CONTROL ID: 2567199

TITLE: Laboratory Measurements of Synthetic Pyroxenes and their Mixtures with Iron Sulfides as Inorganic Refractory Analogues for Rosetta/VIRTIS' Surface Composition Analysis of 67P/CG

ABSTRACT BODY:

Abstract (2,250 Maximum Characters): The Visible and InfraRed Thermal Imaging Spectrometer VIRTIS on board Rosetta provided 0.25-5.1 µm spectra of 67P/CG's surface (Capaccioni et al., 2015). Thermally corrected reflectance spectra display a low albedo of 0.06 at 0.65 µm, different red VIS and IR spectral slopes, and a broad 3.2 µm band. This absorption feature is due to refractory surface constituents attributed to organic components, but other refractory constituents influence albedo and spectral slopes. Possible contributions of inorganic components to spectral characteristics and spectral variations across the surface should be understood based on laboratory studies and spectral modeling. Although a wide range of silicate compositions was found in "cometary" anhydrous IDPs and cometary dust, Mg-rich crystalline mafic minerals are dominant silicate components. A large fraction of silicate grains are Fe-free enstatites and forsterites that are not found in terrestrial rocks but can be synthesized in order to provide a basis for laboratory studies and comparison with VIRTIS data. We report the results of the synthesis, analyses, and spectral reflectance measurements of Fe-free low-Ca pyroxenes (ortho- and clinoenstatites). These minerals are generally very bright and almost spectrally featureless. However, even trace amounts of Fe-ions produce a significant decrease in the near-UV reflectance and hence can contribute to slope variations. Iron sulfides (troilite, pyrrhotite) are among the most plausible phases responsible for the low reflectance of 67P's surface from the VIS to the NIR. The darkening efficiency of these opaque phases is strongly particle-size dependent. Here we present a series of reflectance spectra of fine-grained synthetic enstatite powders mixed in various proportions with iron sulfide powders. The influence of dark sulfides on reflectance in the near-UV to near-IR spectral ranges is investigated. This study can contribute to understand the shape of reflectance spectra of 67P's surface at different spectral ranges. Implications for the VIRTIS data analysis are discussed.

CURRENT * CATEGORY: 67P/Churyumov-Gerasimenko

CURRENT : None

AUTHORS (FIRST NAME, LAST NAME): Kathrin Markus[1, 2], Gabriele Arnold[1], Ljuba Moroz[3, 1], Daniela Henckel[1], David Kappel[1], Fabrizio Capaccioni[4], Gianrico Filacchione[4], Bernard Schmitt[5], Federico Tosi[4], Stéphane Érard[6], Dominique Bockelee-Morvan[6], Cedric Leyrat[6]

INSTITUTIONS (ALL): 1. DLR Institute for Planetary Research, Berlin, Germany.
2. Institut für Planetologie, University of Münster, Münster, Germany.
3. Institute of Earth and Environmental Science, University of Potsdam, Potsdam, Germany.
4. IAPS-INAF, Rome, Italy.
5. Lab. de Planetologie de Grenoble, Grenoble, France.
6. LESIA, Observatoire de Paris, Paris, France.

Contributing Teams: VIRTIS Team