MM 27: Invited Talk Christian Greiner

Time: Thursday 9:30–10:00 Location: H44

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Crystal rotation kinematics during the tribological loading of high-purity copper — •Christian Greiner — Karlsruher Institut für Technologie (KIT), Kaiserstrasse 12, 76131 Karlsruhe

Friction, wear and the associated energy dissipation are major challenges from nanoelectromechanical systems, over hip implants to offshore wind turbines. Already in 1950, Bowden and Tabor pointed out that in metallic tribological contacts the majority of the dissipated energy is spend to change the contacting materials' microstructures. This - in part - explains why most metals show a highly dynamic subsurface microstructure under the shear load imposed by a sliding contact. In order to understand these processes, the elementary mechanisms accommodating the shear strain and acting in the material need to be revealed and understood. One key process involved therein is the reorientation of the crystal lattice, or crystal rotation, due to the shear load imposed by the sliding contact. Our work sheds light on the early stage, fundamental mechanisms of tribologically induced lattice rotation kinematics. Using a high-purity copper bicrystal and a sapphire sphere, unlubricated, single-pass sliding tests were conducted. Electron backscatter diffraction (EBSD) performed directly on the wear track reveals a crystal rotation process around the transverse direction at the heart of tribologically induced lattice rotation, irrespective of sliding direction, grain orientation and normal load. A detailed analysis corroborates that surprisingly, changing the sliding direction merely alters the precise accommodation of crystal rotations, but not their fundamental nature.