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Theoretical Analysis of Electromigration-Induced Void Migration and Surface Waves in Metallic Thin Films JAESEOL CHO, M. RAUF GUNGOR, DIMITRIOS MAROUDAS, University of Massachusetts, Amherst —

Electromigration-induced void dynamics in metallic thin films is of major interest for fundamental understanding of driven surface morphological evolution and for addressing important materials reliability problems. In this presentation, we report results of self-consistent numerical simulations of current-induced void morphological response in metallic thin films accounting rigorously for current crowding, surface curvature, and surface diffusional anisotropy effects. We demonstrate that as the morphological stability limit is approached the migration speed of a stable void deviates substantially from being inversely proportional to the void size and derive a universally valid relationship for a properly rescaled void migration speed as a function of void size. Furthermore, in grains characterized by high symmetry of surface diffusional anisotropy, we predict the onset of stable surface waves that propagate on voids migrating along the metallic film at constant speeds as either the applied electric field strength, or the void size, or the diffusional anisotropy strength is increased over a critical value. This onset of stable time-periodic solutions corresponds to a Hopf bifurcation in the void surface morphological response.

Dimitrios Maroudas
University of Massachusetts, Amherst

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