SPECTROSCOPIC INVESTIGATION OF GRAINS FROM TRACK 134 IN STARDUST TILE C2103

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Introduction: The Wild-2 cometary particles captured in the aerogel tiles of the STARDUST mission produced tracks during the slowing down and fragmentation of the initial grain. The fragmented pieces can be extracted and analysed by various analytical techniques in order to understand the structure and composition of the incident grain. Track 134 is a 1310 micron long bulbous track, of type C in Burchell et al classification [1]. We analysed grains from different locations along this track, using non-destructive techniques, such as Raman and IR spectroscopies, followed by FESEM+EDX analyses. Our results mainly show the strong mixing of compressed or melted aerogel with the particles, but some information can be obtained on the nature of the incident grain.

Experimental set-up: We performed a combined set of micro-InfraRed (IR) spectroscopy, micro-Raman, Field Emission Scanning Electron Microscope (FESEM), and Energy Dispersive X-ray (EDX) analyses. The IR analyses were performed using a synchrotron beamline at SOLEIL (France), in the mid and far IR regions (4000 to 200 cm^{-1}). Raman spectroscopy is performed using a 514.5 nm argon laser with power on the samples lower than 40 W/mm^2.

Results and conclusions: The IR analysis of the cometary grains showed relevant contribution of the aerogel in the spectra of all these grains. Melted or compressed aerogel, due to the grain slowing down process, is strongly mixed with the residues of the incident particles, as already largely observed in other tracks (e.g. [2]). Two grains, extracted close to the entrance and the termination of the track, show clear IR organic signatures, due to aromatic and aliphatic compounds respectively. Silicates are detected in only one grain extracted from the end of the track, both in the mid- and far-IR, mainly in the form of amorphous low-Fe olivine (forsterite), with a minor contribution of crystalline olivine and pyroxene. Amorphous carbon is detected in almost all grains thanks to micro-Raman spectroscopy. The characteristic G-band and D-band are observed, with a relatively high value of the G-peak position and of the G-FWHM. Different grains along the track exhibit different degrees of order of the carbon backbone structure. When possible, the IR and Raman analyses were followed by electron microscopy investigation delivering complementary information about the grains composition. Results from EDX confirm the presence of Mg- and Fe- silicates and a relevant aerogel contribution. Iron and sulphur are present in some particles. These fast, non destructive analyses could be very informative on the nature of the incident cometary particles if aerogel was not masking the information. In order to improve our results, the most interesting grains are being pressed between two diamond windows, as described in [3], for further analyses.

References: [1] Burchell M.J. et al. 2008. *Meteoritics & Planetary Science* 43 (1,2). [2] Rotundi A., et al. 2008. *Meteoritics & Planetary Science* 43 (1/2). [3] Brunetto R. et al. 2010. *Icarus* submitted.