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PHASE-FIELD MODELING OF COUPLED PROBLEMS

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ABSTRACT

Properties of materials are intrinsically related to the underlying microstructure and its evolution. To reveal mechanisms and to assist design of new materials, it is essential to develop efficient theoretical models to predict and manipulate the evolution of microstructures. Phase-field theory turns out to be a most successful and most general approach to serve this purpose. This is not only due to a very general and intuitive theoretical structure, but also thanks to advantageous features including straightforward numerical implementation and flexible extension to coupled scenarios. Through its general formulation it can be readily implemented into continuum-thermodynamics frameworks and thus be combined with multiphysics coupled dynamics in one play ground (e.g. mechanics, electro- and magnetostatics, heat transport, diffusion, fluid dynamics). Phase-field modeling has thus been finding increasing interest in emergent fields of engineering and science such as in structural, functional and biological contexts.

This minisymposium offers a forum to exchange experiences and ideas in model development, numerical techniques and applications spanning various aspects of phase-field modeling in coupled scenarios. Topics include (but are not limited to):

- Damage and fracture in coupled problems
- Grain boundary mechanics
- Domain evolution in ferroic materials
- Melting, solidification and grain coalescence
- Phase transformation and phase separation
- Solid and liquid interaction
- Topology optimization
- Non-isothermal microstructure evolution
- Numerics, algorithms, variational formulations

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