PETROLOGY AND COMPOSITION OF "ENRICHED" MAFIC SHERGOTTITE NORTHWEST AFRICA 5718: CONTRASTS WITH NORTHWEST AFRICA 2975/2986

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Introduction: Northwest Africa 5718 is a completely fusion crusted 90.5 gram stone, at first proposed to be another specimen among the hundreds gathered from an Algerian strewnfield containing Northwest Africa 2975 and other paired material classified under 14 additional NWA numbers. However, although all of these stones are "enriched" mafic shergottites, there are significant differences between NWA 5718 and NWA 2975 et al.

Petrography: NWA 5718 is fine to medium-grained with ophitic, subophitic and granular textures, and some preferred orientation of prismatic clinopyroxene grains. Clinopyroxene (70 vol.%) is more abundant than in NWA 2975 [1]; other phases are maskelynite (25 vol.%; zoned from cores of $An_{56.8}Or_{2.1}$ to rims of $An_{52.3}Or_{4.8}$), ulvöspinel, ilmenite, pyrrhotite, merrillite, and small pockets of late-stage K-rich glasses (with crystallites of ilmenite, merrillite, pyroxene, and silica). Pigeonite and augite are compositionally zoned with mottled extinction, shock lamellae, and kink bands; pigeonite compositions range from $Fs_{30.5}Wo_{9.6}$ to $Fs_{41.8\text{-}45.7}Wo_{12}$ (FeO/MnO = 32), and augite is $Fs_{25.4\text{-}33.4}Wo_{28.3\text{-}31.1}$ (TiO_2 = 1.5 wt.%; FeO/MnO = 28).

Oxygen Isotopes: Two acid-washed subsamples of NWA 5718 analyzed by laser fluorination gave, respectively: $\delta^{17}O$ 2.60, 2.50; $\delta^{18}O$ 4.47, 4.29; $\Delta^{17}O$ 0.253, 0.245 per mil. Eight replicate analyses on paired samples NWA 2975, NWA 2986 and NWA 5313 gave a mean $\Delta^{17}O$ value of 0.265 ± 0.025 per mil.

Bulk Trace Elements: Representative powders from both NWA 5718 and NWA 2986 analyzed by ICPMS demonstrate significant differences in trace element abundances. The chondrite-normalized REE pattern for NWA 5718 is parallel to but much higher (~11×chondrites) than that for NWA 2986 (~3× chondrites), and NWA 2986 exhibits a positive Eu anomaly. These and other differences (e.g., in abundances of Cr, V, Ni and Hf) establish that NWA 5718 crystallized from a more mafic and REE-rich magma than the NWA 2975/2986 parent magma.

Decoupled Major Elements: Although the REE patterns for 13 well-analyzed "enriched" shergottites are essentially subparallel (over a factor of 4 range), there is no consistent correlation with Mg/Fe or other indicators of magmatic evolution. Primitive specimens such as NWA 4468 and RBT 04262 plot at both the high and low ends of the abundance range. These inconsistencies may reflect variable mantle source characteristics (possibly due to fluid metasomatism) and/or assimilation of mafic crust [2].

Neodymium Isotopes: NWA 5718 whole rock has $^{143}Nd/^{144}Nd$ = 0.512305 and $^{147}Sm/^{144}Nd$ = 0.1719, confirming that it was derived from an "enriched" mantle source with present day ε_{Nd} of -6.48. Rb-Sr and Lu-Hf analyses are in progress.

References: [1] Wittke J. et al. 2006. *Lunar Planet. Sci.* **XXXVII**, #1368. [2] Rumble D. and Irving A. 2009. *Lunar Planet. Sci.* **XL**, #2293.