Insights into the composition of the comet 67P nucleus from laboratory reflectance spectroscopy of analogue materials

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Reflectance spectroscopy is powerful tool of remote sensing of planetary surfaces and small solar system bodies. However, extraction of compositional information from remote sensing reflectance spectra of complex intimate mixtures requires significant efforts including spectral reflectance studies of laboratory analogs and theoretical modeling. Since not only absorption but also multiple scattering of light is involved, intensities of absorption bands in reflectance spectra depend not only on abundance of a component but also on its grain size distribution, as well as grain sizes and optical properties of all other components present in the mixture. The results can be also affected by surface temperature, viewing geometry and exogenic processes. The VIRTIS spectrometer onboard Rosetta orbiter revealed that the surface of comet 67P/CG is dark from the near-UV to the IR and is enriched in refractory phases such as organic and opaque components. The analysis of the VIRTIS data provided unique information on the surface composition of 67P, as well as spatial and temporal variations of composition and physical/optical properties and their correlation with morphological features. However, the first years of data analysis demonstrated that the results are not straightforward and the extraction of reliable information requires continuous cooperative efforts. Here the results of laboratory spectral reflectance studies helping to derive compositional information from the VIRTIS spectra will be reviewed and the open issues concerning the composition of the 67P nucleus will be discussed.