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Polymer-Based Hypersonic Phononic Crystals TARAS GORISHNYY, CHAITANYA ULLAL, MARTIN MALDOVAN, JI HYUN JANG, Massachusetts Institute of Technology, GEORGE FYTAS, Max Planck Institute for Polymer Research, and University of Crete, EDWIN THOMAS, Massachusetts Institute of Technology — The ability to influence high frequency phonons has great importance for both fundamental science and practical applications. A number of important physical processes, such as thermal energy flow, charge carrier mobility and lifetime, and the superconductivity transition, can be altered by modifying the phononic dispersion relation of a medium. Applications range from thermal management and thermoelectricity, to enhanced microelectronic and opto-electronic devices. In this talk we will discuss the use hypersonic phononic crystals to achieve control over the emission and propagation of high frequency phonons. We fabricate high quality, 2D single crystalline hypersonic crystals using interference lithography and perform direct measurement of their phononic band structure with Brillouin light scattering. Numerical calculations are employed to explain the nature of the observed propagation modes. This work lays the foundation for experimental studies of hypersonic crystals and, more generally, phonon-dependent processes in periodic nanostructures.

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