THE PRESOLAR GRAIN INVENTORY OF CM CHONDRITES.

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Introduction: Fine-grained material, including interchondrule matrix and dust rims around chondrules (FGRs) in primitive meteorites contains small amounts of isotopically anomalous presolar or "stardust" grains that have formed in the ejecta of evolved stars or stellar explosions [e.g., 1–3]. CM chondrites contain pronounced FGRs [e.g., 4], qualifying them as promising objects for the search for presolar materials. The majority of the CMs is of petrologic type 2, and has experienced aqueous alteration to a similar degree as the majority of the CR chondrites. Low presolar silicate abundances were reported previously for Murchison by [5], but we observed large variations for other CMs [6]. Studying the presolar grain inventory of the CMs in detail allows us to assess the effect and extent of aqueous alteration on meteorite parent bodies, and to monitor potential heterogeneities of stardust populations within the solar nebula.

Experimental: We investigated FGRs in thin sections of the CM chondrites Banten, Jbilet Winselwan, Maribo, Murchison, Murray, and Yamato (Y-) 791198. Ion imaging of 10×10 µm²-sized areas was performed with the NanoSIMS 50 ion probe at the MPI for Chemistry. $^{16}O^-$, $^{17}O^-$, $^{18}O^-$, $^{28}Si^-$, and $^{27}Al^{16}O^-$ were measured in multi-collection to identify presolar silicates and oxides. Elemental compositions of five grains from Murchison and Murray were studied with the PHI 700 Auger Nanoprobe at Washington University.

Results & Discussion: A total area of ~62,000 µm² was scanned for presolar O-rich signatures. We identified 6 presolar silicates and 6 Al-rich oxides. The average presolar O-anomalous grain abundance is 22±6 ppm (10 ppm for silicates, 12 ppm for oxides). This is largely compatible with the interchondrule matrices of CR2 chondrites, but lower than the respective FGR abundances [3]. The presolar silicate/oxide ratio is ~1, the lowest observed for primitive solar system materials [7]. The average presolar grain size in the CMs is ~370 nm, larger than the 250–300 nm observed in other chondrites [7]. Two oxide grains have spinel-like compositions; two silicates are Fe-rich, while one shows a Mg-rich composition. Our observations indicate that aqueous alteration in the CM2s, other than in the CR2s, resulted in preferential destruction of presolar silicates and of smaller O-anomalous grains in general. The presence of Fe-rich stardust silicates could also hint towards progressive secondary processing, although non-equilibrium condensation in stellar environments or Fe-implantation in the interstellar medium are other possibilities [e.g., 8].

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References: [1] Hoppe P. 2008. Space Sci. Rev. 138:43. [2] Haenecour P. & Floss C. 2012. *LPSC* 43:#1107. [3] Leitner J. et al. 2013. *MAPS* 48:#5175. [4] Metzler K. et al. 1992. *GCA* 56, 2873. [5] Nagashima K. et al. 2005. LPSC 36:#1671. [6] Leitner J. et al. 2013. *LPSC 44*:#2273. [7] Hynes K. M. & Gyngard F. 2009. *LPSC* 40:#1198. [8] Bose M. et al. 2010. *ApJ* 714:1624.