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Persistent Step-Flow Growth of Strained Overlayers on Vicinal Substrates WEI HONG, Harvard University, MINA YOON, Oak Ridge National Laboratory, ZHIGANG SUO, Harvard University, HO NYUNG LEE, HANS M. CHRISTEN, DOUG H. LOWNDES, ZHENYU ZHANG, Oak Ridge National Laboratory — Driven by step-step (SS) attraction, a strained overlayer grown on a vicinal substrate is inherently unstable, as manifested by step bunching. The step-edge (or Ehrlich-Schwoebel) barrier effects may either accelerate, delay, or suppress step bunching, depending on the nature of the ES barriers for a given system. Using linear stability theory and numerical simulations, we analyze the morphological evolution in heteroepitaxial growth with explicit consideration of the competition between the SS and ES effects. We establish the existence of a deposition flux window within which stable and persistent step-flow growth can be achieved. This window for step-flow growth is sandwiched between the island growth mode at too high deposition fluxes, and the step bunching mode at too low deposition fluxes. We express the phase boundaries in terms of intrinsic physical parameters and experimentally controllable growth conditions, and compare the predictions with experimental results from PLD growth studies of metal oxide thin films.

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