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Scaling of the Island Density, Size Distribution and Capture Numbers in 3D Nucleation and Growth[1] JOHN ROYSTON, JACQUES AMAR, University of Toledo — The results of kinetic Monte Carlo (KMC) simulations of a model of the irreversible nucleation and growth of fractal islands in 3D are presented along with a comparison with rate-equation (RE) results and mean-field (MF) theory. In previous work for point-islands in 3D it was found that both the scaled island-size distribution (ISD) and capture-number distribution (CND) approach the MF prediction of a diverging ISD and size-independent CND in the limit of large D/F (where D is the monomer diffusion rate and F is the deposition rate). In contrast, here we find that the divergence of the ISD with increasing D/F is much weaker for the case of fractal islands while the scaled CND $C(s/S)$ (where S is the average island size) is not constant but increases linearly with island size s. We also find that the exponent χ describing the dependence of the peak island-density on D/F (e.g. $N_{pk} \sim (D/F)^{-\chi}$) deviates significantly from the standard prediction $\chi = 1/3$. Self-consistent RE results for the average island and monomer densities which give good agreement with simulations are also presented, along with an analytical expression for the exponent χ.

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