EMISSIVITY MEASUREMENTS OF BASALTIC ANALOGUES FOR MERCURY. J. Gurgurewicz[1,2], A. Maturilli[3], J. Helbert[3], J. Kostylew[4,5], and N. Zalewska[2], [1]WROONA Group, Institute of Geological Sciences PAS, Research Centre in Wrocław, Podwale St. 75, PL-50449 Wrocław, Poland, [2]Space Research Centre PAS, Bartycka St. 18A, PL-00716 Warsaw, Poland (jgur@cbk.waw.pl), [3]Institute of Planetary Research, German Aerospace Center (DLR), Rutherfordstr. 2, 12489 Berlin, Germany, [4]Institute of Geochemistry and Petrology, ETH Zürich, Clausiusstr. 25, 8092 Zürich, Switzerland, [5]Institute of Geological Sciences, University of Wrocław, Cybulskiego St. 30, PL-50205 Wrocław, Poland.

Introduction: Data from Mercury, provided by the MESSENGER mission, opened many new scientific questions, which need more analysis, including experimental data from measurements of planetary analogues in laboratory, in adequate conditions. The facilities at Planetary Emissivity Laboratory (PEL) at German Aerospace Center (DLR) in Berlin allow to measure emissivity of planetary analogue materials at temperature of more than 400°C, which is typical for Mercury's low-latitude dayside, and under vacuum.

Basaltic analogues: Measured basalts from Mongolia are representative of three different terrestrial geological environments, both old and young geological units (terranes): Mandalovoo, Gobi Altay and Bayanhongor. The Mandalovoo terrane comprises a nearly continuous Paleozoic island arc sequence. In the Gobi Altay terrane an older sequence is capped by younger Devonian-Triassic volcanic-sedimentary deposits. The Bayanhongor terrane forms a discontinuous, narrow belt that consists of a large ophiolite allochton. Differences and similarities between measured spectra of basalts from these three different geological environments are analysed.

X-ray diffraction data: For the complementary information about the mineral composition, basalt samples have been analyzed by X-ray diffractometer SIEMENS D5005, at the Institute of Geological Sciences of the University of Wrocław. The powder mounts of the whole-rock samples were scanned from 2 to 75°θ at a speed of 1.2°θ/minute using 30kV and 20mA CoKα radiation. The XRD results indicate the presence of the main basalt components: plagioclases, pyroxenes and olivines, in various proportions. Plagioclases are dominant; other feldspars (anorthoclase) are also present. Olivines occur only in samples from Mandalovoo terrane. Actinolite is present in two samples from Mandalovoo, and chlorite is observed in the Mandalovoo and Gobi Altay samples.

Emissivity measurements at PEL: Emissivity of 11 samples of basalts - possible analogues for Mercury - has been measured using a Fourier transform infrared spectrometer Bruker VERTEX 80v, in the 3-16 μm wavelength range. For these measurements, the samples of basalts have been reduced, to produce the powders in four particle size ranges: < 25, 25-63, 63-125 and 125-250 μm. Such wavelength and particle size ranges give a lot of possibilities for the remote sensing data interpretation. For the moment we have focused only on the measurements of the powders in the smallest particle size (< 25 μm), which is the most relevant for Mercury. Each sample powder has been measured at power to the induction heating system of 1, 4 and 5A. For all measured samples the temperatures at 1A have been around 150°C, at 4A - around 350/400°C and at 5A - around 450/500°C.

Results and discussion: Each measured emissivity was calibrated. For the interpretation of absorption bands in the 6-16 μm wavelength range (we do not take into account the range below 6 μm, due to some calibration issues) of the calibrated emissivity spectra and comparison with the spectra of the mineral powders in adequate particle size, we are using the Berlin Emissivity Database (BED), which contains all the most important mineral components of basaltic analogs [1].

Preliminary comparison of the spectra of each sample measured in different temperatures shows, in general, flatting and smoothing of the spectra at higher temperatures, and, as a consequence, fade of the smaller absorption bands.

Analysed basaltic samples are feldspar-rich, based on assumptions from ground-based measurements before the MESSENGER mission [2]. However, recent results from X-Ray Spectrometer (XRS) onboard MESSENGER show that Mercury's surface composition is also close to komatiites [3]. These XRS results would suggests that probably the most adequate basaltic analogues are basalts with quite high pyroxenes and olivines content, from older geological units. Independently from the study presented here first measurements on komatiite samples are currently underway at PEL [4].

Direct comparison of our data obtained in PEL with the spectra from Mercury is for the moment not possible. MESSENGER carries no instrument covering this spectral range. The MERTIS instrument, currently being build for the ESA/JAXA Bepi Colombo mission, will provide the data in the 7-14 μm wavelength range [5].

References: [1] Maturilli A. et al. (2008) *Planet. Space Sci., 56,* 420-425. [2] Helbert J. et al. (2007) *AdSR, 40,* 272-279. [3] Nittler L. R. et al. (2011) *Science, 333,* 1847-1850. [4] Maturilli A. et al. (2012) this mtg. [5] Hiesinger H. et al. (2010) *Planet. Space Sci., 58,* 144-165.