Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Categorizing Dense Attractive 2D Colloidal Packings using Vibrational Modes and Local Structure[1] MATTHEW LOHR, TIM STILL, Department of Physics and Astronomy, University of Pennsylvania, KEVIN APTOWICZ, Department of Physics, West Chester University, YE XU, MATTHEW GRATALE, ARJUN YODH, Department of Physics and Astronomy, University of Pennsylvania — In this work, we investigate the microscopic dynamics of quasi-2D dense attractive colloidal systems. We confine bidisperse polystyrene spheres between glass coverslips in a suspension of water and 2,6-lutidine; as we increase the temperature of the sample into a critical regime, lutidine wets the colloids, creating a strong attractive interaction (greater than 4kT). We track the particle locations via bright-field video microscopy and analyze the dynamics of packings at various packing fractions. Subsequent calculations of the vibrational modes of the systems demonstrate a hallmark of "glassy" vs. "gel-like" behavior at low frequencies. Specifically, we observe a sudden increase in the density of low-frequency modes with decreasing packing fraction. These modes appear to be coupled to collective motion of large groups of particles. Additionally, there is evidence that this change in vibrational behavior is tied to a packing's local structure. By investigating the correlation between collective vibrations and local packing, we take a significant step towards delineating "gel" and "attractive glass" states in attractive, dense disordered systems.

[1]This work is supported by funding from NSF grant DMR12-05463 and PENN MRSEC grant DMR11-20901.

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Date submitted: 14 Nov 2013 Electronic form version 1.4