Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Using colloids to model atomic thin film growth RAJESH GANAPATHY, MARK BUCKLEY, ITAI COHEN, Cornell University — We epitaxially grow colloidal thin films by sedimenting micron sized colloidal particles on a microfabricated substrate. The attractive interaction between the colloids, induced by a depletant polymer, leads to the nucleation of islands that grow and coalesce with one another. We use confocal microscopy and particle tracking to study the dynamics of the colloidal particles as they diffuse, aggregate and rearrange configurations during deposition. The saturation island density is estimated as a function of the deposition rate and depletant concentration. We find that our results are in excellent agreement with those obtained from atomic deposition experiments suggesting that our system can be used to model various phenomena that occur in atomic thin film growth. Furthermore, we quantify the Ehrlich-Schwoebel step edge barrier by using holographic optical tweezers to create artificial islands and study the dynamics of colloidal monomers placed on the edge of these islands. Owing to the short-range of the attractive interaction in our system, the origin of the step edge barrier in colloids is strikingly different from atoms.

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Date submitted: 25 Nov 2008 Electronic form version 1.4