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The Berlin Emissivity Database (BED)

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Remote sensing infrared spectroscopy is the principal field of investigation for planetary surfaces composition. Past, present and future missions to bodies in the solar system include in their payload instruments measuring the emerging radiation in the infrared range. The PFS instrument on the ESA Mars Express mission is collecting spectra since the beginning of 2004, with the possibility to continues working until at least the end of 2007. In spring 2006 the PFS and VIRTIS experiments will start their operations on the ESA Venus Express mission, while the MERTIS spectrometer is included in the payload of the ESA BepiColombo mission to Mercury, scheduled for 2013.

For the interpretation of the measured data an emissivity spectral library of planetary analog materials is needed. Unlike the ASU thermal emission spectral library, our database is focused on relatively fine-grained size separates, providing a realistic basis for interpretation of thermal emission spectra of planetary regoliths. The Berlin Emissivity Database (BED) currently contains emissivity spectra of plagioclase and potassium feldspars, low Ca and high Ca pyroxenes, olivine, elemental sulfur and a lunar highland soil sample measured in the wavelength range from 7 to 22 μm as a function of particle size. For each sample we measured the spectra of four particle size separates ranging from 0 to 250 μm.

The device we used is built at DLR (Berlin) and is coupled to a Fourier transform infrared spectrometer (Bruker IFS 88), purged with dry air and equipped with a cooled detector (MCT). All spectra were acquired with a spectral resolution of 4 cm^{-1}. A cooled detector has a sensitivity 100 times better than a non-cooled one, this permits to measure with precision the spectral features of the smallest size separates.

We are currently working to upgrade our emissivity facility. A new spectrometer (Bruker IFS 66) and new detectors will allow us to measure the emissivity of samples in the wavelength range from 1 to 50 μm, even in a vacuum environment. This aspect will be particularly important for the interpretation of the MERTIS data.