MM 2: Invited talk: Tobias Brink

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

Invited Talk MM 2.1 Mon 9:30 C 130

Defect phases and their line defects in fcc metal grain boundaries — •Tobias Brink — Max-Planck-Institut für Eisenforschung GmbH, Düsseldorf, Germany

Grain boundaries (GBs) are no longer simply regarded as planar defects, but as objects with distinct atomic structures. In analogy to the bulk, interface thermodynamics can describe GB phases, which also have their own defects, i.e., defects of defects. With atomistic simulations and in close collaboration with atomic-resolution scanning transmission electron microscopy, we investigated different GB phases of fcc ⟨111⟩ tilt GBs [1]. We find more and more that the presence and nature of GB defects leads to interesting and unexpected phenomena: The junctions of faceted GBs usually drive facet growth (at least on the nanoscale) because of their dislocation-like character and consequently high defect energy. We identified a stable nanofaceted GB structure that eliminates this energy cost and only leaves attractive facet junction interactions due to alternating GB excess stresses [2]. Even on flat GBs, disconnections exist as line defects with a Burgers vector. They are responsible for GB plasticity and couple shear stress to GB migration by introducing a GB step. We show how different GB phases lead to different disconnections that can in turn result in opposite migration directions under the same shear load [3]. Finally, a short overview over other examples of GB line defects will be provided.

[1] Brink, et al., Phys. Rev. B **107**, 054103 (2023)
[2] Brink, et al., arXiv:2309.07595 [cond-mat.mtrl-sci]
[3] Pemma et al., arXiv:2305.10275 [cond-mat.mtrl-sci]