HARZBURGITIC ACHONDRITE NORTHWEST AFRICA 7835 AND ITS POTENTIAL AFFINITY TO UNGROUPED METAL-POOR "ORDINARY" CHONDRITES.

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The fresh interior of a 56 gram stone coated in black, glossy fusion crust found in southern Morocco has the appearance of a coarse grained diogenite consisting of gray pyroxene and pale yellow olivine with very little metal or sulfide.

Petrography: NWA 7835 is an unusual melt-matrix fragmental mineral breccia. It is composed predominantly of large grains (up to 6 mm) of olivine ($Fa_{23.7-24.6}$, FeO/MnO = 57-60) and orthopyroxene ($Fs_{19.5-20.4}Wo_{1.4-1.6}$ with more magnesian cores $Fs_{15.0-15.8}Wo_{0.8-0.7}$; FeO/MnO = 33-37), minor clinopyroxene ($Fs_{7.2}Wo_{45.0}$; FeO/MnO = 24), chromite, rare taenite and troilite in a sparse, interstitial matrix of vesicular, feldspathic glass charged with angular fragments of the constituent minerals. No chondrules are present. The matrix glass contains (in wt.%) SiO_2 61.5, Al_2O_3 22.0, FeO 0.51, CaO 3.2, Na_2O 9.4, K_2O 0.9.

Oxygen Isotopes: Analyses of four acid-washed subsamples by laser fluorination gave, respectively: $\delta^{17}O$ 3.190, 1.971, 2.309, 1.889; $\delta^{18}O$ 5.042, 3.709, 4.044, 3.870; $\Delta^{17}O$ 0.528, 0.013, 0.174, -0.154 per mil (for a TFL slope of 0.528).

Bulk Composition: Representative clean bulk cutting dust was analyzed by XRF and ICPMS: (in wt.%) SiO_2 42.9, TiO_2 0.16, Al_2O_3 2.6, Cr_2O_3 0.45, FeO 17.9, MnO 0.33, MgO 29.9, CaO 1.7, Na_2O 0.85, K_2O 0.13, P_2O_5 0.05, Ni 0.1; (in ppm) La 0.45, Ce 1.23, Pr 0.19, Nd 0.89, Sm 0.28, Eu 0.10, Gd 0.37, Tb 0.06, Dy 0.39, Ho 0.08, Er 0.24, Yb 0.23, Lu 0.04, Hf 0.31.

Discussion: This unusual specimen is an ungrouped achondrite, but with affinities to "ordinary" chondrites, yet there is hardly any metal present (and no kamacite). The bulk major and trace elements are broadly chondritic, yet only one out of four subsamples analyzed for oxygen isotopes plots near the trends for any typical ordinary chondrites (namely H chondrites). However, the compositions of the mafic minerals are inconsistent with those of H chondrites and more similar to those of L chondrites. Three other oxygen isotope analyses conducted on acid-washed subsamples of this very fresh specimen plot close to the TFL.

The vesicular nature of the feldspathic glass seems to indicate that a partial melting event affected the specimen following the formation of the major mineral phases. However, that event did not result in homogenization of oxygen isotopes within different portions of the specimen. Therefore, we conclude that the oxygen isotope heterogeneity is an inherited feature from a pre-existing coarse grained harzburgitic protolith, which furthermore may have affinities with certain metal-poor, unequilibrated chondrites that we have documented previously [1, 2]. Specimens such as NWA 3127, NWA 4468 and NWA 5717 also are characterized by metal contents much lower than in LL chondrites and variable oxygen isotopic compositions which include some near the TFL.

References: [1] Rumble D. et al. 2007. Abstract #2230. *LPS* XXXVIII. [2] Bunch T. et al. 2010. Abstract #1280. *LPS* XLI.