

Abstract Submitted  
for the DFD11 Meeting of  
The American Physical Society

**Layer formation in particle-laden free-films**<sup>1</sup> LUCIEN BRUSH, University of Washington, STEVEN ROPER, University of Glasgow — Solutions to a model of a particle-laden free-film that includes structural oscillatory forces in addition to van der Waals forces are presented. Examination of steady solutions to the equations reveals layer and bulge solutions. Fully nonlinear time-dependent numerical calculations reveal that at fixed concentration a uniform film evolves into a multi-layered film, the heights of which are given by the common tangent construction applied to the particle-film interaction free energy. If the interaction free energy curvature is negative there is no barrier to the formation of a layered film from the uniform film, whereas if the interaction free energy curvature is positive the uniform layer is metastable. This behavior is analogous to spinodal decomposition and nucleation and growth mechanisms observed in classical first order phase transformations. Phase diagrams for layer transitions are also presented and discussed.

<sup>1</sup>Support from NSF Grant No. CMMI-0827101 is acknowledged.

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Date submitted: 04 Aug 2011

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