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A Level-Set Method for Epitaxial Growth and Self-Organization of Quantum Dots CHRISTIAN RATSCH, YOUNG-JU LEE, XIAOBIN NIU, RUSSEL CAFLISCH, UCLA — We have developed an island dynamics model that employs the level-set technique to describe epitaxial growth. One virtue of this method is that the typical simulation timestep can be chosen much larger than in an atomistic simulation, even when several microscopic processes with vastly different rates are relevant. This makes it feasible to solve the elastic equations and obtain the entire strain field at every timestep of the simulation. The strain field modifies the potential energy surface, and different limits will be discussed. We will present simulation results where we self-consistently modify the strain dependent microscopic rates for surface diffusion and detachment of adatoms from island edges. Our results for the island size distributions indicate that such strain dependent kinetic rates lead to the regularization of island sizes, and ultimately the formation and self-organization of quantum dots.

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