

**Stardust cometary matter analyzed by synchrotron nano-XRF:
New results and developments**

T. Schoonjans¹, B. Vekemans¹, G. Silversmit¹, S. Schmitz², F. Brenker², L. Vincze¹

¹ X-Ray Micro-Spectroscopy and Imaging Group, Department of Analytical Chemistry, Ghent University, Krijgslaan 281, B-9000 Gent, Belgium

² Institut für Geowissenschaften, Facheinheit Mineralogie – Abt. NanoGeoscience, Altenhöferallee 1, D-60438 Frankfurt am Main, Germany

Stardust is an interplanetary spacecraft launched on February 7, 1999, by NASA, whose primary purpose was to investigate the make up of comet Wild2 and its coma. A second goal of the project was the acquisition of interstellar dust. In order to facilitate the capture of the particles, the spacecraft was equipped with aerogel (highly porous silica foam with an extremely low density) collectors. After the return of Stardust to Earth on January 15, 2006, the acquired samples were distributed among more than 150 researchers worldwide, including the X-Ray Micro-spectroscopy and Imaging group of Ghent University (XMI-UGent).

Each presented sample contains an elongated cavity (called *track*) produced by the impact and deceleration of a single comet coma particle through the aerogel. Multiple experiments were performed on such tracks and their terminal particle at the ESRF ID13 beamline using several non-destructive X-ray based methods such as conventional 2D scanning nano X-ray fluorescence (XRF) and confocal nano-XRF imaging. The latter technique is applied by mounting a polycapillary half-lens in front of the energy dispersive detector, thereby effectively reducing the volume defined by the intersection of the incoming beam and the sample to a volume defined by the acceptance of the polycapillary. A linear Fresnel lens assembly or a KB-mirror system, were used to reduce the dimensions of the incoming X-ray beam to the 200-300 nm level.

The recorded XRF data have been evaluated using XMI-quant, a software package made by the XMI-UGent group in order to perform quantitative evaluation of micro-XRF spectra with special focus on data from confocal XRF imaging experiments. This software package includes an implementation of the fundamental parameter method allowing the analysis of the complex Stardust particles. The presented quantitative results confirm the earlier findings concerning the presence of Ca-Al-rich inclusions in the cometary dust.