SAHARA 00182, THE FIRST CR3 CHONDRITE AND FORMATION OF MULTI-LAYERED CHONDRULES.
Michael K. Weisberg[1,2] (mweisberg@kbcc.cuny.edu) (1) Kingsborough College (City University of New York) NY, NY 11235, (2) American Museum of Natural History, New York 10024

Introduction: The CR chondrites are metal-rich primitive meteorites that have experienced various degrees of hydrous alteration. They are type 2 chondrites based on the presence of olivine, pyroxene and glass, as well as hydrous phyllosilicates and carbonates in their chondrules, refractory inclusions, and/or matrix [1]. GRO 95577 is similar to CR chondrites but has been hydrated to a much greater degree and completely lacks anhydrous silicates [2]. Sahara 00182 (SAH 00182) is a remarkable new chondrite that was initially characterized as an ungrouped metal-rich C3 chondrite [3]. Its metal-rich character suggests that it may be the first CR3 chondrite and CR may be the only chondrite group in which we have an entire suite of materials that range from primitive unaltered (petrologic type 3) to completely hydrated (type 1) chondrites.

Petrology: SAH 00182 contains large (up to 2mm diameter), metal-rich, multi-layered chondrules that are texturally similar to those in the CR chondrites. However, SAH 00182 differs from the CR chondrites in that its chondrules contain troilite, and the chondrules and matrix lack the hydrous phyllosilicates that are characteristic of most CR chondrites. Most chondrules in SAH 00182 are type I with Mg-rich silicates, as in the CR chondrites, and some have normally zoned olivine ranging from Fa_1 in the center to Fa_8 at grain edges. Many chondrules are concentrically layered aggregates containing cores of one or more crystals of forsterite and/or metal surrounded by mantles of metal blebs, followed by silicate shells consisting of olivine and/or pyroxene. Some layered chondrules have barred olivine or cryptocrystalline cores surrounded by mantles of metal blebs, followed by coarser olivine- or pyroxene-rich shells. In some cases, the layered chondrules have rims of silica-rich material similar to those described on layered chondrules in some CR chondrites [4]. Metal in the chondrules from SAH 00182 ranges from 4.7 to 6.6 wt. % Ni and has an approximately solar Ni:Co ratio, similar to metal in the CR chondrites.

Discussion: SAH 00182 is petrologically similar to the CR chondrites but has escaped hydrous alteration and appears to be the first known CR3 chondrite. This affords us the opportunity to petrologically, as well as oxygen isotopically, study an entire alteration sequence in a group of primitive carbonaceous chondritic materials, ranging from unaltered (SAH 00182) to completely hydrated (GRO 95577). Additionally, this is the first opportunity to study multi-layered chondrules from a meteorite that has escaped secondary hydrous alteration. The multi-layered chondrules may represent an early generation of chondrules that record multiple episodes of accretion and heating in the nebula. The cores of the layered chondrules range from aggregates of materials that experienced low levels of partial melting to barred or cryptocrystalline textured materials that may have been completely molten. The mantles of metal blebs that surround the cores appear to have aggregated onto the surfaces of the solidified or partially molten cores. The blebs may have formed by reduction during chondrule formation or may be metal condensates. The silicate shells, consisting of olivine and/or pyroxene, may represent materials that accreted onto the metallic mantle and were subsequently melted or partially melted by a transient heating event. The final stage in formation of these chondrules is marked by the silica-rich rims which may have condensed onto the surfaces of some chondrules from a fractionated nebular gas, as outlined in [4].

References: [1] Weisberg et al. (1993) GCA 57, 1567-1586; [2] Weisberg M. K. and Prinz M. (2000) MAPS 35, A168; [3] Grossman J. N. and Zipfel J. (2001) MAPS, Meteoritical Bulletin No. 85; [4] Krot et al. (2000) LPSC XXXI, abst. # 1470.