Scaling of the Island Density, Size Distribution and Capture Numbers in 3D Nucleation and Growth\textsuperscript{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 $\chi$ 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 $\chi$.

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