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Instabilities of structured liquid metal geometries on nanoscale[1]
NANYI DONG, NJIT, YUEYING WU, U. Tennessee, JASON FOWLKES, ORNL, PHILIP RACK, U. Tennessee and ORNL, LOU KONDIC, NJIT — Directed assembly on nanoscale is one of quickly growing fields in materials science, and understanding basic physical mechanisms that lead to formation of desired patterns is crucial for future progress. This contribution, motivated by the experiments carried out with structured metal geometries liquefied by laser irradiation, centers on formulating simple but realistic models that allow to reach this understanding. The model is based on long-wave limit of Navier-Stokes equations relevant to evolution of liquid metals. Liquid-solid interaction forces are included and we show that these are crucial for instability development. We carry out fully nonlinear simulations of the derived model, and find that the computational results are fully consistent with the experimental ones, thus confirming that the main feature of the experiments could be captured by a simplified continuum model. In addition, our simulations suggest that stochastic effects, possibly due to thermal noise, may play an important role.

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Lou Kondic
NJIT

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