Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Transitions from hard-sphere colloidal crystals to colloidal crystals with strong attractive interactions[1] MATTHEW GRATALE, YE XU, ARJUN YODH, Department of Physics and Astronomy, University of Pennsylvania — Recently, colloid experiments have probed and found interesting differences in the properties of disordered glassy media as a function of the sign of the interparticle interaction [1-3]. Here, we report a similar kind of experiment, this time involving colloidal crystals wherein the interparticle interaction between constituent particles evolves from hard-sphere repulsive to attractive. This change in sign of the interparticle interaction is achieved through use of temperature-tunable depletants assembled from surfactants. The depletion-driven entropic attraction between particles in suspension grows with increasing temperature. Increasing temperature changes particle interactions in a dense crystal from repulsive to attractive, and accompanying variations in structure and dynamics of the crystal can be tracked. The increase in attractive interaction can also be turned on slowly and rapidly. Preliminary experiments on polycrystalline hard-sphere samples show accompanying decreases the lattice constant and a fluid-crystal coexistence phase consisting of small, dense "attractive" crystalline domains separated by "voids" filled with dilute colloidal fluid. These voids appear to originate at grain boundaries and near lattice defects in the original hard-sphere polycrystal. Further work explores the dense parts of the colloidal phase diagram with depletion interactions. [1] Eckert *et al.*, PRL **89**, 125701 (2002). [2] Pham *et al.*, Science **296**, 5565 (2002). [3] Kaufman *et al.*, J. Chem. Phys. **125**, 074716 (2006).

[1]This work is supported by NSF grant DMR12-05463, Penn MRSEC grant DMR11-20901, and NASA grant NNX08AO0G.

Matthew Gratale
Department of Physics and Astronomy, University of Pennsylvania

Date submitted: 13 Nov 2014 Electronic form version 1.4