PRESENCE OF HYDROUS PHASES IN TWO R CHONDRITES, NORTHWEST AFRICA 6491 AND 6492. N. Jamsja and A. Ruzicka, Cascadia Meteorite Laboratory, Portland State University, 17 Cramer Hall, 1721 SW Broadway, Portland OR 97207.

Introduction: R chondrites are one of the most oxidized groups of chondrites. They are largely devoid of metal and contain fayalitic olivine, Ni-rich sulfide, Fe^{3+}-bearing spinels, and less commonly, magnetite [1-5]. Recently, amphibole and biotite have also been identified [5-7]. Data presented in this abstract suggests that other hydrous phases of pre-terrestrial origin are present in two newly classified R chondrites, NWA 6491 and 6492.

Results: Both meteorites are genomict breccias (R3-5 and R3-6, respectively) that experienced limited terrestrial weathering. Both contain two phases that have not yet been explicitly identified, but based on low microprobe totals and apparent replacement textures, appear to be hydrous alteration products. The compositions of these phases are summarized in Table 1.

Table 1. Composition (mean, with standard deviation shown in parenthesis, N =number of analyses) of two predominant hydrous phases, hp1 and hp2, found in NWA 6491 and 6492. Ranges in calculated O and totals reflect the possibility of Fe occurring either as Fe^{2+} or Fe^{3+}.

wt%	hp1	hp2
Fe	47.3 (7.9)	35.0 (2.4)
Mg	0.3 (0.3)	6.9 (1.7)
Si	3.5 (1.5)	14.8 (0.6)
Ni	2.4 (2.0)	0.3 (0.2)
O	18.9 – 28.4	31.8 – 36.8
Total*	**73.9 – 83.3**	**88.5 – 94.5**
N	*14*	*14*

*Less $(OH)^-$ or H_2O component. Other elements are present at <1 wt%.

Hydrous phase 1 (hp1) is relatively abundant and is present in the host of both meteorites as well as in lithic clasts of all petrologic types. In type 3 clasts, it can form small interstitial patches between other phases or can form veins that cross-cut mafic silicates; elsewhere it appears to have largely replaced a phase that could have been metal (Fig. 1a,b). In Type 5 and 6 clasts (and much of the host), hp1 is commonly coarser (hundreds of µm across) and intergrown with plagioclase and ferrous olivine (Fig. 1c). The composition of hp1 (Table 1) is rich in Fe and O and does not seem to vary systematically with petrographic type despite the variation in textures. With ~20-30% OH or H_2O, phase hp1 appears to be an iron hydroxide, and could be the Fe-serpentine cronstedtite:

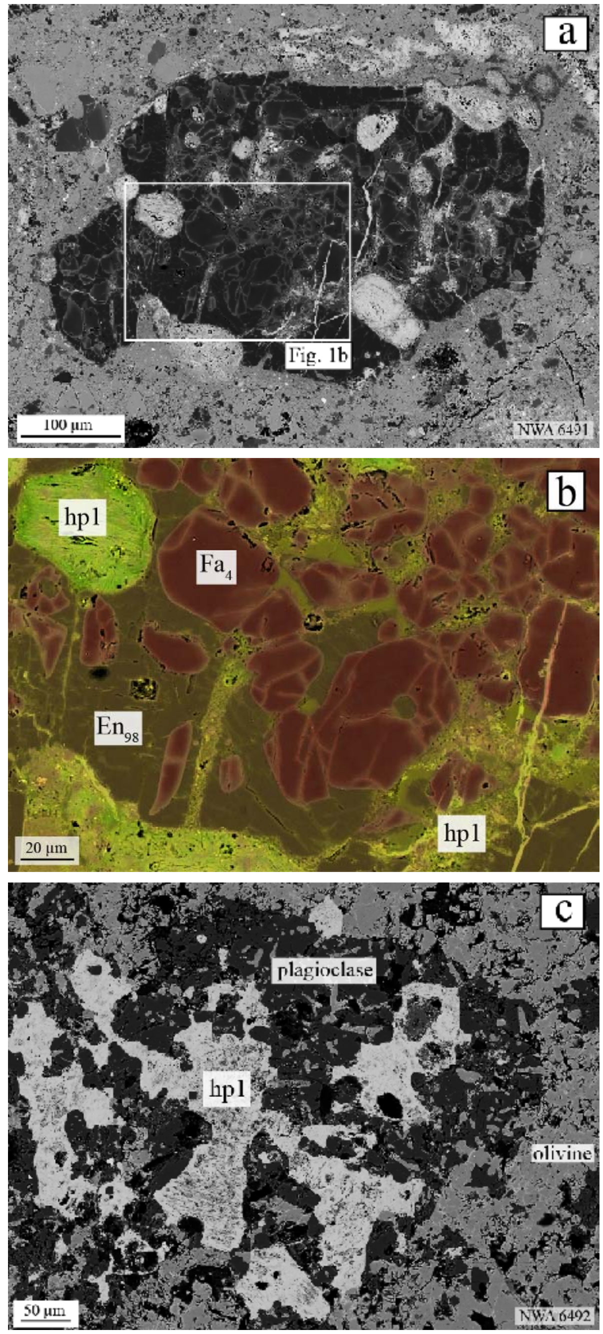

Fig. 1: Hydrous phase 1 (hp1) is visible in backscatter-electron micrographs (a,c) and chemical x-ray map (b). Hp1 is a) present within a magnesian olivine-pyroxene chondrule in a type 3 clast, b) visible as yellow-green coloration in a false-colored phase map, associated with voids. Hp1 appears to have completely replaced a phase, possibly metal, at upper left, c) intergrown with plagioclase and olivine in the host.

