to the mafic mineralogy of SPA basin, as also concluded by [8].

References: [1] Korotev, R. et al. 2007. *Meteoritical Society Meeting*, this vol. [2] Jolliff B. et al. 2000. *Journal of Geophysical Research* 105:4197–4216. [3] Korotev R. 2005. *Chemie der Erde*, 65:297–346. [4] The Meteoritical Bulletin 2005. No. 89, *Meteoritics & Planetary Science* **40**, A201-A263. [5] Jolliff, B. and Gillis, J. 2005. #5330, in *Meteoritics & Planetary Science* 40, A77. [6] Prettyman, T. et al., 2006. *Journal of Geophysical Research* 111, E002656. [7] Pieters, C. et al. 2001. *Journal of Geophysical Research* **106**, 28,001–28,022. [8] Lucey, P. et al. 2005. *Lunar & Planetary Science*, **36**, #1520.