PHYSICAL MATHEMATICS SEMINAR

DYNAMICS OF STEP FLOW ON CRYSTALLINE SURFACES DUE TO THE INTERPLAY OF ELASTICITY AND KINETICS

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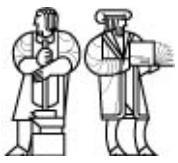
ABSTRACT:

Epitaxial growth of one crystal on the surface of another is a process fundamental to many technologies. We propose and experimentally verify a theory of persistent step-flow growth of strained films on vicinal substrates. For step flow to be stable against island formation, the deposition flux must be sufficiently low; when applied to pulsed laser deposition, this constraint requires that the time to evacuate adatoms deposited in one pulse be shorter than the period between pulses. For step flow to be stable against step bunching, the deposition flux must be sufficiently high, so that the effect of the adatom attachment barrier prevails over that of strain. These considerations lead to a morphological phase diagram that contains a step-flow regime, surrounded by regimes of three less desirable growth modes: step bunching, island formation, and concurrent island formation and step bunching. The theory rationalizes diverse growth modes observed in pulsed laser deposition of oxides.

TUESDAY, DECEMBER 13, 2005
2:30 PM
Building 3, Room 370

Refreshments at 3:30 PM outside of Room 370



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