Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Two Species Diffusion Model of Self-Organized Evolution on Patterned GaAs(001) Surfaces* HUNG-CHIH KAN, National Chung Cheng University, Taiwan ROC, ERIN FLANAGAN, TABASSOM TADAYYON-ESLAMI, University of Maryland, SUBRAMANIAM KANAKARAJU, Lab for Physical Sciences, CHRIS RICHARDSON[1], RAY PHANEUF, University of Maryland — We report on numerical simulations of the self-organized evolution on GaAs(001) surface, pre-patterned with square arrays of pillars, during homo-epitaxial growth. Our experiments showed that lithographically fabricated, flat-topped cylindrical pillars evolved into a universal, downward paraboloidal shape, for initial diameters of the pillar ranging from 0.7um to several microns. In modeling this behavior, we construct a two-species diffusion model to simulate the growth. We consider the diffusion of both the Ga atom and As_2 dimers deposited on terraces between the concentric loop steps which make up the sidewall of the pillar. The stoichiometry for incorporating the diffusing Ga atoms and As_2 dimers into solid GaAs at the step edges produces boundary conditions that couple the flux of both diffusising species. We compare the results of our numerical simulation to the observed self-organization of the topography. *supported by the Lab for Physical Sciences and by NSF# DMR-0705447.

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Date submitted: 27 Nov 2007 Electronic form version 1.4