MID-INFRARED STUDIES OF IMPACT ROCKS (2): MELT FROM SUEVITES OF MISTASTIN AND MIEN IMPACT CRATERS. A. Morlok[1] and H.Hiesinger[1], J.Helbert[2] [1]Institut für Planetologie, Wilhelm-Klemm Strasse 10, 48149 [2]Institute for Planetary Research, DLR, Rutherfordstrasse 2, 12489 Berlin, Germany

Introduction: Infrared spectroscopy allows determining the mineralogical compositions of planetary surfaces via remote sensing . To correctly interpret the remote sensing data, laboratory spectra of analog materials are beneficial. Our work at the IRIS (InfraRed spectroscopy for Interplanetary Studies) laboratory produces spectra for the Berlin Emissivity Database (BED) for the MERTIS (Mercury Radiometer and Thermal Infrared Spectrometer) spectrometer on board the ESA/JAXA BepiColombo mission to Mercury. This unique mid-infrared spectrometer allows us to map spectral features of the hermean surface in the 7-14 µm range, with a spatial resolution of ~500 m [1-4]. Since the surface of Mercury was exposed to heavy impact cratering in its history, the effects of impacts on spectral properties are of high interest. To investigate this, we analyzed Suevite impact rocks from the Nördlinger Ries impact crater in Germany [5].

In order to expand on the range of spectrally studied materials from impact craters and their involved target materials, we present new mid-infrared spectra of melts separated from impact rocks from the ~119 Ma old Mien (Sweden, 9 km diameter) and ~36 Ma old Mistastin (Canada, 16 km) impact craters [6,7,8].

Techniques: The selected rocks were ground in a steel mortar, the rock powder was dry sieved into four size fractions: 0-25 µm, 25-63 µm, 63-125 µm and 125-250 µm. For the mid-infrared analyses at the IRIS laboratory at the Institut für Planetologie at the WWU Münster, we used a Bruker Vertex 70 infrared system with a MCT detector with a spectral range from 2 to 20 µm. Analyses were conducted under high vacuum (3 mbar) to avoid atmospheric bands.

For diffuse reflectance measurements, a Bruker 513 variable geometry stage allowed us to measure samples with independent incidence and emergence angles. Here we present the results in the wavelength range of interest for the MERTIS project, 7-14 µm.

Results: The melt from Mistastin (Fig.1) shows a smooth feature between 9.7 and 10 µm in all size fractions. A shoulder at 8.8 µm is visible in all size fractions >25 µm. The Christiansen Feature is at 8.0-8.1 µm. The transparency feature in the smallest size fractions is at 12.1 µm.

The suevite breccia is very similar to the melt, with a strong Reststrahlen feature at 9.6 µm and a smaller at 8.8 µm.

The melt glass from Mien looks different and is similar in band shape and positions to the suevite breccia from the same crater (Fig.1): Here sharp, crystalline bands are visible at 8.2-8.3 µm, 8.5-8.6 µm, 8.7-8.8 µm and 9.2 µm. The transparency feature is at 11.6 µm, the Christiansen feature at 7.5-7.7 µm.

For comparison, a spectrum of impact melt rock from Polsingen (Fig.1) in the Nördlinger Ries crater [5] shows an amorphous feature at 9.5 µm and a shoulder with weaker bands between 8.5 and 8.9µm. The general shape is similar to that of the Mistastin melt glass, mainly with differences in band positions due to differences in the petrology of the melted basement rock

Summary & Conclusions: Mid-infrared spectra of powdered bulk melt glasses from various terrestrial impact craters show the sensibility of this technique for recrystallization of the melt material. Only amorphous phases like in the Ries and Mistastin samples are clearly idenfiable as impact related materials, while recrystallized melt in the case of Mien is difficult to distinguish from the unshocked starting materials or the suevite breccia.

Impact melts form different craters show significant differences in band positions that reflect the starting materials: anorthosite, monzonite in Mistastin [7]; granite and gneiss for Mistastin [8] and granite, gneiss, and amphibolite in the Ries Crater [6].

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Figure 1 Mid-infrared diffuse reflectance spectra of sieved size fractions of (left) suevite breccia and (right) impact melt from the Mistastin, Mien and Nördlinger Ries impact craters. Brown: 0-25 µm, Red: 25-63 µm, Pink: 63-125 µm, Blue 125-250 µm.