Unmelted Antarctic micrometeorites at the nanoscale

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Unmelted micrometeorites represent unique extraterrestrial materials that largely preserved the original petrographic, mineralogical and geochemical properties of their precursor parent bodies or phases [e.g., 1]. Five unmelted and scoriaceous micrometeorites, with diameters varying between 142 and 408 μm, that were recovered from sediment traps in the Sør Rondane Mountains of East Antarctica, have been analyzed in a non-destructive way using the ID16B Nano-Analysis beamline at the ESRF in Grenoble. For each particle, XRF and XRD spectra were measured simultaneously at a spatial resolution of 250 nm, while CT data were obtained at spatial resolutions varying between 100 and 225 nm.

Based on the structural, chemical, and mineralogical data collected, the characterized micrometeorites were classified as either scoriaceous or unmelted, with porosities calculated to vary from 8.9 to 23.3 %. The combined observations concerning the mineralogy, porosity and chemical composition for these particles all point towards a carbonaceous chondrite (CC) parentage, as suggested previously for comparable particles [2-3]. Using a Cameca IMS 1270 ion microprobe at the CRPG in Nancy, France, triple-oxygen isotope ratios confirm and refine the parentage for two of the studied particles, containing either refractory Mg-Al spinel or relict olivine minerals, to the CM-CO clan [4].

References: **[1]** Van Ginneken et al. (2012). *Meteorit. Planet. Sci.*, 47, 2, 228-247. **[2]** Taylor et al. (2012). *Meteorit. Planet. Sci.,* 47, 4, 550-564. **[3]** Britt & Consolmagno (2003). *Meteorit. Planet. Sci.,* 38, 8, 1161-1180. **[4]** Matrajt et al. (2006). *Geochim. Cosmochim. Acta,* 70, 4007-4018.