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Current-induced Stabilization of Surface Morphology in Stressed Solids VIVEK TOMAR, M. RAUF GUNGOR, DIMITRIOS MAROUDAS, University of Massachusetts Amherst — We report results on the surface morphological evolution of a conducting crystalline solid under the simultaneous action of an electric field and mechanical stress based on a fully nonlinear model and combining linear stability theory with self-consistent dynamical numerical simulations. Surface diffusional anisotropy is taken into account in the analysis. We address the morphological response of a planar surface for a stress that acts on the solid uniaxially and parallel to the applied electric field, which is directed parallel to the surface plane. For a given stress level, our linear stability analysis predicts three regimes of surface morphological response at weak, moderate, and strong electric fields, respectively. Our key theoretical findings are in agreement with our numerical simulation results. Most importantly, we find that a sufficiently strong electric field, through surface electromigration, can stabilize the surface morphology of the stressed solid against crack-like surface instabilities.

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