Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Phase Field Model of Contact Angle Hysteresis MAHESH PANCHAGNULA, Tennessee Technological University, SRIKANTH VEDANTAM, National University of Singapore — We describe a phase field theory based model in the Ginzburg-Landau framework for wetting of surfaces by sessile drops. The theory uses a two dimensional non-conserved phase field variable to parametrize the Gibbs free energy of the three dimensional system. Contact line tension is included through the gradient term in the free energy and contact angle hysteresis arises out of a special form of the kinetic coefficient. The form of the kinetic co-efficient is chosen to include both rate dependent as well as rate independent effects on contact angle hysteresis. In this fashion, hysteresis is included constitutively without explicit consideration of the underlying causes. We invoke a spherical cap approximation for the shape of most of the drop for the reduced order of dimensionality. Using this theory we examine the wetting of a surface containing a circular heterogeneous island. The model captures the empirically observed contact angle behavior and is found to be determined solely by the material properties at the contact line.

Mahesh Panchagnula
Tennessee Technological University

Date submitted: 27 Aug 2007 Electronic form version 1.4