

MM 27: Invited talk Rösner

Time: Wednesday 9:30–10:00

Location: H38

Invited Talk

MM 27.1 Wed 9:30 H38

The secret of shear bands — ●HARALD RÖSNER — WWU Münster, Institut für Materialphysik, Wilhelm-Klemm-Str. 10, D-48149 Münster, Germany

Plasticity of metallic glasses is generally still puzzling since in contrast to crystalline materials no comparable deformation carriers such as dislocations, twins or grain boundaries exist. Deformation tests on metallic glasses performed well below the glass transition temperature have shown that the plastic flow is restricted to narrow regions called shear bands. The current understanding is that dilated zones of increased excess volume caused by shear localization enable shear softening. In my talk I will introduce a new method for quantitative density measurements in amorphous materials combining several quantitative

electron scattering signals [1,2]. Density measurements in shear bands of different metallic glasses ($\text{Al}_{88}\text{Y}_7\text{Fe}_5$, $\text{Pd}_{40}\text{Ni}_{40}\text{P}_{20}$, Vitrelloy-105) show a unique propagation behavior; that is, alternating high and low density regions. Similar behavior has been reported for granular media, but not for amorphous solids. One important implication is that individual shear bands apparently propagate via local, segment-wise stick-slip that might originate from their complex topology. These results suggest connections to the physics of granular materials and jammed systems.

[1] H. Rösner, M. Peterlechner, C. Kübel, V. Schmidt, and G. Wilde, *Ultramicroscopy* 142 (2014) 1-9.

[2] V. Schmidt, H. Rösner, P.M. Voyles, M. Peterlechner, G. Wilde, *Physical Review Letters* 115 (2015) 035501.