LMS Seminar

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Monitoring microstructural evolution in-situ during cyclic loading with high-resolution reciprocal space mapping

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ABSTRACT

High-resolution reciprocal space mapping using high-energy hard x-rays has been developed to investigate the microstructure of grains located in the bulk of a metallic sample in a non-destructive way in-situ during different loading conditions. The technique allows to identify and follow individual grains and subgrains during ongoing deformation such as loading in tension and compression, during repeated cyclic deformation or even individual load cycles while simultaneously monitoring macroscopic stress and strain. Insight in the structural reorganization within single grains is gained by in-situ monitoring of the characteristic intensity distribution of Bragg reflections from individual grains during cyclic deformation of commercially pure polycrystalline aluminium. By reciprocal space mapping with high angular resolution and combined analysis of the radial and azimuthal information, individual subgrains are tracked during single load cycles with different strain amplitudes. Additionally, changes in mean peak position, peak width and asymmetry of integrated radial profiles from individual grains are analyzed as well as their orientation spread. In this manner, the microstructural evolution in grains embedded in the bulk of polycrystalline specimens is traced and linked to the changing mechanical loads during cyclic deformation.

BIOGRAPHY

Wolfgang Pantleon is Professor at the Technical University of Denmark in the Department of Civil and Mechanical Engineering, working on the modeling of microstructure evolution. He completed his PhD in Physical Metallurgy (Dr.-Ing.) at the Freiberg University of Mining and Technology in Germany with Prof. P. Klimanek on the modeling of the microstructural evolution during hot-working.