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Electromigration-driven assembly of single-layer epitaxial islands on substrates: An approach to nanopatterning DWAIPAYAN DASGUPTA, DIMITRIOS MAROUDAS, Univ of Mass - Amherst — We study an approach to surface nanopatterning based on the current-driven assembly of single-layer epitaxial islands on crystalline substrates. We develop a fully nonlinear model for the driven morphological evolution of single-layer epitaxial islands on crystalline elastic substrates with diffusional mass transport limited to the island edge. We validate our model by comparisons of simulation results for individual islands with experimental data for Ag island morphology and migration speed. We report oscillatory dynamics for islands on $\langle 110 \rangle$-oriented substrate surfaces and explore the dependence of the stable time-periodic state on the angle between the applied electric field and fast edge diffusion directions. Toward current-driven nanopatterning, we study the evolution of different-size island pairs driven to coalescence and its dependence on three key geometrical parameters: the sizes of the two islands of the pair and their center-to-center line misalignment with respect to the electric-field direction. We discover various patterns ranging from equal- and different-size stable steady island-pair configurations to many-island patterns that can be tailored by controlling the initial-pair geometrical parameters as well as the duration of application of the electric field.

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