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Phase field model for growth of adatom islands YAN-MEI YU, Institute of Physics, Chinese Academy of Sciences, Beijing 100080, China, BANG-GUI LIU, Department of Physics, University of California, Berkeley, CA 94720; and Institute of Physics, Chinese Academy of Sciences, Beijing 100080, China — We developed a phase-field model for epitaxial growth of 2D/3D adatom islands and self-organized formation of regular nanostripes. A local phase-field variable is introduced to describe adatom islands. The evolution of this phase field is determined by a time-dependent equation coupled to a diffusive transport equation of local adatom density. The limited interlayer diffusion and atomic detachment at steps are included in the model. Applied to real submonolayer epitaxial systems, we reproduce not only the scaling law of the island density but also the experimental size and spatial distribution of the islands. With large coverages of adatoms we obtain not only the 3D mounding islands but also their coarsening and roughening exponents. We explored the self-organized formation of regular arrays of Fe nanostripes on W(110) by the hybrid growth of islands and step flows during the post-deposition annealing. Compared with atomic models and mean-field models, this phase-field model can not only span larger space and time scales while containing the elemental atomic kinetic of epitaxy, but also provide a fine visualized morphology of epitaxial features in 2+1 dimensions. Y. M. Yu and B.-G. Liu, Phys. Rev. E 69, 021601 (2004); Phys. Rev. B 70, 051444 (2004).

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