Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Large colloidal crystals grown by centrifugation onto a template DANIEL PENNACHIO, School of Engineering and Applied Sciences, Harvard University, Cambridge, MA, KATHARINE JENSEN, Department of Physics, Harvard University, Cambridge, MA, DAVID WEITZ, Department of Physics, Harvard University, Cambridge, MA; School of Engineering and Applied Sciences, Harvard University, Cambridge, MA, FRANS SPAEPEN, School of Engineering and Applied Sciences, Harvard University, Cambridge, MA — Colloidal crystals are commonly formed by sedimenting a colloidal solution at 1g onto a patterned template. Slow sedimentation was previously believed to be a requisite for growing large, perfect crystals without crossover to an amorphous sediment. By increasing the relative gravitational force applied to a monodisperse sample of hard-sphere, 1.55μm diameter silica colloids, we examined the effect of increased sedimentation velocity on the growth of face-centered cubic crystals on a (100) template. We varied relative centrifugal force up to 3000g, time of centrifugation, lattice parameter, and crystal thickness to assess their effect on crystal quality. Single crystals up to 52 μm thick were grown for all centrifugation speeds. Crystal defects were predominantly stacking faults (bounded by partial dislocations), most of which formed after the critical thickness was reached. The critical thickness, which is a function of the lattice mismatch between crystal and template, was measured directly by varying the crystal thickness. Final stacking fault and vacancy concentrations were independent of centrifugal force and time. We also examined samples centrifuged onto other templates to elucidate the critical role of the template design in directing crystal versus glass formation.

Daniel Pennachio
School of Engineering and Applied Sciences,
Harvard University, Cambridge, MA

Date submitted: 17 Nov 2011 Electronic form version 1.4