Europlanet TNA Report

PROJECT LEADER

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Date of TNA visit:	24 Oct 2010 – 29 Oct 2010 13 Dec 2010 – 17 Dec 2010
Host laboratory:	INAF-Osservatorio Astronomico di Capodimonte TNA2: Planetary Dust Simulation Chambers - Dust Analogue Simulation

Project Title – IR and FESEM-EDX characterization of cometary dust

- Report on the outcomes of the TNA visit

In this set of experiments we have analysed two Interplanetary Dust Particles (IDPs) using a combination of IR and FESEM-EDX, at the Laboratorio di Fisica Cosmica e Planetologia (LFCP), Napoli. The two IDPs, originally provided by NASA Johnson Space Center Cosmic Dust Laboratory, were named L2021D9 and L2021D12.

We have also analysed using IR microscopy a large (>100 μm) spheric particle named D08C_002, belonging to the collection of stratospheric particles retrieved by the DUSTER instrument (Palumbo et al., 2008) on its first balloon flight. This particle has possible extraterrestrial origin.

Infrared spectra have been acquired with a microscope attached to a FTIR interferometer (Mod. Bruker Equinox-55) in the range 7000–600 cm^{-1} and spectral resolutions between 4 and 8 cm^{-1}. FESEM and EDX analyses have been performed using a ZEISS Supra FESEM. For FESEM images we have used low accelerating voltages (1-2 kV). EDX mapping have been performed using an Oxford INCA Energy 350 system attached to the FESEM with a Si(Li) INCA X-sight “PREMIUM” detector at an accelerating voltage of 10 kV.

The FESEM images of the two IDPs are reported in Fig. 1. For particle L2021D12 it was possible to collect detailed maps of elemental abundances (an example of a preliminary map is given in Fig. 2), whereas particle L2021D9 was unfortunately lost due to charge accumulation. The mineralogy and composition of L2021D12 as obtained from EDX maps are currently under analysis.

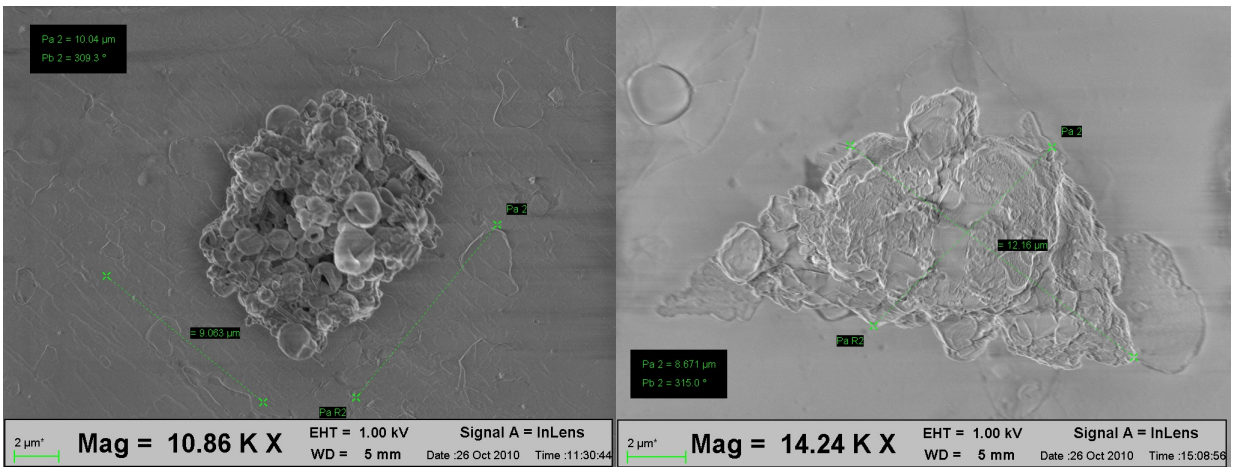

Fig. 1. FESEM images (1 keV) of IDPs L2021D9 (left) and L2021D12 (right).

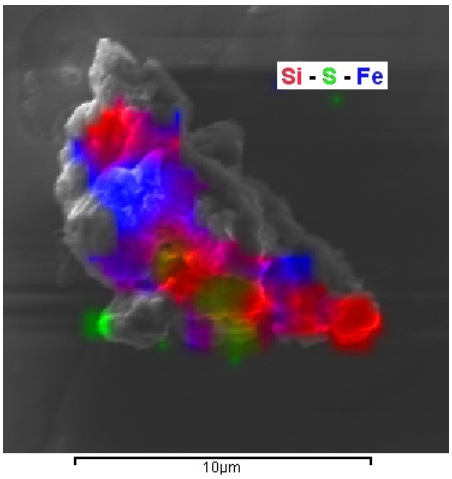

Fig. 2. Preliminary EDX analysis of L2021D12, showing the elemental distribution for Si (red), S (green), and Fe (blue).

IR spectra of the two IDPs and of particle D08C_002 are currently under reduction. Finally, additional tests were performed to build a compression cell made of KBr windows that would allow crushing particles to collect far-IR spectra. Unfortunately, preliminary tests performed using meteorite dust were unsuccessful.

- Publications arising/planned

After detailed reduction, the data collected during this TNA visit will be included in publications on stratospheric particles of possible cometary origin. One paper, focusing on the results of the DUSTER instrument collection, will include IR data of D08C_002 obtained during this visit. Another paper will focus on IDPs and will include IR, Raman, and FESEM-EDX data on several particles.

- Host approval

I confirm that the previous report is an accurate description of the scientific activity performed by Dr. Rosario Brunetto during his two TNA visits at the Laboratorio di Fisica Cosmica e Planetologia in Napoli.
Vito Mennella