

Abstract Submitted
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Normal modes of various colloidal crystals¹ FENG WANG, YI PENG, ZIREN WANG, YILONG HAN, Department of Physics, Hong Kong University of Science and Technology, Clear Water Bay, Hong Kong, China, SOFT MATTER AND VIDEO MICROSCOPY LAB TEAM — We measured the vibrational normal modes from particle displacements in various microgel colloidal crystals including monolayers, multi-layer thin films, three-dimensional normal and superheated crystals by video microscopy. Their density of states all agree with the Debye's theory in the low-frequency regime, but the fluctuation of the frequency is similar to that of the eigenvalues of random matrices: the distributions of the frequency spacings between successive normal modes are the Wigner surmise, the spectral rigidities are logarithmic, and the distributions of vibrational amplitudes in the majority of modes are Gaussian. In addition, the first a few low-frequency modes are plane waves and dominate the thermal vibration, and the majority of modes are delocalized.

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