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Epitaxial growth of colloidal nanoparticles Y. KRYUKOV, C. JOSHI, T.P. BIGIONI, J.G. AMAR, University of Toledo — In recent drop-drying experiments involving gold nanoparticles suspended in an evaporating droplet, the formation of large highly-ordered nanoparticle monolayers growing at the liquid air-interface has been observed. While this process appears to be analogous to epitaxial growth, there are also some important differences. For example, in analogy to epitaxial growth on a solid substrate, our experimental results indicate the existence of a sharp island-size distribution as well as a well-defined critical island-size. However, in contrast to epitaxial growth, we find a power-law decay of the island density with coverage due to the coalescence of large diffusing clusters. In order to better understand these results, we have carried out kinetic Monte Carlo simulations of a realistic model which takes into account (i) "deposition" of nanoparticles at the liquid-air interface (ii) two-dimensional diffusion of nanoparticles, and (iii) cluster diffusion and coalescence, as well as the effects of monomer detachment and van der Waals attraction. A comparison between our simulation results and experimental results will be presented.

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