Post-Doctoral Position on stress concentrations at grain boundaries in Al polycristals using Dislocation Dynamics

This work is part of a multi-scale modeling project funded by Labex (Lab of Excellence) "Science and Engineering for Advanced Materials and devices" (SEAM). This project regroups a dozen of permanent researchers from three different laboratories from Univ. Paris 7 and Paris 13. Simulations ranging from the atomistic scale up to the component length scale are part of this project.

Context and job description

In polycrystalline materials, fracture is often initiated at weak spots of the microstructure, such as grain-boundaries, triple junctions or around precipitates. At grain boundaries, especially, crack initiation is affected by several parameters such as temperature, plastic activity within grains, dislocation accumulations at grain boundaries, or the presence of impurities, among which hydrogen atoms diffusion toward grain boundaries, leading to the reduction of the grain boundary cohesive energy (phenomenon known as Hydrogen Enhanced Decohesion or HEDE). In consequence, the exact conditions, e.g. when and where debounding will start within a given microstructure, are still not precisely known.

The objective of this post-doctoral work is to improve our understanding of the hydrogen-assisted intergranular fracture through the mapping of stress concentrations at grain boundaries in Al induced by deformation microstructures. To this goal, Dislocation Dynamics (DD) simulations are employed to reproduce in 3D the dislocation accumulation observed at GBs. The influence of slip conditions, GB geometry and cross-slip activity will be evaluated. This work is in close connection to other tasks performed within the consortium at the atomic (DFT) and continuum (FE) scales. A set of grain-boundaries and grain orientations of interest will be provided by experimental observations conducted in parallel.

The applicant will be recruited by LSPM (Univ. Paris 13) and will spend a part of his time at Univ. Paris 7.

Applicant profile

A good candidate should hold a recent PhD degree in Materials Sciences, Mechanical Engineering, or Physics, with a strong expertise in Dislocation Dynamics calculations.

Applicants should join:

1) a resume including a list of publications and references,
2) an application letter,
3) a statement of research,
4) at least one recommendation letter.

The Application deadline is set to the 15th of November 2015.

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