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MICROSTRUCTURE EVOLUTION AND THE EFFECT OF CHEMO-MECHANICAL COUPLING: PROCESS TO PROPERTY

TRACK NUMBER 1000 - MANUFACTURING AND MATERIALS PROCESSING

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ABSTRACT

Applied materials like metals and solid-state polymers consist of multiple phases. Their properties depend crucially on the internal phase-structure, i.e. the fraction and local distribution of the phases, their composition and their molecular configuration. Chemical inhomogeneity leads to inhomogeneity in mechanical properties as well as mechanical load couples back to chemistry. This strong interrelation is expressed in the thermodynamic functional of the material which is composed of a thermo-chemical or thermo-solutal part on the one hand and a chemistry-dependent mechanical part on the other hand. This symposium will focus its attention on the modeling of materials at the microstructure and grain structure levels. The goal will be to present the latest developments in all types of modelling techniques that address the levels of microstructure and grain structure evolution during processing and during service. Special emphasis shall be given to the effect of chemo-mechanical coupling and the prediction of properties based on microstructural criteria. Different approaches at the mesoscopic scale, phase field, level set, front tracking, cellular automaton, Monte Carlo, finite element, discrete element, mesh-free methods are welcomed. We invite contributions concerned with microstructural-driven phenomena such as

- Diffusion controlled phase transitions
- Mixed mode and massive transformations
- Ideal grain growth, drag effect and abnormal grain growth
- Texture evolution during severe plastic deformation with plastic activity and twinning
- Effect of chemo-mechanical coupling on microstructure evolution
- Recrystallization and recovery
- Damage and fracture related to microstructures