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Coarsening and Saturation of Quantum Dot Evolution during Strained Film Heteroepitaxy CHAMPIKA GIGIRIWALA GAMAGE, ZHI-FENG HUANG, Department of Physics and Astronomy, Wayne State University, Detroit, MI — Morphological properties of an epitaxially grown film and the self-organization process of coherent strained islands are analyzed via the development of a continuum elasticity model based on the 2nd order perturbation method. Effects of wetting stress due to film-substrate interactions have been incorporated in the resulting nonlinear dynamic equation governing the film morphological profile. We study the formation and evolution of surface strained islands or quantum dots for different film/substrate misfit strains, via analyzing the time-dependent behavior of the structure factor for surface heights, its various moments, and the surface roughness. Three regimes of island array evolution have been identified, including a film instability regime at early stage, a slow power-law-type coarsening at intermediate time, and the crossover to a saturated state, with detailed behavior dependent on misfit strains but not qualitatively on finite system sizes. The results are compared to previous experimental and theoretical efforts on quantum dots coarsening and saturation.

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