MICROCHEMICAL ANALYSIS OF SMALL-SCALE PSEUDOTACHYLITIC BRECCIA ZONES FROM THE CENTRAL UPLIFT OF THE VREDOFORT IMPACT STRUCTURE, SOUTH AFRICA. T. Mohr-Westheide and W. U. Reimold. Museum für Naturkunde – Leibniz Institute at Humboldt University Berlin, Invalidenstrasse 43, 10115 Berlin, Germany. E-mail: Tanja.Mohr@mfn-berlin.de.

Pseudotachylitic breccias (PTB) are the most prominent impact-induced deformation in the central uplift of the Vredefort Impact Structure [1, 2]. However, controversy remains about the genesis of these melt breccias, with the most popular hypotheses being genesis by (1) shearing (friction melting); (2) shock compression melting; (3) decompression melting immediately after shock propagation through the target; (4) combinations of these processes, or (5) intrusion of allochthonous impact melt. Resolving this problem requires detailed multidisciplinary analysis in order to characterize the nature of different occurrences and to identify the exact melt-forming process. Here, the results of detailed microchemical and micro-petrographic analysis of small- to meso-scale PTB in Archean gneiss from several dimension stone quarries (Rand Granite Quarry, National Sun, Kudo and Leeukop) in the core of the Vredefort Dome are reported.

PTB matrices were analysed in polished thin sections by image analysis, optical and scanning electron microscopy (SEM), and electron microprobe analysis (EPMA). Selected bulk samples of pseudotachylitic breccia and host rock were analysed by X-ray fluorescence spectrometry for major and trace element abundances.

None of the analyzed veinlets give textural evidence supporting a significant influence of shearing/faulting. Electron microprobe in situ and XRF bulk chemical analysis (of both pseudotachylitic breccias and their host rocks) revealed that pseudotachylitic breccia generally displays a close chemical relationship to its direct wall rock, indicating that melt was formed from material of the same composition. Compositions of centimeter wide PTB veins are predominantly the same as those of the rocks in which they occur, when the entrained microclast content is corrected for. In contrast, < 1mm wide PTB veinlets have locally heterogeneous compositions, which can be related directly to the respective compositions of immediately adjacent host rock mineral grains.

Conclusions: For very small veinlets (< 1mm) local melt formation could be confirmed in this study. Variable and localised chemical composition in very thin pseudotachylitic breccia veinlets provides strong evidence for local origin of these melts as well, in agreement with the conclusions earlier findings of Mohr-Westheide et al. (2009). At least for the smallest (mm) veinlets an origin by local shock melting at the mineral grain scale is indicated.

References: [1] Dressler B. O. and Reimold W. U. 2004. *Earth-Science Reviews* 67:1–60. [2] Reimold W. U. and Gibson R. L. 2006. *Geological Society of America Special Paper* 405:407 pp. [3] Gibson R. L. and Reimold W. U. 2005. *Large Meteorite Impacts III. Geological Society of America Special Paper* 384:329-349.