Rhyolitic (Micrographic Granite) Igneous Clasts from Ancient Mars in the Martian Meteorite Northwest Africa 8171

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We report rhyolitic igneous rock clasts and SiO_2 grains found within a proto-breccia clast (PBC-01) in the Martian polymict breccia Northwest Africa 8171 (NWA 8171). Proto-breccia clasts show a brecciation history prior to incorporation into a final regolith breccia [1]. PBC-01 is depleted in Mg compared to the typical NWA 8171 groundmass. It texturally resembles a rapidly crystallized melt and consists of crystal fragments, glassy melt chards, and a low number of igneous clasts *inter alia*.

Numerous crystal fragments are SiO_2 grains showing a sub-angular to sub-rounded shape; the largest 12 fragments are 40−170 µm in apparent diameter. Two igneous rock clasts (clast8 and clast9, 220×110 µm and 30×20 µm, respectively) are of rhyolitic composition. We focussed our study on the clast8 because of its larger size and higher mineral variability. It consists mainly of two potassic feldspars ($An_{11}Ab_{82}Or_7$-$An_0Ab_{27}Or_{73}$) forming a micrographic intergrowth with α-quartz; minor phases include acicular chlorapatite, a euhedral Fe-oxide grain, and small zircon crystals. Three zircon grains ((z1, z2, z3), 1−4 µm in size), were used for *in situ* U-Pb dating with SIMS. This yielded two data points (z1 and z2) which fall in row with reported zircon data for paired samples NWA 7533 and NWA 7034 [2,3]. The discordia intercepts at 4289±970 Ma and 1397±410 Ma (2σ error). z3 plots off that discordia, with lower $^{206}Pb/^{238}U$ and $^{205}Pb/^{235}U$ values.

We tentatively interprete the U-Pb data in the sense, that z1 and z2 plot on a similar discordia as previously measured zircons by [2,3]. z3 was likely affected by a Pb-loss event at <<1500 Ma. The data suggest that evolved melts were already present on ancient Mars. The co-occurrence of SiO_2 grains might suggest that these melts crystallized in larger bodies, opposed to the rhyolitic melts reported in [4]. Their erosional products where present within the Martian regolith when the PBC-01 lithology formed.

[1] Santos A. R. et al. (2015) *GCA* 157, 56-85; [2] Humayun M. et al. (2013) *Nature* 503, 513-516; [3] Yin Q.-Z. et al. (2014) *LPSC* XLV Abstract #1320; [4] Filiberto J. et al. (2014) *Am. Min.* 99, 601-606.