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On Scaling Exponents for Roughening and Coarsening in Unstable Epitaxial Mound Growth: A Parametric Study[1] JOSHUA SCHNEIDER, CHRISTIAN RATSCH, UCLA, DIONISIOS MARGETIS, University of Maryland, FREDERIC GIBOU, UCSB — We describe scaling behavior of growing crystal surfaces in the presence of Ehrlich-Schwoebel step-edge barriers and two surface transport mechanisms: Downward funneling (DF) and transient mobility (TM). DF and TM are mechanisms that enable freshly deposited atoms to descend to lower layers on the surface, leading to a downhill mass current. This downhill current opposes the effect of step-edge barriers, which tend to suppress interlayer transport. Using kinetic Monte Carlo simulations of atomistic motion and level set simulations of island dynamics, we find that scaling exponents for surface roughening and mound coarsening depend on the strength of both step-edge barriers and surface transport mechanisms during unstable growth. Specifically, as downward transport becomes stronger, roughening exponents decrease while coarsening exponents increase, measured after a fixed amount of deposition. Dependence of scaling behavior on Ehrlich-Schwoebel barriers, detachment rate of atoms from step edges, and edge diffusion is also discussed. The goal of this work is to provide a more thorough understanding of the interplay between several competing effects which influence mound evolution.

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