MM 49: Invited Talk: Daniel Sopu

Time: Thursday 9:30–10:00 Location: C 130

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STZ-vortex unit, a step forward in understanding and controlling shear banding in metallic glasses — •Daniel Sopu — Erich Schmid Institute of Materials Science, Austrian Academy of Sciences, Leoben, Austria — Darmstadt University of Technology, Germany

The ability to control plastic deformation of metallic glasses is based on the capacity to influence the percolation of shear transformation zones (STZs) that ultimately leads to shear band formation. In this talk, using molecular dynamics and athermal quasi-static simulations, we propose a novel atomic-level mechanism underlying the STZ activation and percolation processes, which could provide a robust microscopic description of shear band formation and propagation in metallic glasses. The proposed mechanism entails two main units: large shear strains (i.e. STZs) and vortex-like (i.e. rotating) structures. Such a vortex-like flow corresponds to a strong rigid rotation of groups of atoms which, in turn, appears to be a necessary step to activate the subsequent STZ through a kind of autocatalytic process.

So far, STZ-vortex mechanism allowed to follow the structural and dynamical evolution during shearing in metallic glasses and provided an atomistic description of deformation mechanisms such as shear band formation and interaction, shear band branching and multiplication or shear band blocking and deflection. This new model can further contribute to the understanding and control of shear banding behavior and the avoidance of runaway instability, thereby improving the plastic deformability of metallic glasses.