

Abstract Submitted
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Submonolayer island growth with anomalous diffusion¹ JACQUES AMAR, University of Toledo, MIKHAEL SEMAAN, California State University, Long Beach — Island nucleation and growth play an important role in the early stages of thin-film growth. Of particular interest is the exponent χ which describes the dependence of the peak island density on deposition flux, and which also depends sensitively on the critical island-size i . While the dependence of χ on i is known for normal diffusion, the case of anomalous monomer diffusion is also of interest, since this appears to play a role in recent experiments. Here we derive general expressions for χ which are valid for arbitrary substrate dimension, island fractal dimension, critical island size, and monomer diffusion exponent μ . Excellent agreement is obtained between our predictions and kinetic Monte Carlo simulations carried out for the case of irreversible growth ($i = 1$), and monomer superdiffusion with $1 < \mu \leq 2$, although unusually large crossover effects are also observed. These results also confirm and generalize a previous prediction for the case of ballistic diffusion ($\mu = 2$). We also consider the case of monomer subdiffusion corresponding to $0 \leq \mu < 1$. Good agreement with our predictions for $\chi(\mu)$ is also found in this case, although the general scaling behavior is more complex due to the presence of large fluctuations.

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