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Analysis of IDPs and cometary grains combining MIR-FIR, Raman micro-spectroscopy, and FESEM-EDX analysis

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Abstract

Important information on the composition of comets, Centaurs, TNOs, and primordial materials in molecular clouds come from the laboratory study of some primitive meteorites, micro-meteorites, interplanetary dust particles (IDPs), and comet Wild 2 grains (Stardust).

In particular, those IDPs who originated from cometary parent bodies are the best candidates to investigate the properties of the grains present in the primitive nebula.

Recent results will be presented here on the analysis of one IDP, which has a possible cometary origin. The particle, which has been pressed in a diamond cell (see Fig. 1), has been analyzed combining mid to far FTIR (2 – 60 μm) micro-spectroscopy, Raman micro-spectroscopy, Field Emission Scanning Electron Microscopy and Energy Dispersive X-ray analysis (FESEM-EDX), at the micron size resolution. In particular, the IR results are compared to IR astronomical observations.

The combination of these techniques on the same sample allows a complete characterization of the mineralogical, organic, and chemical composition of the particle. They represent a bridge between astronomical observations and geological analyses of natural samples of extraterrestrial origin, and allow a better understanding of the origin of this particular type of interplanetary dust particles.

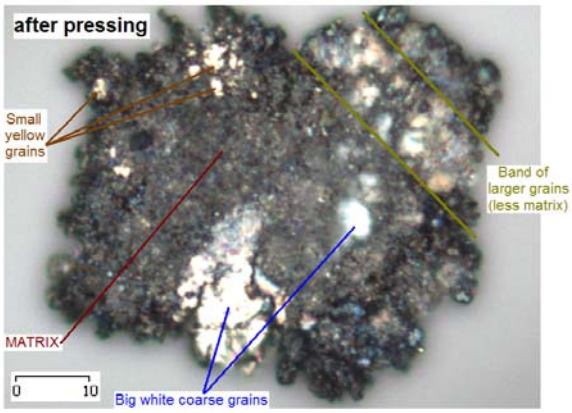

Figure 1: reflected light view of the pressed IDP. Lines are drawn to identify: (1) a dark matrix with small grains (mostly < 1 μm); (2) a band of larger grains (2-4 μm) but less matrix; (3) two big white coarse grains; (4) several yellow grains (1-3 μm).

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