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Periodic Polymers for Control of PhoXons, where X = t + n

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1, 2 and 3D periodic nanoscale composites with either dielectric or impedance contrast or both, can serve as photonic and or phononic crystals for electromagnetic and elastic waves. Compared to electromagnetic waves, elastic waves are both less complex (longitudinal modes in fluids) and more complex (longitudinal, transverse in-plane and transverse out-of-plane modes in solids). Engineering of the dispersion relation between wave frequency w and wave vector, k enables the opening of band gaps in the density of phoXon modes and detailed shaping of w(k). Periodic polymeric materials can be made by self assembly of block polymers and by interference lithography. Band gaps can be opened by Bragg scattering, anti-crossing of bands and particle resonances. Current interest is in our group focuses using design - modeling, fabrication and measurement of polymer based phoXonic crystals for applications as tunable optics and control of phonon flow.