**FORMATION OF FE-ENRICHMENT BOUNDARY ZONES BETWEEN CHONDRULES AND THEIR FINE-GRAINED RIMS IN THE CM2 CHONDRITE, Y-791198.**

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**Introduction:** The primary nebular components of CM carbonaceous chondrites have been partially to completely replaced by secondary hydrous phases, as a result of aqueous alteration. The location of the alteration is controversial. Several petrographic studies [1-2] have cited the fact that fine-grained rims in CM chondrites are a disequilibrium mixture of hydrous and anhydrous phases as evidence that the aqueous alteration took place before the accretion of the final parent asteroid. Alternatively, there is also a large body of evidence that supports the parent body alteration model [3-5], including the presence of undisturbed Fe-rich aureoles around altered metal grains [6].

**Results:** SEM studies show that several chondrules in Y-791198 have thin (10-20μm) zone of Fe enrichment at the boundary between the chondrule and its surrounding fine-grained rim. There are three distinct morphologies of Fe-rich zones: a) PCP-like, b) Fe-rich rim-like and c) Fe sulfide-like. The PCP-like boundary usually occurs on the edge of the chondrule, invading the fine-grained rim. These boundaries are not always continuous and seem to be composed of multiple, blocky Fe-rich phases. The Fe-rich rim-like boundaries are similar to the PCP-like type in occurrence, but seem to be simply an Fe enrichment in the fine-grained rim, directly around the chondrule. These are often also discontinuous. The Fe sulfide-like boundaries appear much more homogeneous in composition and texture. Also, these boundaries sometimes occur in the fine-grained rim, slightly detached from the chondrule. Overall, these Fe-rich zones are very similar to those seen in CR chondrites, as reported by [7].

Electron microprobe transverses from the chondrule interior into the fine-grained rim were conducted on two type I and two type II chondrules to characterize the Fe enrichment zones. The transition region from the chondrule mesostasis to the fine-grained rim for type I and type II chondrules is characterized by an increase in Fe, S, Ni, Na and K and a decrease in Mg for the Fe-rich zones. In general, Si and Al decrease, but can remain homogeneous across the Fe-rich zone. Ti generally decreases and Cr generally increases, but both can remain homogeneous. Ca varies indiscriminately.

**Discussion:** It is difficult to reconcile the presence of the Fe enrichment zones, which clearly cross into the fine-grained rims, with the pre-accretionary model. This model calls for the alteration to have taken place before the formation of the fine-grained rims, to explain the presence of unaltered phases juxtaposed against the hydrated rim materials, such as FeNi metal grains. It is more likely that the rims accreted to the chondrules and then these objects accreted into the parent asteroid, where they experienced aqueous alteration. Formation of the Fe-enriched zones may be the result of precipitation of $Fe^{2+}$ or $Fe^{3+}$ from solution as a result of an decrease in pH at the interface between the matrix and chondrule, during the early stages of aqueous alteration.

**References:** [1] Metzler *et al.* (1992) *GCA* **56** 2873. [2] Lauretta *et al.* (2000) *GCA* **64** 3263. [3] Tomeoka & Buseck (1985) *GCA* **49** 1761. [4] Browning *et al.* (1996) *CA* **60** 2621. [5] McSween (1987) *GCA* **43** 1761. [6] Hanowski & Brearely (2001) *GCA* **65** 495. [7] Burger & Brearley (2004) *LPSC* **35** abs#1966, CDROM. **Acknowledgements:** This research was supported by NASA grant NAG5-9798 (A. J. Brearley, P.I.).