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Laboratory Spectral Measurements to Simulate Pyroclastic Material on Mercury

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The recognition of pyroclastic deposits on Mercury surface was driven by the presence of central pit (vent) surrounded by a spectrally bright and red deposit (facula) (Head et al, Science, 2008). In particular, the Visible to Near-InfraRed (VNIR) spectral properties permitted them to differentiate it from the surrounding terrains and defining the putative border of the deposits (e.g. Head et al, Science, 2008), since there is no morphological evidence that permits to limit their areal extension. Consequently, to improve our understanding of how the spectral properties of the effusive material extruded during the pyroclastic activity can change, considering variations in composition or textural properties of the material could improve our understanding of the pyroclastic deposits itself.

In this work we planned spectral analysis in reflectance and emittance of a systematic variation of samples with a silicate component as an example of pyroclastic extruded lava mixed with graphite or sulfide suitable for product formed with interaction of volatiles components during the pyroclastic activity at very reduced condition on Mercury (e.g., Cartier&Wood, Elements, 2019).

The pyroclastic endmember was prepared considering different variations among a crystalline mafic material and an amorphous component. We take into account variations in abundance as well as variation of particle size for the endmembers and for the mixtures.

All the samples have been measured in bidirectional reflectance in the VIS+VNIR+MIR spectral range, with particular attention to the 0.4-2.0 mm and 7-14 mm, spectral ranges where SIMBIO-SYS and MERTIS, onboard to Bepicolombo (Benkhoff et al., Spa.Sci.Rev., 2021), will operate. Moreover, for selected samples, emissivity (at Tsample = 150°, 250°, 350°, 450° C) in the MIR spectral range will be carried on. All the spectroscopic measurements are done at the PSL of DLR in Berlin.

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