Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Correlations Between Structure, Vibrational Modes and Collective Motion in Dense Attractive 2D Colloidal Packings[1] MATTHEW LOHR, TIM STILL, University of Pennsylvania, Department of Physics and Astronomy, KEVIN APTOWICZ, West Chester University, Department of Physics, YE XU, MATTHEW GRATALE, ARJUN YODH, University of Pennsylvania, Department of Physics and Astronomy — 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 (>4kT). We specifically study suspensions in the "dense gel" regime, i.e., at a volume fraction high enough that the attractive particles form a spanning cluster, yet just low enough that there exists some structural heterogeneity larger than the individual particle size. We track the particle locations via bright-field video microscopy and analyze the dynamics of both lower-volume-fraction gel states and higher-volume-fraction glassy states. Despite similarities in local structure, we find several consistent differences in the dynamic and vibrational properties of these two extreme systems. Specifically, we observe a drastic change of the presence of low-frequency modes between the two states. These modes appear to be coupled to collective motion of large groups of particles. By investigating the correlation between these collective motions and local packing structures, we gain further insight into the origins of dynamic heterogeneity in disordered systems.

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

Matthew Lohr
University of Pennsylvania

Date submitted: 09 Nov 2012 Electronic form version 1.4