THE SULFUR ISOTOPIC COMPOSITION OF WILD 2 DUST COLLECTED BY STARDUST ANALYZED WITH THE NANOSIMS.

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Introduction: The NASA mission Stardust collected coma dust of comet 81P/Wild 2 using aerogel and Al foil targets [1] and successfully returned it to Earth in 2006 [2]. Preliminary examination (PE) revealed that the dust consists of an unequilibrated, heterogeneous mixture of material with mainly solar system isotopic composition [3]. During PE the H, C, N, O and Ne isotopic compositions of selected samples were analyzed [3]. Only one presolar ^{17}O-rich circumstellar grain was found. A few residues in impact craters are moderately enriched in ^{15}N, consistent with observations in IDPs [4] and insoluble organic matter from primitive meteorites [5]. Sulfur in Wild 2 dust is associated with organic matter [6] but also occurs in sulfides [7]. Here, we present first results of the S isotopic composition of Wild 2 dust in impact crater residues on Stardust Al-foil targets.

Samples and Experimental: We studied impact residues in a large crater (ø 140 µm; foil C013N) and in 13 small craters (ø 430–1860 nm; foil C037N). The latter were found in a SEM high-resolution survey. EDX spectra of the impact residues were obtained to select craters with moderate to high S content. In the NanoSIMS 50 a primary Cs^+ beam (ø ~100 nm) was rastered over the sample area and negative secondary ions of ^{16}O or ^{28}Si and all S isotopes were counted in multicollection. Reproducibility was evaluated by analyzing a thinsection of Mundrabilla troilite standard and crater residues on a Stardust-type Al foil, which had been artificially bombarded with pyrrhotite.

Results and Discussion: S isotopic ratios of residues in large impact craters were found to depend noticeably on surface geometry. Topographic correction factors were determined for each analyzed raster area and average from 0.5 to 1.5% on the crater floor, and from 1.4 to 4.4% on the crater rim. In the 15 areas of 10×10 µm^2 analyzed on the large Stardust crater we identified 629 S-rich sub-areas. All of the sub-areas are isotopically normal within 4σ. Topographic effects were less pronounced in small craters and isotope ratios were determined by integrating the secondary ion signals over the whole crater surface. Six out of 13 craters display small to moderate bulk crater anomalies (>2σ and >10 ‰) in at least one δS-value. One crater (#12) has negative anomalies in all δS-values (δ^{33}S= –51 ± 28 ‰; δ^{34}S= –37 ± 12 ‰; δ^{36}S= –177 ± 154 ‰); errors are 2σ. Nucleosynthetic isotope anomalies are expected to be particularly prominent in δ^{36}S (depending on the stellar source, up to several hundred ‰ [8]). At the meeting we will discuss possible stellar, nebular and solar system sources for the S isotopic anomalies.

References: [1] Brownlee D. et al. 2004. *Science* 304: 1764–1769. [2] Brownlee D. et al. 2006. *Science* 314:1711–1716. [3] McKeegan K. et al. 2006. *Science* 314:1724–1728. [4] Floss C. et al. 2006. *Geochimica et Cosmochmica Acta* 70:2371–2399. [5] Busemann H. et al. 2006 *Science* 312:727–730. [6] Sandford S. A. et al. 2006. *Science* 314:1720–1724. [7] Zolensky M. E. 2006. *Science* 314:1735–1739. [8] Mauersberger et al. 2003. *Astronomy and Astrophysics* 426:219–227.

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