Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Vibrational Phonon Modes of Two-Dimensional Soft-Particle Colloidal Crystals with Hard-Particle Dopants[1]

MATTHEW GRATALE, PETER YUNKER, KE CHEN, Department of Physics and Astronomy, University of Pennsylvania, KEVIN APTOWICZ, Department of Physics, West Chester University, ARJUN YODH, Department of Physics and Astronomy, University of Pennsylvania —

We study the phonon modes of two-dimensional colloidal crystals consisting of random distributions of "soft" NIPA microgel particles and "hard" polystyrene particle dopants. Thus, the effective springs connecting nearest-neighbors are very stiff, very soft, or of intermediate stiffness, corresponding to three possible inter-particle potentials present in the crystals. We employ video microscopy to derive the phonon modes of corresponding "shadow" crystals with the same geometric configuration and interactions as the experimental colloidal system, but absent damping [1,2,3]. Long wavelength, Debye-like behavior is found at low frequencies, regardless of the number of hard polystyrene particles present in the crystal. Hard particles are primary participants at high frequencies, while soft spheres are primary participants at intermediate frequencies. [1] Chen *et al.*, PRL **105**, 025501 (2010). [2] Kaya *et al.*, Science **329**, 656 (2010). [3] Ghosh *et al.* PRL **104**, 248305 (2010).

[1]This work is supported by NSF grant DMR-0804881, Penn MRSEC grant DMR11-20901, and NASA grant NNX08AO0G

Matthew Gratale
Department of Physics and Astronomy, University of Pennsylvania

Date submitted: 09 Nov 2011 Electronic form version 1.4