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Effects of cluster diffusion on the island density and size-distribution in submonolayer island growth YEVGEN KRYUKOV, JACQUES AMAR, University of Toledo — The effects of cluster diffusion on the submonolayer island density and island-size distribution (ISD) $N_s(\theta)$ (where $N_s(\theta)$ is the number of islands of size s at coverage θ) are studied for the case of irreversible submonolayer growth of compact islands on a 2D substrate. In our model, monomers are deposited with deposition rate F while the mobility D_s of an island of size s satisfies $D_s \sim s^{-\mu}$. Results are presented for $\mu = 1/2$ (corresponding to Brownian motion) as well as for higher values of μ. In general, we find that the exponents describing the flux-dependence of the island and monomer densities vary continuously as a function of μ. For $\mu < 1$ we also find that the ISD exhibits power-law behavior up to a cross-over size S_c. However, the values of the corresponding exponents are significantly larger than previous theoretical predictions. A generalized scaling form for the ISD for $\mu < 1$ is also proposed which leads to excellent scaling of the entire distribution. In contrast, for $\mu \geq 1$ we find that, due to a competition between size-scales, neither our generalized scaling form nor the standard scaling form $N_s(\theta) = \theta/S^2\ f(s/S)$ (where S is the average island-size) lead to scaling of the entire ISD. Instead, the scaled ISD becomes more sharply peaked with increasing D_1/F and coverage. This is in contrast to models with limited cluster mobility for which good scaling occurs over a wide range of coverages and D_1/F.

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