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NORTHWEST AFRICA 2824; ANOTHER EUCRITE-LIKE SAMPLE FROM THE IBITIRA PARENT BODY?

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Petrography: Northwest Africa 2824 is a highly shocked (S3–5) and brecciated achondrite (485 grams) composed of 80 vol.% orthopyroxene ($Fs_{31.2-33.8}Wo_{3.1-3.8}$; FeO/MnO = 31–38; with more Mg-rich, $Fs_{20}Wo_{3.3}$ reaction rims) and 18 vol.% plagioclase ($An_{96.3-98.8}$; some as large, angular clasts up to 1.5 cm), with 2 vol.% metal and iron sulfide (2–3.4 wt%. Ni), and rare olivine. Plagioclase exhibits complex spherulitic textures typical for crystallization from former shock-melt glass. Most of the smaller pyroxenes have recrystallized into polygonal mosaics, and grains larger than one mm show mechanical twinning, PDFs, reduced birefringence and annealed reaction grain margins.

Oxygen Isotopes: Acid-washed samples analyzed in replicate by laser fluorination gave, respectively: $\delta^{17}O$ 1.937, 1.841; $\delta^{18}O$ 3.786, 3.594; $\delta^{17}O$ –0.054, –0.050 per mil. These compositions plot resolvably below the TFL, and very close to the values determined in the same laboratory for the vesicular, eucrite-like achondrite Ibitira[1], but far from the field for HEDOD meteorites considered to be related to 4Vesta.

Bulk Composition: INAA on a 191 mg sample gave the following preliminary results: FeO 14.9 wt%, Na2O 0.29 wt%; in ppm, Sc 34, Cr 3500, Co 29, La 2.52, Sm 1.55, Eu 0.62, Yb 1.7, Lu 0.26. NWA 2824 is less Fe-rich (and presumably more magnesian) than typical eucrites, and also Ibitira. In comparison to Ibitira [2], NWA 2824 has similar Sc abundances but higher Cr and Co abundances, yet its chondrite-normalized REE pattern is almost identical (flat at ~8 times chondrites).

Affinities: Although the pyroxenes in NWA 2824 are compositionally similar to those in diogenites, the plagioclase content and oxygen isotopic composition are inconsistent with diogenites (and also eucrites). The possibility that this highly shocked specimen may be related to Ibitira begs the question as to whether Ibitira may be a product of impact melting [cf., 3]. The hornfelsic texture of Ibitira [4] and the presence of secondary, probably vapor-deposited phases within the vesicles [5] suggest that its enigmatic vesicularity might be a manifestation of trapped solar wind in a former regolith or related to vaporization during an energetic impact on its parent body.

References: [1] Wiechert U. et al. 2003. *Earth and Planetary Science Letters* 90:1151–1154. [2] Wänke H. et al. 1974. Proc., 5th LPSC. pp. 1307–1335; Jarosewich E. 1990. *Meteoritics* 25:323–327. [3] Mittlefehldt D. W. 2005. *Meteoritics & Planetary Science* 40:665–677. [4] Steele I. M. and Smith J. V. 1976. *Earth and Planetary Science Letters* 33:67–78. [5] Wadhwa M. and Davis A. M. 1998. LPSC XXIX, #1931; Heim N. A. et al. 1999. LPSC XXX, #1908.