A data-based derivation of internal stress and material microstructure characteristics

Katrin Schulz*[1,2]

[1]Karlsruhe Institute of Technology = Karlsruher Institut für Technologie – Germany
[2]Karlsruhe University of Applied Sciences – Germany

Abstract

In this presentation, we introduce a framework for the derivation of the internal stress terms based on the statistical analysis of data from microscale dislocation simulations. By investigating the dislocation structure formation within the coarse graining benchmark systems under various combinations of numerical and microstructure conditions, e.g. element size, initial dislocation density, and the gradient of geometrically necessary dislocations, the heterogeneous dislocation structures formation within an element is identified. The resulting structure can be further predicted by the collected data base statistically or by a machine learning approach. We derive the near field correction stress within a coarse-grained system according to the uneven stress field induced by the heterogeneous dislocation structure formation. This stress terms are again used to set up a surrogate model to find meaningful correlations between experimental and simulation results.

*Speaker