Abstract Submitted
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Effects of large critical cluster size in thin-film nucleation and growth models: deviation of island- and capture-zone size distributions from standard models.[1] LINNEA BAVIK, BRAD JOHNSON, CYRUS SCHAAF, MICHAEL JENKINS, DAVID PATRICK, Western Washington University — Submonolayer island formation in molecular and metallic thin films prepared by vacuum deposition is typically characterized by a small critical nucleus size, i* ˜1 – 3 monomers. However, comparable nucleation kinetics in a liquid solvent environment involves critical nuclei sizes an order of magnitude (or more) larger, an important regime that has not been well explored by theory. Here we examine the effects of large critical nucleus size on nucleation and growth kinetics via kinetic Monte Carlo simulations of burst nucleation, treating extended fractal, compact circular, and point island models. In extended models, following a short burst of nucleation, the rate of island growth is proportional to island size, causing small initial size differences to become exaggerated as growth proceeds. This effect becomes more pronounced as the critical nucleus size increases, where the average monomer density, and hence nucleation behavior, is more sensitive to the proximity of islands. This leads to deviations in the resulting island size distribution from the predictions of standard models.

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