Geophysical Research Abstracts
Vol. 16, EGU2014-11999-1, 2014
EGU General Assembly 2014

Wild 2 grains characterized combining MIR/FIR/Raman micro-spectroscopy and FE-SEM/EDS analyses

Alessandra Rotundi (1,2), Frans J.M. Rietmeijer (3), Marco Ferrari (1,2), Vincenzo Della Corte (2), Giuseppe A. Baratta (4), Rosario Brunetto (5), Emmanuel Dartois (5), Zahia Djouadi (5), Sihane Merouane (5), Janet Borg (5), John R. Brucato (6), Louis Le Sergeant d'Hendecourt (5), Vito Mennella (7), Maria Elisabetta Palumbo (4), Pasquale Palumbo (1,2)

(1) Dip. Scienze e Tecnologie, Università degli Studi di Napoli "Parthenope", Centro Direzionale I C4; 80143 Napoli, Italy, (2) INAF-Istituto di Astrofisica e Planetologia Spaziali, Via Fosso del Cavaliere 100, 00133 Roma, Italy, (3) Dept. of Earth and Planetary Sciences, MSC03 2040, 1-University of New Mexico, Albuquerque, NM 87131-0001, USA, (4) INAF-Osservatorio Astrofisico di Catania, Via Santa Sofia 78, 95123 Catania, Italy, (5) Institut d'Astrophysique Spatiale, CNRS, UMR-8617, Université Paris Sud, bâtiment 121, F-91405 Orsay Cedex, France, (6) INAF-Osservatorio Astrofisico di Arcetri, Largo E. Fermi 5, 50 125 Firenze, Italy, (7) INAF-Osservatorio Astronomico di Capodimonte, Via Moiariello 16, 80131 Napoli, Italy

We present the analyses results of two bulk Terminal Particles, C2112,7,171,0,0 and C2112,9,171,0,0, derived from the Jupiter-Family comet 81P/Wild 2 returned by the Stardust mission. Each particle embedded in a slab of silica aerogel was pressed in a diamond cell. The aerogel, as expected, caused problems to identify the minerals and organic materials present in these particles. These problems were overcome by means of the combination of FE-SEM/EDS, IR and Raman μ-spectroscopy, three non-destructive analytical techniques, which allowed the mineral and organic information on the two bulk particles. Indeed, this approach proved to be practical for preliminary characterization, i.e. scanning particles for chemical and mineralogical heterogeneity. It can be considered as a procedure to be followed for selecting Stardust particles-of- interest using this type of bulk characterization prior to more detailed studies.

TP2 and TP3 are dominated by Ca-free and low-Ca, Mg-rich, Mg,Fe-olivine. The presence of melilite in both particles is supported by IR μ-spectroscopy, but is not confirmed by Raman μ-spectroscopy possibly because the amounts are too small to be detected. TP2 and TP3 show similar silicate mineral compositions but Ni-free and low-Ni, sub-sulfur (Fe,Ni)S grains are present in TP2 only. TP2 contains indigenous amorphous carbon hot spots; no indigenous carbon was identified in TP3. These non-chondritic particles probably originated in a differentiated body. The presence of high temperature melilite group minerals (incl. gehlenite) in TP2 and TP3 reinforces the notion that collisionally-ejected refractory debris from differentiated asteroids may be common in Jupiter-Family comets. It does raise the question if similar debris and other clearly asteroidal dust could be present in Halley-type comets and if so what fractions of the dust in these comets are truly non-processed silicates and organic material.

The results of this study will be relevant to the ROSETTA mission that will rendezvous with Jupiter-Family comet 67P/Churyumov-Gerasimenko during 2014 October. At the time this mission was launched our ideas of comet dust were biased by the findings of the Halley missions. The Stardust mission showed an unexpected richness of dust that originated from the inner solar system. We should be prepared for a similar mixed dust population of mono- and polymict debris in this J-F comet. Still, it would be nice if doesn't look like anything seen in comet Wild 2. The work in Stardust samples is important to the question what are the similarities and differences among comets.