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PHASE FIELD MODELING AND COMPUTATION

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ABSTRACT

In many processes in industrial applications and natural sciences, the evolution of interfaces is of paramount importance. Examples occur in a wide range of research areas including multi-phase flows, crack propagation, fluid-structure interaction, solidification, crystal growth and biomembranes. The phase-field methodology is a powerful mathematical modeling approach for systems with moving interfaces like these. In the phase-field method, moving boundary problems are reformulated as PDEs on fixed domains in which the interface evolution is governed by a PDE of a scalar order parameter (the phase field). Phase-field models are diffuse-interface models meaning that the interface is a smooth region described by the smooth phase field.

The phase field method has favorable properties, such as a rigorous thermodynamical structure and a physical interface description, but introduces new challenges for computations. Important challenges include the discretization of higher order spatial derivatives that typically occur in phase- field models, the design of thermodynamically stable numerical methods (both in space and time) and the treatment of a relatively sharp interface. This minisymposia is dedicated to modeling and computation with the phase-field method. We welcome talks on novel phase-field modeling approaches and numerical algorithms as well as applications in fluids, solids and biomechanics.