# OXYGEN ISOTOPE ANALYSIS OF A CHONDRULE-LIKE WILD2 TERMINAL PARTICLE USING NANOSIMS

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**Introduction:** Oxygen isotopes provide a key tool in determining origins and links of diverse Solar System materials. SIMS analyses of terminal particles returned from Comet Wild2 with sufficient analytical precision for useful comparison to meteorites are very limited [1-3]. Generally, analyses of grains have used potted butts or single grains pressed into gold in order to provide sufficient sample thickness to analyse with high current probes. At most, only one potted butt can exist for any characterised terminal particle and in many cases it is required for other analytical techniques or no longer contains cometary material. Here we utilise the more readily available microtomed sections as a means of extracting useful oxygen isotopic information. NanoSIMS 50L isotope imaging mode allows the material available for analysis from these very thin sections (≈70nm) to be maximised, although analytical uncertainty reported by others using this technique is large [4].

**Sample:** The microtomed TEM section is from *Stardust* terminal particle #2, Track 154 (C2063,1,154,1,15). This ~4x1.5μm$^2$ particle has previously been characterised by TEM [5] and is composed of Al-rich diopside and pigeonite with minor enstatite and forsterite, and is thought to be a fragment of an Al-rich chondrule rather than a CAI [5].

**Analyses:** The back of the TEM grid containing the sections was reinforced with a 200nm gold coat and a further 20nm gold coat was deposited on the top of the sections to facilitate charge dissipation. A 2pA probe was rastered over an 8x8μm$^2$ area for analysis. The Cameca-defined mass resolution was >10,000 with $^{16,17,18}$O, $^{28}$Si and $^{24}$Mg$^{16}$O measured on electron multipliers. $\delta^{17}$O and $\delta^{18}$O were normalised to SMOW from San Carlos olivine measurements. Results were processed using L'image software and corrected for position drift, QSA effects and detector ageing. The difference in matrix effect between the low-FeO pyroxene and the olivine standard are thought to be negligible compared to the precision and a correction is not applied. Reproducibility determined from analyses on comparable areas of San Carlos olivine was 0.9‰ for $\delta^{18}$O and 4‰ for $\delta^{17}$O and analyses of Eagle Station gave correct values within error of true value.

**Results:** The particle was surrounded by aerogel with the sample area being defined on the basis of $^{24}$Mg$^{16}$O and $^{16}$O counts. The isotopic composition of the particle was determined as: $\delta^{18}O = -8.2 \pm 2.3$‰ and $\delta^{17}O = -5.0 \pm 5.4$‰ (1σ errors). On a three-isotope diagram the sample plots just above (but well within 2σ) of the CCAM line. The isotopic composition is indistinguishable from that of Al-rich chondrules found in carbonaceous chondrites, in agreement with its mineralogy [5], and clearly distinct from unaltered CAI-like materials. The chondrule-like compositions are similar to those reported previously [1-3] and support a common origin for chondrules in asteroids and comets.

**References:** [1] McKeegan K. D. et al. 2006. *Science* 314:1724-1728. [2] Nakamura T. et al. 2008. *Science* 321: 1664-1667. [3] Nakashima D. et al. 2011. *LSPC* 42, Abstract #1240. [4] Joswiak D. J. et al. 2010. LPSC 41:2119. [5] Bridges J. C. & Changela H. G. 2010. *LPSC* 41, Abstract #2058.