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PHASE-FIELD APPROACHES TO PLASTICITY AND INELASTICITY

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ABSTRACT

The phase-field method (PFM) is a numerically highly efficient method that is widely used for the simulation of microstructure evolution. The field of application includes, among other, phase transitions such as liquid–liquid, liquid–solid, and solid–solid. Examples are phase separation, solidification, growth of precipitations, recrystallization, and crack propagation.

Regarding the investigation of polycrystalline materials with respect to their plastic material behavior, experimental data and simulations are commonly compared on the basis of dislocation densities or the overall mechanical behavior. For the latter, phenomenological plasticity theories, such as crystal plasticity, are commonly applied.

The main objective of this invited session is to discuss the implementation of both mechanism-based and phenomenological plasticity theories, as well as inelastic material behavior within the diffuse interface of PFM through different approaches. This also includes the consideration of inelastic material behavior in the context of crack propagation.