NORTHWEST AFRICA 766: A NEW FERROAN UREILITE WITH Cr-SPINEL, Cr-RICH GARNET (?) AND ASSOCIATED Si,Al-RICH GLASSES. Mathieu Sikirdji and Paul H. Warren, Institute of Geophysics, University of California, Los Angeles, CA 90095-1567, USA (mat.sikirdji@wanadoo.fr, pwarren@ucla.edu).

This is a very preliminary report on a mineralogically extraordinary ureilite, NWA766. The meteorite consists of ~80 vol% olivine, 20% pigeonitic pyroxene, several percent of interstitial black carbon phase(s), and slightly less than 1% Cr-spinel. The olivine is uncommonly ferroan: cores average about $Fo_{76.3}$, with 0.26 wt% CaO, and molar Fe/Mg, Fe/Mn and Fe/Cr ratios of 0.31, 49 and 52, respectively. These ratios hint at possible deviations from the usual ureilite Fe/Mg-Fe/Mn-Fe/Cr systematics [*1*] in the same way, albeit less dramatically, as seen in the extremely ferroan and Cr-rich sample LEW88774 [*1-3*]. Pyroxene generally clusters tightly around $En_{67.0}Wo_{14.5}$. The overall texture is typical ureilitic, with mafic grains averaging 1 mm across (but up to 4 mm), curved intergranular boundaries, and abundant triple junctions. The rock is moderately weathered, W2 [*4*].

The Cr-spinel is compositionally similar to that of LEW88774 [*2*]. In addition, and generally in close proximity to Cr-spinel, there are traces of Cr-rich sulfides, possible carbides, and most interestingly, an association of slender masses of Al,Si-rich glass and a strange Cr-silicate phase. One such Cr-rich region is shown in Fig. 1 (backscattered electron images; lower portion is a magnified view of small box near top portion's right edge). The glasses average 79.5 wt% SiO_2, 13.5 wt% Al_2O_3, 2.4 wt% CaO, 1.6 wt% Na_2O, and 0.5 wt% FeO. Similar glasses have been reported for a few other ureilites [e.g., *5*]. Analyses of the associated Cr-rich silicate show a consistent stoichiometry, with atomic Si/O ratio uniform at 0.254±0.004. For the average composition, a simplified chemical formula is $(Mg,Ca,Fe,Mn,Na)_{2.7}(Cr,Al)_{2.0}(SiO_4)_3$. The compositions appear to represent a solid solution of the knorringite-uvarovite varieties $[Mg_3Cr_2(SiO_4)_3$ and $Ca_3Cr_2(SiO_4)_3]$ of garnet. Shuiskite, $Ca_2(Mg,Al)(Cr,Al)_2(SiO_4)(Si_2O_7)(OH)_2\cdot(H_2O)$, can be ruled out because of the consistently good analysis sums. The long, narrow garnets are internally complex. Ca/Mg ratio increases with distance from the glass. The boundary between knorringite with 0-5 wt% CaO and more uvarovitic garnet with up to 14 wt% CaO is sharp. The *mg* ratio varies from 0.61 (in a knorringite) to 0.94 (at a point with 10.4 wt% CaO). At high magnification (Fig. 1), the garnet, especially the knorringitic portions, appears to have decomposed into a symplectic intergrowth. These intergrowths are far too fine to be resolved by e-probe, and analyses simply reflect their bulk (garnet stoichiometry) compositions. In at least one locale, the garnet is also associated with a sliver of subcalcic $(En_{63}Wo_{29})$ pyroxene.

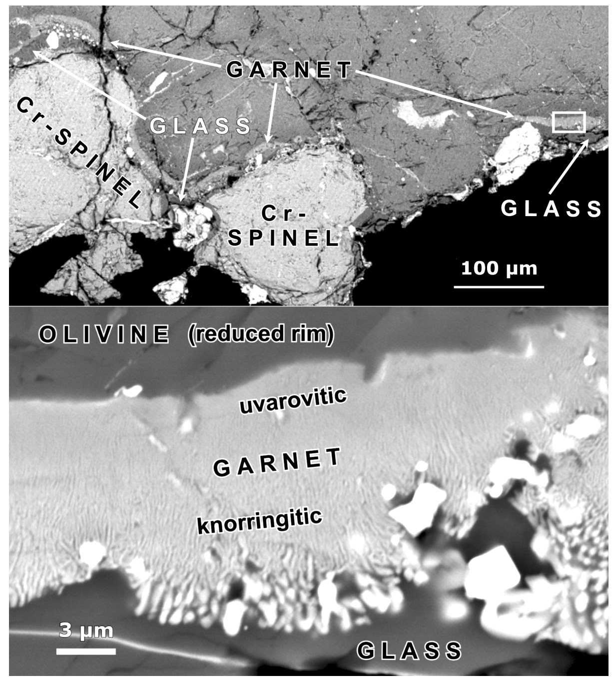

Fig. 1. BSE images of NWA766

Assuming the garnets (or decomposed garnets) formed preterrestrially, their genesis probably involved shock. A huge extrapolation from an experimental dataset tailored for terrestrial Cr-garnets [*6*] suggests that production of the NWA776 garnets, which have Cr/(Cr+Al) = 92.5±(1-σ)3.7, may have required only about 4 GPa, along with a (locally) high shock temperature, >>1700°C.

References: [1] Mittlefehldt D. W. et al. (1998) in *Rev. Mineralogy* **36**, 4.1-4.195. [2] Warren P. H. & Kallemeyn G. W. (1994) *LPS* **XXV**, 1465-1466. [3] Chikami J. et al. (1997) *Meteoritics* **29**, 843-848. [4] Wlotzka F. (1993) *Meteoritics* **28**, 460. [5] Ogata H. et al. (1991) *Meteoritics* **26**, 195-201. [6] Girnis A. V. & Brey G. P. (1999) *Euro. J. Mineral*. **11**, 619-636.