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Phononic Band Gaps in Colloidal Crystals at Hypersonic Frequencies GEORGE FYTAS, Department of Materials Science and Technology and FORTH, Heraklion, Greece and Max Planck Institute for Polymer Research, Mainz, Germany, WEI CHENG, EUGENIA NUNEZ, ULRICH JONAS, Max Planck Institute for Polymer Research, Mainz, Germany, NIKOLAOS STEFANOU, Section of Solid State Physics, University of Athens, Panepistimioupolis, Athens, Greece — The phononic properties of fabricated closed packed fcc colloidal crystals were investigated by high resolution Brillouin light scattering spectroscopy in the GHz frequency range. The dispersion relation has revealed two phononic band gaps: (i) a Bragg –gap occurring at the boundary of the first Brillouin zone and (ii) a hybridization-gap resulting from the interaction of particle eigenmodes with the acoustic mode of the effective medium. Crystallinity is a prerequisite for the appearance only of the Bragg-gap. Depending on the particle size and the speed of sound in the infiltrated fluid, the frequency and the width of the Bragg-gap can be tuned. Since hypersonic crystals can simultaneously exhibit phononic and photonic band gaps in the visible spectral region, the technological applications could range from tunable filters and heat management to acoustic-optical devices.

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