

## Phonon Modes in Colloidal Solids

20  $\mu\text{m}$

*(Invited Talk #1)*

Ke Chen<sup>1,\*</sup>, Tim Still<sup>2</sup>, Andrea Liu<sup>2</sup>, Arjun Yodh<sup>2</sup>

<sup>1</sup>Beijing National Laboratory for Condensed Matter Physics and Key Laboratory for Soft Matter Physics, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China

<sup>2</sup>Department of Physics and Astronomy, University of Pennsylvania, Philadelphia PA 19104, USA

\*Email of Presenting Author: kechen@iphy.ac.cn

Phonon modes reflect the collective vibrations of atoms in solids. Phonon properties can help us understand many of the thermodynamic and mechanical properties of materials, e.g. heat capacity, speed of sound, shear and bulk modulus, etc. Recent development of displacement covariance matrix analysis to extract detailed phonon information from dense colloids revealed many interesting features in glasses and crystals. We will discuss some of the findings in our experiments, and the latest development of this technique. We will focus on the “soft modes”, the low-frequency quasi-localized phonon modes in both colloidal glasses and colloidal crystals, and their correlation to mechanical deformation and structural defects in colloidal solids.