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Isotopic compositions and structural features of presolar SiC grains from supernovae.

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We identified 54 supernova (SN) derived presolar SiC grains in a separate of the Murchison meteorite, using automated NanoSIMS isotope imaging [1]. Fifty-one grains are of type X, with subsolar $^{29}Si/^{28}Si$, $^{30}Si/^{28}Si$ and $^{14}N/^{15}N$ but variable $^{12}C/^{13}C$ ratios. Two grains are of type C (with extreme enrichment in the heavy Si isotopes) and one grain has an unusual isotopic composition with supra-solar $^{29}Si/^{28}Si$ and $^{12}C/^{13}C$ ratios but a sub-solar $^{30}Si/^{28}Si$. Electron-transparent lamellae of 6 SN grains have been prepared by FIB and investigated by TEM. Two of the 6 grains are single crystals whereas 4 are crystal aggregates. All but one grains are inclusion-free. We identified the cubic 3C and the hexagonal 2H and 6H polytypes of SiC in the grains. Crystals of the hexagonal polytypes are apparently more common among SN grains than in non-SN presolar SiC [2], which presumably reflects differences in the condensation conditions between SN ejecta and the winds of AGB stars.

[1] Gröner, E. & Hoppe P. (2006) Appl. Surf. Sci. 252, 7148–7151. [2] Daulton, T.L. et al. (2003) GCA 67, 4743–4767.

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