PETROLOGY OF THE METAL-RICH LL6 NWA 1396.

K. G. Gardner,[1] D. S. Lauretta,[1] D. H. Hill,[1] and M. Killgore[2]. [1]Lunar and Planetary Laboratory, University of Arizona. E-mail: kgardner@lpl.arizona.edu. [2]Southwest Meteorite Center.

Introduction: Northwest Africa 1396 is an unusual LL6 ordinary chondrite; while containing silicate clasts of LL composition, it contains mm-wide taenite veins and has textural similarities to the H6 ordinary chondrite Portales Valley, an impact-melt breccia [1-3]. We perform a comprehensive study of the petrology and geochemistry of NWA 1396 in order to better constrain its origin and genetic relationship to other ordinary chondrites and possibly the primitive achondrites.

Initial Results: Electron microprobe (Cameca SX-50) analyses of one thin section of NWA 1396 reveal homogeneous olivine ($Fa_{30.7\pm0.3}$), both low- and high-Ca pyroxene ($Wo_{1.6\pm0.4}En_{73.5\pm0.3}Fs_{24.8\pm0.2}$ and $Wo_{43.8\pm0.7}En_{46.3\pm0.3}Fs_{9.9\pm0.6}$), and inhomogeneous secondary plagioclase (averaging $Ab_{80.2\pm18}An_{9.6\pm2.3}Or_{10.2\pm20.2}$). Two pyroxene thermometry yields an equilibration temperature of 866 ± 6 ºC. Iron alloys occurs rarely as kamacite (~4.4 wt % Ni) and frequently as millimeter-wide taenite (40-52 wt % Ni) veins, which extend up to ~7.5 mm in length, and taenite blebs in the matrix. Minor troilite and chromite are also present. Relict chondrules exist that are 0.5-1 mm in diameter. Based on the methods of [4] and [5], NWA 1396 is a shocked (S2) monomict LL6 ordinary chondrite breccia with a weathering grade of W2.

Discussion: The texture of NWA 1396 is very similar to that of Portales Valley; it contains metal with a sinuous, wormy texture indicative of shock processing. Thus, NWA 1396 likely formed as an impact melt breccia on the LL-chondrite parent body. It is curious, however, that the metal veins in NWA 1396 are Ni-rich, indicating they did not result from the melting of LL-chondrite material during the impact. It is possible that the metal veins in NWA 1396 are melt products of the impactor, perhaps an iron meteorite.

The silicate portion of NWA 1396 shares compositional similarities to the primitive achondrites Tafassasset and RBT 04239 [6]. However, the two-pyroxene equilibration temperatures are different for these three. It is noteworthy that Fa and Fs values of NWA 1396 silicates are at the Fe-rich end of the LL range and are similar to Tafassasset and the brachinites. Likewise, NWA 1396 plots near Tafassasset and the brachinites on a mol % Fa versus Fe/Mn plot. Oxygen-isotopic analysis is needed to determine whether a genetic link exists between NWA 1396 and these primitive achondrites. However, it is possible that these samples equilibrated in a similar oxidation environment.

References: [1] Kring D. A. et al. 1999. *Meteoritics & Planetary Science* 34:663-669. [2] Rubin A. E. et al. 2001. *Geochimica et Cosmochimica Acta* 65:323-342. [3] Ruzicka A. et al. 2005. *Meteoritics & Planetary Science* 40:261-295. [4] Kallemeyn G. W. et al. 1989. *Geochimica et Cosmochimica Acta* 53:2747-2767. [5] Wlotzka F. 1993. *Meteoritics and Planetary Science* 28:A460. [6] Gardner K. G. et al. 2007. Abstract # 2086 38th Lunar and Planetary Science Conference.

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