$Fe^{2+}_2 Fe^{3+} (Si,Fe^{3+}) O_5 (OH)_4$.

Hydrous phase 2 (hp2) is less abundant (with only 16 grains found in both meteorites) and appears only in the host portion. This phase varies in size from 50 to 200 µm across and is observed either in the form of isolated grains or associated with (sometimes coarse) plagioclase or pyroxene (Fig. 2). Brown absorption and interference colors are characteristic for hp2, and in reflected light (of uncoated thin sections) this phase can be identified by a higher reflectivity compared to surrounding silicates. Hp2 could be a hydrated form of laihunite, $(Fe^{2+}, Mg) Fe^{3+}_2 (SiO_4)_2$.

Conclusions/Implications: Low wt% totals of both hp1 and hp2 suggest their hydrous origin. Hydrous phase 1 might be cronstedtite, which is a common alteration product in CM2 chondrites [8]. The systematic change in appearance of hp1 in clasts of different petrologic types suggests that the phase (or its precursors) was growing during metamorphism. Hydrous phases are usually destroyed with progressive heating, suggesting that hp1 formed by alteration of one or more precursor phases following thermal metamorphism.

Hydrous phase 2 might be related to laihunite, which forms by the oxidation of olivine [9], but if this is the case, hp2 must also have been hydrated. Curiously, hp2 can be associated with glass that does not appear to have been altered (Fig. 2b, c), suggesting that it might have crystallized from a hydrous melt. Coarse intergrown silicates are consistent with this possibility

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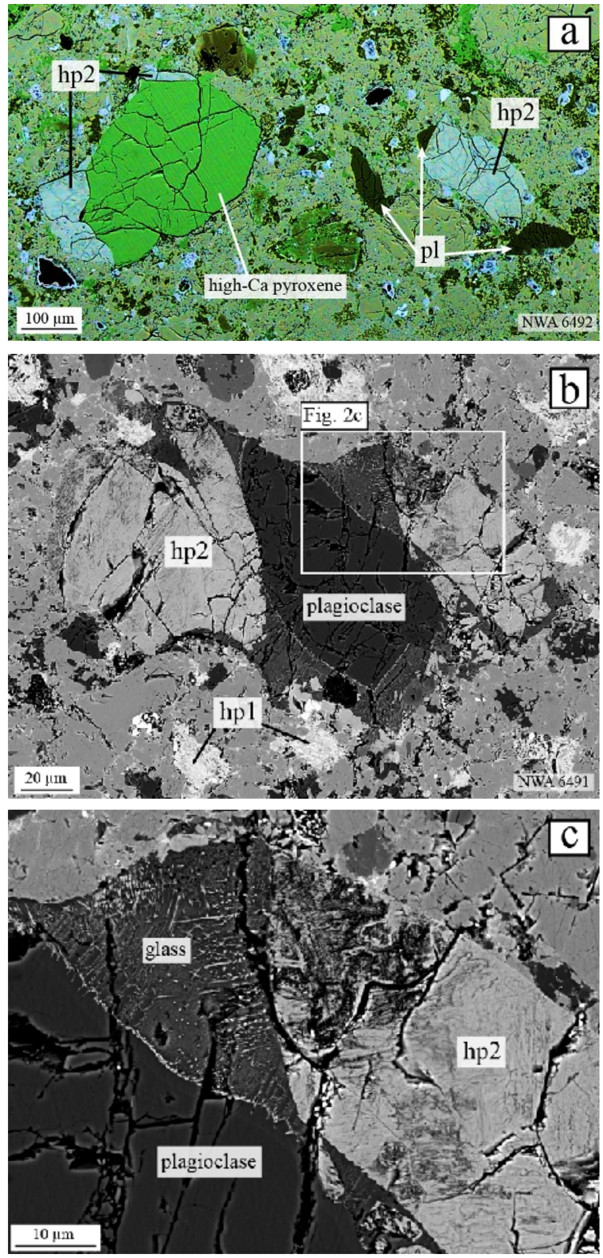

Fig. 2: Hydrous phase 2 (hp2) is shown in a chemical x-ray map (a), and backscatter-electron micrographs (b, c). a) Hp2 (turquoise-blue) is intergrown with plagioclase and high-Ca pyroxene, b) a complex intermixture of hp2 and feldspathic glass and plagioclase. Hydrous phase 1 is also present nearby, c) Hp2 is associated with partly devitrified glass.