MM 30: Invited Talk: Anna Kareer

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

Invited Talk MM 30.1 Wed 9:30 C 130

Scratching the surface: understanding plasticity associated with microscale asperity contacts — •Anna Kareer — Department of Materials, University of Oxford, Oxford, United Kingdom

When considering macroscale wear, an understanding of the effect of plasticity is essential; plastic behaviour directly affects the macroscopic wear processes and provides a quantitative mechanism of energy dissipation in friction. It is well established that macroscale friction and wear behaviour is controlled by micronmeter sized surface asperities, thus, understanding and predicting wear relies on a mechanistic understanding of the plastic deformation associated with a micronmeter sized sliding asperity. In this work we use nanoscratch testing to probe microscale deformation from a frictional contact in metallic samples, in an attempt to understand the mechanisms of deformation associated with a single sliding asperity. Nanoscratches are made using a nanoindenter operating in force-controlled mode and the displacement is monitored throughout the experiment. The localised deformation is characterised using advanced microscopy, both at the surface and subsurface. A physically based crystal plasticity finite element model (CPFEM) is used to simulate the deformation and provides insight into the 3D evolution of the deformation fields surrounding the nanoscratch experiment, as it transitions from a statically loaded indent to a kinetic scratch. Furthermore, in-situ high temperature nanoscratch experiments reveal the sliding deformation behaviour of materials operating at elevated temperatures, where in service, macroscale wear phenomenon are often accelerated.