Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Band patterns in thin film suspensions DAVID MOLENAAR, MARK BUCHANAN, SIMON DE VILLIERS, Oslo University, MIKE EVANS, University of Leeds — A range of fascinating patterns can be observed when a thin, particle-laden flow has drained down an inclined substrate. If particles are on the order of 10 to 100 microns in diameter and behave, roughly, as hard spheres, the emerging pattern consists of horizontal bands, oriented perpendicular to the mean flow direction. We discuss the mechanisms of pattern formation, and set up a theory based on excluded-volume and viscous couplings between particles and solvent. Large particles are pinned in the thinning film by means of static friction with the substrate, mediated by surface tension effects at the fluid-air interface. Subsequently, pinned particles alter the film surface and provide an efficient instability mechanism. Additional particles become arrested and link-up the pinning points into band structures. These bands block the mean flow, followed by a phase of coarsening, where smaller particles sediment onto the band. The final band thickness is thus proportional to the captured feeding area.

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Date submitted: 05 Aug 2006 Electronic form version 1.4