REFLECTANCE AND EMISSIVITY SPECTRA OF GRAPHITE AS POTENTIAL DARKENING AGENT FOR MERCURY FROM THE UV TO THE TIR AND ITS COMPARISON TO REMOTE SENSING MEASUREMENTS FROM MESSENGER AND MERTIS ON BEPICOLOMBO. A. Maturilli[1], J. Helbert[1] and I. Varatharajan[1], [1]1Institute of Planetary Research, German Aerospace Center DLR, Berlin, Germany (alessandro.maturilli@dlr.de).

Introduction: For long time Mercury was considered a planet very similar to the Moon. Both are small rocky bodies in the inner solar system with thin exospheres and no large scale traces of recent geological activity. However Mercury's surface reflects much less sunlight than the Moon. Trying to explain the reasons for this difference, significant abundances of iron and titanium (and their oxides) were proposed for the Hermean surface. But the NASA MESSENGER instruments found only small abundances of iron, confirming earlier ground-based spectroscopy observations, and virtually no titanium. Therefore neither of the elements can account for this diversity. New analysis of MESSENGER data acquired for the darkest regions of Mercury's surface suggest that the unknown darkening material could be carbon, in particular as the mineral graphite [1] whose abundance in the darker regions is predicted to be 1 to 3 wt% higher than the surroundings.

Our Study: At the Planetary Spectroscopy Laboratory (PSL) of the Institute of Planetary Research (DLR, Berlin) we measured reflectance spectra for several phase angles of graphite, from UV to TIR spectral range (0.2 to 20 μm). Samples have been measured fresh and then after successive steps of heating at 400°C in vacuum for 8 hours. Following the same procedure, reflectance spectra of Komatiite (chosen as Mercury surface simulant, after [2]) was measured alone and mixed with few % of graphite to reproduce the results from [1]. The results from this experiment can be compared to the data acquired from the MDIS and the MASCS instrument onboard the NASA MESSENGER mission. The same set of samples has been measured in emissivity, in vacuum (< 0.8 mbar) for successive cycles of several surface temperatures from 100°C to 400°C in the TIR spectral range (1 to ~ 18 μm) in preparation for the emissivity spectra that will be collected by the Mercury Radiometer and Thermal Infrared Spectrometer (MERTIS), a spectrometer developed by DLR, jointly with the Wilhelms Universität in Münster, that will be on board of the ESA BepiColombo Mercury Planetary Orbiter (MPO) scheduled for launch in October 2018.

References:

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