

## PARALLEL ADAPTIVE PHASE FIELD SIMULATION FOR SOLIDIFICATION

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### ABSTRACT

Phase field models continue to be valuable for studying two-phase problems where the free energy is easily derived from physical principles. Unfortunately, creating high-performance phase field simulations remains a challenge. We present a new parallel and adaptive phase field simulation for modelling solidification processes. By leveraging the parallel and structured adaptive mesh refinement capabilities of the SAMRAI library, we were able to rapidly develop a high-performance, portable software framework for solving systems of time-dependent PDEs. We then used this framework as the foundation for our high-resolution phase field simulations of multi-crystal growth processes in the presence of crystal anisotropy. We will demonstrate the accuracy and computational performance of our simulations and present some recent results on void formation in multi-nuclei solidification processes.