**A SPECTACULAR COMPOUND CHONDRULE-CAI IN NORTHWEST AFRICA 2918, A NEW CO3.1 CHONDRITE.**

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**Introduction:** Northwest Africa (NWA) 2918 was recently classified as a very primitive, type 3.0, CO chondrite [1]. Our analysis of the Cr content of ferroan olivine using the method of [2] shows a distribution very similar to that in DOM 03238 [3], lacking a prominent mode near 0.4 wt% $Cr_2O_3$ as in type 3.0; mean $Cr_2O_3$ = 0.24 ± 0.12 wt%. Both meteorites are probably type 3.1 and have experienced very light thermal metamorphism.

Optical examination of a 2-$cm^2$ thin section of NWA 2918 revealed a typical CO chondrite texture, with an abundance of small chondrules and Ca-Al-rich inclusions (CAIs). A deep-blue, circular object 170 μm in diameter was conspicuous in transmitted light. This object is a CAI partially enveloped by a type I, porphyritic pyroxene (PP) chondrule. Compound objects consisting of CAIs and ferromagnesian chondrules are extremely rare [4], and this one has many unusual properties worthy of study.

**Mineralogy/petrology**: The chondrule portion of the compound object is unremarkable in mineralogy. Low-Ca pyroxenes, $Fs_{1.5}Wo_{1.5}$ are richer in refractory elements than is normal for PP chondrules (2.4% $Al_2O_3$, 0.4% $TiO_2$), and poikilitically enclose olivine ($Fa_2$). Abundant oxidized grains, formerly rich in Fe metal are present. Mesostasis is anorthite or anorthitic glass, richest in $TiO_2$ near the CAI and $Na_2O$ away from it. Ca-rich pyroxene is also abundant.

The core of the CAI is dominantly a deep-blue colored spinel that has 2.0 wt% $TiO_2$, 0.6 wt% $Cr_2O_3$ and 0.6 wt% FeO. Spinel near the rim of the CAI has 1.3 wt% $TiO_2$ and is nearly colorless. A pale-blue spinel grain previously extracted from Murchison [5] was not rich in $TiO_2$. The outer portion of the CAI is mostly anorthite or anorthitic glass. Like the spinel, anorthite is high in $TiO_2$ near the CAI core (0.4 wt%) and has ~half as much near the rim. Several crystals of an unidentified Ti-rich oxide phase occur in the CAI core, with 85% $TiO_2$, 10% MgO and 4% $Al_2O_3$. Nepheline and Ca-rich pyroxene are present in the outer part of the CAI, but only on the surface away from the chondrule. Tiny metal grains rich in Fe, Ru and Mo are also present in the CAI.

**Discussion:** This compound object formed by the collision of an unusual Ti-rich CAI with a molten or partially molten chondrule. The absence of perovskite is puzzling; there is no evidence that the Ti-rich oxide is secondary after perovskite. The chondrule minerals experienced chemical exchange with those in the CAI, leading to zoning and refractory enrichment. Entry of alkalis occurred after the compound object solidified, resulting in sodic plagioclase in the chondrule far from the CAI and nepheline in the CAI far from the chondrule. Isotopic studies are underway to determine the chronology of the events leading to the formation of the object as well as the origin and nature of the minerals in the strange CAI.

**References:** [1] Connolly H. C. Jr. et al. 2006. *M&PS* 41:in press, [2] Grossman J. N. and Brearley A. J. 2005. *M&PS* 40:87-122. [3] Grossman J. N. and Rubin A. E.2006. Abstract #1383. 27th LPSC. [4] Krot A. N. et al. 2006. *Ap. J.* 639: 1227-1237. [5] MacPherson et al. 1983. *GCA* 47:823-839.