NEW DATA FOR NWA 7906, 7907 AND 8171, PAIRINGS OF MARS BRECCIA NWA 7034.

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Introduction: Pairings of NWA 7034 were investigated by X-ray tomography, light microscopy, SEM, electron microprobe, XRF and laser fluorination-mass spectroscopy. This study mainly investigated the events resulting in the formation of a compact rock and subsequent alterations.

X-ray tomography: Bulk tomographs of NWA 7906 and NWA 7907 reveal a multiphase brecciation and the common precence of spherical, sometimes elongated homogeneous (rarely concentrically layered) objects with elevated density. One clearly dumbbell-shaped double-spheroid of 2.5 by 5 mm was observed. The rock shows a subtly layered texture.

Density and porosity: Bulk density measurements based on tomographic volumes and immersion in isopropanol yielded very similar results of 2.89±0.03 g/cm^3 (n=6). The grain density calculated from bulk mineralogy [1] is 3.26 g/cm^3. This indicates a porosity of 11.4±0.9 vol%. Open porosity determined by saturation with isopropanol in vacuum is 7.8 vol% (n=2).

Petrology: Melt spherules show a range of different textures (devitrified glass, porphyritic, concentric layered). Evidence for post-brecciation events include secondary feldspar ($An_{22-36}Ab_{60-60}Or_{04-14,}$ n=14) in fractures and around melt globules, magnetite overgrowths on complex oxide grains, red-brown alteration of melt spherules and strong alteration of pyrite to goethite. We consider feldspar, magnetite and blackening of reddish fragments as evidence of a mild metamorphic event resulting in breccia compaction under magnetite stability conditions. Goethite formation and reddish oxidation rims represent the last event and might be due to terrestrial alteration, which would have been facilitated by the dominantly open porosity of the material.

XRF: 40 XRF analyzes of natural and cut surfaces show very similar results, indicating low levels of terrestrial contamination. Key elements (wt %) are Fe 12.2±0.3, Mn 0.27±0.01, S 0.10±0.03, Cl 0.20±0.04, (ppm) Ni 524±61, Zn 95±17, Zr 135±27.

Oxygen isotopes: Six analyses of two distinct and isotopically heterogeneous lithologies gave the following averaged results: $\delta^{17}O$=4.28±0.32; $\delta^{18}O$ 6.96±0.67; $\Delta^{17}O$ 0.67±0.02 (1σ). Samples leached with ethanolamin-thioglycollate to remove iron (hydr)oxides show a slight shift to heavier isotopic values along a slope of ~0.5, suggesting that the dominant magnetite has a $\Delta^{17}O$ similar to the bulk rock and hence may be indigeneous to the samples. The influence of terrestrial hydroxides may be hidden due to their relatively low abundance.

Conclusions: Formation of a solid rock from a regolith is a result of a mild metamorphic event indicated by formation of secondary feldspar and magnetite. Subsequent formation of iron hydroxides is possibly related to terrestrial alteration. Any interpretation of bound water requires caution, therefore. The elemental composition is very similar to in-situ analyzes of regolithic surface materials on Mars [2] except for much lower contents of S, Cl and Zn.

References: [1] Agee, C. B. et al. 2013. *Science* 339, 780-785. [2] Blake, D. F. et al. 2013. *Science* 341.