Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Transitions in colloidal crystals induced by changes in interparticle interactions[1] BARTHOLOMEUS MACHIELSE, MATTHEW GRATALE, ZOEY DAVIDSON, ARJUN YODH, Univ of Pennsylvania — We experimentally study the phase diagram of two-dimensional colloidal crystals as the interparticle interactions transition from weakly attractive to strongly attractive. Simulations have shown that crystals transition from a crystal phase into fluid-crystal coexistence at high attraction strengths. To control the interaction between colloids, we use temperature sensitive, rod-like surfactant micelles as depletants. As the temperature of the system increases, the rod length of the micelles grows, leading to an increase in both the range and strength of interparticle attractions. As the attraction strength increases we observe a decrease in the lattice constant of the crystal, and the creation of tears in the crystal structure. These tears allow a colloidal fluid to form, thus yielding the fluid-crystal coexistence phase predicted by previous simulations. These tears and their corresponding phase separation occur simultaneously with a peak in the susceptibility of the orientational order parameter. By creating colloidal systems with various packing fractions and slowly increasing the temperature, which increases the attraction strength between colloids, we attempt to accurately map out the phase diagram of two-dimensional colloidal crystals with attractive interactions.

[1]This work is supported by NSF grants DMR12-05463 and NSF RUI-1306990, Penn MRSEC grant DMR11-20901, and NASA grant NNX08AO0G.

Bartholomeus Machielse
Univ of Pennsylvania

Date submitted: 29 Oct 2015 Electronic form version 1.4