

MATHEMATICS DEPARTMENT
North Carolina State University

JOINT DIFFERENTIAL EQUATIONS/
NUMERICAL ANALYSIS SEMINAR

Wednesday, April 26, 2006
3:00 p.m. 330 Harrelson Hall

Bo Li

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**“Surface diffusion vs. the Ehrlich-Schwoebel
effect in thin-film growth”**

The surface of an epitaxially growing thin film often exhibits a mound-like structure with its characteristic lateral size increasing in time. We consider two competing mechanisms for such a coarsening process: (1) surface diffusion described by high-order gradients of the surface profile; and (2) the Ehrlich-Schwoebel (ES) effect, which is the asymmetry in the adatom (adsorbed atoms) attachment and detachment to and from atomic steps. We present a theory based on a class of continuum models that are gradient flows of effective free-energy functionals describing these mechanisms. This theory consists of two parts: (1) variational properties of the free energies, in particular, their large-system-size asymptotics, showing the unboundedness of surface slope and revealing relations between some of the models; (2) rigorous bounds for the scaling law of the roughness, the rate of increase of surface slope, and the rate of energy dissipation, all of which characterize the coarsening process.

Graduate students are invited to attend.

For questions, comments, and offers to talk, contact Steve Schechter, schechter@math.ncsu.edu. Please visit the DE Seminar web page at www.math.ncsu.edu/seminars.html.