PETROLOGY AND CHEMISTRY OF A LUNAR FELDSPATHIC IMPACT MELT ROCK METEORITE FROM OUED AWLITIS, MOROCCO.

A. Wittmann[1], R. L. Korotev[1], B. L. Jolliff[1], H. Chennaoui-Aoudjehane[2] and and A. J. Irving[3]. [1]Washington University in St. Louis, USA, wittmann@levee.wustl.edu; [2]Hassan II University, Casablanca, GAIA Laboratory, Moroccan Geoheritage Team Morocco; [3]University of Washington, Seattle, USA.

Introduction: Oued Awlitis 001 is a brownish-gray lunar meteorite found as two fitting pieces in 2014 in Morocco (25.954°N, 12.493°W). The main 382 g piece was excavated from shallow depth during a search for firewood.

Petrography: The stone has a pale yellow-brown, ~0.5 mm thick, translucent fusion crust that displays a darker network of anastomozing wrinkle ridges; a cut face exhibits a fine-grained, wavy texture of gray minerals in a grayish-white groundmass.

Microscopically, Oued Awlitis 001 is a crystallized, clast-rich melt rock with a poikilitic texture of intensely fractured olivine, pigeonite and augite that fill interstitial spaces between 5 to 50 µm, blocky plagioclase phenocrysts. This crystallized groundmass envelops partly assimilated, strongly undulous, <1 mm plagioclase clasts that are distinguished by irregular fractures and larger compositional variation than the phenocryst plagioclase. Commonly these clasts display planar deformation features (PDF) and, in places, 10 µm, euhedral silica. Up to 10 µm kamacite and taenite, and up to 70 µm troilite occur in both clasts and groundmass. Rare, euhedral, <10 µm ilmenite and Ti-Fe rich spinel can contain tiny domains of FeNi metal. Vitric shock melt occurs in <0.1 mm pods, or <10 µm thick veins that offset the rock fabric. A ~10 µm wide, irregular fracture is filled with brown clay minerals, but no other terrestrial alteration phases were observed in the analyzed thin section.

Chemistry: The major minerals have compositions typical for lunar rocks ($An_{88–97}Ab_{3–12}Or_{0–0.3}$; $Fa_{30–44}$; $En_{48–59}Fs_{26–40}Wo_{6–19}$; $En_{64–70}Fs_{20–24}Wo_{25–34}$). Pyroxene and olivine molar Fe/Mn plot along trendlines for lunar and terrestrial rocks [1]. Kamacite has Ni and Co abundances typical for L-chondrites [2], whereas taenite compositions fall in the field for Apollo polymict rocks [3].

Implications: Shock metamorphic overprints of >10 to <24 GPa [4,5] that are manifested by PDF in plagioclase clasts are inferred to be relict features of unassimilated debris that became entrained in the impact melt that crystallized plagioclase chadacrysts and olivine and pyroxene oikocrysts. Intense fracturing of these oikocrysts and local shock melting post-dates solidification of the impact melt rock and could relate to the excavation of this stone. Texturally and compositionally similar clasts to this meteorite occur in lunar regolith breccia meteorites Shişr 161 [6] and Pecora Escarpment 02007 [7]. Such rocks may represent >0.01 to <1 km thick lids of debris-choked melts that overlie extensive volumes of impact melt [6].

Outlook: We will present trace element INAA data for the stone from Oued Awlitis, and explore the chemical similarities with clasts in other lunar meteorites and in Apollo impact melt rocks to test hypotheses for the petrogenesis of this lithology.

References: [1] Papike J. J. 1998. *Rev. Min.* 36: 7-1–7-11. [2] Afiattalab F. & Wasson J. T. 1980. *GCA* 44: 431–446. [3] Ryder G. et al. 1980. *Proc. LPSC* 11: 471–479. [4] Ostertag R. 1983. *Proc. LPSC* 14: B364–B376. [5] Fritz J. et al. 2011. Abstract #1196. 42nd LPSC. [6] Wittmann A. et al. in press. *Am. Min*. [7] Korotev R. L. et al. 2006. *GCA* 70: 5935–5956.