FOUNTAIN HILLS IMPACT MELTED CB CHONDRITE AND THERMAL HISTORY OF THE CB PARENT BODY

M. K. Weisberg[1,2] and D. S. Ebel[2]. [1]Dept. Earth and Planetary Sciences, Kingsborough College CUNY, Brooklyn NY 11235. mweisberg@kbcc.cuny.edu. [2]Dept. Earth and Planetary Sciences, American Museum Natural History, NY, NY 10024.

Introduction: CB chondrites have characteristics that sharply distinguish them from other chondrites including (1) high metal abundances (60-80 vol.% metal), (2) most chondrules are cryptocrystalline or barred, (3) moderately volatile lithophile elements are highly depleted and (4) nitrogen is enriched in the heavy isotope [1]. The unusual characteristics of the CBs, the possibility of a relatively young formation age for some CB chondrules [2] and trace element compositions of some CB metal that are consistent with condensation from a dense metal-rich gas [3], suggest that impact played a major role in the formation of CB chondrites. Fountain Hills (Arizona) is a recent find that has oxygen isotopic and mineral compositions that indicate it is a CB chondrite, but has textural characteristics that differ dramatically from other CBs and its $\delta^{15}N$ value is relatively low [4]. We studied Fountain Hills to understand the thermal history of the CB parent body.

Results: Texturally, Fountain Hills (FH) differs from other CBs. Metal is less abundant (26 vol. %) and is distributed throughout the meteorite, interstitial to the silicates. Additionally, the metal is strewn with small mineral and barred chondrule fragments. In other CBs metal occurs as discrete inclusions or fragments and is generally not associated with silicate. FH contains barred and porphyritic chondrules as well as large olivine phenocrysts up to 1 mm in size. Porphyritic chondrules are rare in other CBs and large olivine is not present. Most mineral and chondrule fragments in FH are surrounded by a mixture (melt) of fine anorthite - high-Ca-pyroxene – Si, Al-rich glass and coarse pyroxene grains. Some barred olivine fragments appear to be integrated into this material and their boundaries are obscured. Compositionally, FH is fairly homogenous. Average olivine is $Fa_{3.4}$ (s.d.=1.7). The coarse pyroxene is $Wo_{3.4}$, $Fs_{3.7}$ with 1.7 wt. % Al_2O_3. The anorthite is pure, the fine Ca-pyroxene has up to 2 wt. % TiO_2 and 7 Al_2O_3, the glass has 65 SiO_2 and 19.1 Al_2O_3.

Discussion and Conclusions: FH is a partly melted CB chondrite. It experienced melting and redistribution of metal and possibly drainage of some metal resulting in its lower metal abundance relative to other CBs. Since the metal is one of the major nitrogen carriers in the CB chondrites [5], melting and separation of metal may account for the low $\delta^{15}N$ values of FH [4]. Some relict barred and porhyritic chondrules survived melting while others were completely melted or partly assimilated into the melt, which crystallized to produce olivine phenocrysts and the surrounding anorthite-pyroxene mixture. All of the CBs experienced some degree of post-accretion impact melting as evidenced by small amounts of melt at boundaries between their metal and silicate components. FH is a record of much greater degrees of impact melting than that recorded in the other CB chondrites.

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