Abstract Submitted
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Polymer Phononic Meta-material Networks[1] CHEONGYANG KOH, EDWIN THOMAS, DMSE, MIT — Phononic Meta-materials (PMM) offer unique opportunities for molding the flow of phonons through artificial structuring of the material at relevant length scales; however, most structures rely on combining mechanically "stiff" and "soft" materials to create the desired phononic properties, usually focusing on resonances to stop phonon flow. Such an approach suffers from lack of scalability, placing fabrication and material compatibility constraints on technological realization. Here, we show that these constraints are unnecessary and that phonon propagation behavior relies on the fundamental requirements of avoided crossings in the frequency dispersion relations. In particular, we demonstrate 1) polymer/air PMMs possessing i) multiple complete spectral gaps (MCSG), ii) negative index bands, iii) both a complete sub-wavelength transverse gap and Bragg-type longitudinal gap and 2) waveguides of pma2 *Frieze* group symmetry that possess MCGS; we verify their dispersion relation using Brillouin light scattering. This opens up the ability to develop novel integrated low-cost all-polymer phononic platforms for information processing via mesoscale polarization manipulation, filtering and superlensing.

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