SHOCK MELT PRODUCTS IN OLIVINE-PHYRIC SHERGOTTITE DAR AL GANI 1037

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Introduction: This study reports new data on strongly shocked olivine-phyric shergottite Dar al Gani (DaG) 1037, found early 1999 in the Libyan desert [1]. Twelve grams of DaG 1037 were recently acquired by the University of Alberta Meteorite Collection, from which a polished thick section (~2.2 x 1.0 x 0.2 cm) was prepared for this study. Here, we provide a detailed description of the shock melt products (~8 vol%), focusing on the relationship between the melts and the basaltic host rock. The results represent preliminary work that is part of a larger study mapping the location and distribution of mineral assemblages in DaG 1037 shock melts.

Analytical Methods: Detailed microtextures were characterized at the University of Alberta using a JEOL 6301F FE-SEM, with an 8 mm working distance and an accelerating voltage of 20 kV. X-ray elemental maps were collected using a Cameca SX-100 EM at the same institution.

Results and Discussion: A vein of shock melt (3.1 to 4.2 mm apparent thickness) transects the entire sample, similar to 'melt dikes' described from ordinary chondrites and shergottite NWA 4797 [2]. We use this term (melt dike) to distinguish this feature from thin, glassy networks of shock veins that are also observed in our sample. Large vesicles (200 to 950 μm) occur within the dike and are concentrated near the center. Olivine and pyroxene grew from the melt, with skeletal shapes in the interior and equant euhedral shapes near the margin. The dike / host rock contact is gradational. In some areas 'rafts' of lithic fragments are concentrated near the margin. Plagioclase melt from the host rock intermingles with the groundmass of the melt dike.

Numerous isolated pockets of shock melt are heterogeneously distributed throughout the host rock. These shock melt pockets vary in apparent diameter from 140 μm to 860 μm with complex internal microtextures varying from schlieren-rich glass, to quench crystallized products with little interstitial glass, to fragment-laden pockets. Gradational contacts are typical. Shock veins, ~10 to 210 μm apparent thickness, are typically connected to the melt pockets. These veins have sharp, discordant contacts with the host rock, and numerous offsets (displacements of igneous minerals) are observed along their margins indicating a shearing component to their formation. In one area, the melt dike has been observed to truncate a shock vein.

The host rock is pervaded by two generations of open, irregular fractures. The first cuts across igneous pyroxene and olivine, but does not cut across maskelynite or shock melt products. The second transects all features and is partially filled with calcite. The former are interpreted to result from shock-induced mechanical deformation, the latter to terrestrial alteration.

Although DaG 1037 is likely paired with other DaG shergottites [1], the sample contains shock melt features that are unique among these possibly paired stones. The complexity of shock melt products in terms of their internal microtextures, composition, relationship to the host rock, distribution and abundance testify to the heterogeneity of shock on a μm-scale.

References: [1] Russell S. S. et al. 2004. Meteoritical Bulletin, no. 88 *Meteoritics & Planetary Science* 39:A215-A272. [2] Walton E. L. et al. 2009. Abstract #1464. 40th Lunar & Planetary Science Conference.