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A TEM-NanoSIMS study of chromium nitride in CM chondrites.

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CM2 chondrites contain assemblages of chromium nitride (carlsbergite) and nanocrystalline, phosphorus-bearing pentlandite.

In the CM2 chondrite Yamato 791198, the reduced nitride + sulfide assemblage is found in association with schreibersite and relict grains of Cr-bearing Fe,Ni metal. The crystallographic characteristics of the nitride crystals suggest that their growth was controlled by the Baker-Nutting orientation relationship. Therefore, they most likely precipitated from Cr-bearing metal prior to the sulfidation event. Based on the mineralogical constraints, isotopic investigations by NanoSIMS, and thermodynamic calculations, the most plausible explanation for the high nitrogen enrichments in these assemblages (~1 wt% N) is the reaction of the metal grains with a hot gas containing metastable ammonia (NH₃). This implies complex interactions of volatile reservoirs in the formation region of the CM chondrites.

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Cite abstract as:

Harries, D., Hoppe, P., Langenhorst, F. (2013) A TEM-NanoSIMS study of chromium nitride in CM chondrites. Paneth Kolloquium, Nördlingen (Germany), abstract URL:

<http://www.paneth.eu/PanethKolloquium/2013/0048.pdf> (abstract #0048).