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Submonolayer Island Nucleation and Growth for Subdiffusive Random Walkers[1] MIKHAEL SEMAAN, The University of Toledo, and California State University, Long Beach, JACQUES AMAR, The University of Toledo
— Classical nucleation theory has long been used to model submonolayer growth, and kinetic Monte Carlo (KMC) simulations have provided accurate checks of the theory. However, classical nucleation theory deals only with ordinary diffusion on the surface. At least two other types of diffusion exist: superdiffusion, whereby a random walker travels in the same direction over a 'persistence length' – whose distribution is given by a power law distribution – before changing direction; and subdiffusion, whereby a random walker waits some time τ – where τ also follows a power law distribution – before taking its next step. While subdiffusive walkers are notably present in many physical scenarios, including Xerography, disordered glasses, and systems with many surface defects which create a large distribution of hopping potentials, the effects of subdiffusion have never been studied in terms of surface growth and nucleation. In this project, the island density scaling exponent χ is investigated for subdiffusive systems using KMC simulations. Excellent agreement is found between the simulation results and a recently obtained analytical prediction (J. G. Amar, unpublished) based on a self-consistent rate equation approach.

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