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Step Density Minimum on Vicinal Surfaces and Surface Cusps in Epitaxial Regrowth on Patterned Substrates TIAN LI, University of Illinois, Urbana, IL, A. BALLESTAD, T. TIEDJE, University of British Columbia, Vancouver, BC — In kinetic Monte Carlo (KMC) simulations of a solid-on-solid model of epitaxial growth, we measure the step density as a function of surface slope and find a special slope where the step density has a minimum. This slope occurs where the surface step density changes from two dimensional (islands) to one dimensional (staircase). The minimum in the step density results from the fact that one dimensional steps are more efficient at capturing adatoms than two dimensional steps, so that a small vicinal angle tends to suppress nucleation of islands. The slope for minimum step density is most sharply defined at low growth rates and high temperatures where the step edges tend to be smooth. The special slope goes away at low temperatures where the steps have a convoluted fractal shape. The minimum in the step density generates characteristic features in KMC simulations for stable (negative Ehrlich Schwoebel barriers) growth on patterned substrates, namely cusps on the top and shoulders of ridges. These features are also found in a continuum growth model which includes the step density minimum. Simulated surface shapes are in good agreement with experimental data for MBE growth of GaAs on patterned substrates, and with data in the literature.

Tom Tiedje
University of British Columbia

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