

# Materials Chemistry Seminar Prof. Ned Thomas

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*Mechanical Engineering & Materials Science*



## Multiscale Periodic Polymer Composites

Polymers provide a versatile materials platform for 1, 2 and 3D periodic nano-micro scale composites with either dielectric or impedance contrast or both, and these can serve as photonic and or phononic crystals for electromagnetic and elastic waves as well as mechanical frames/trusses. 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  $\omega$  and wave vector,  $k$  enables the opening of band gaps in the density of modes and detailed shaping of  $\omega(k)$ . Hierarchical periodic polymeric structures can be made by the bottom-up self assembly of block polymers and by top-down interference lithography and electron beam lithography. Band gaps can be opened by Bragg scattering, anti-crossing of bands and discrete shape resonances. Current interest is in our group focuses using design - modeling, fabrication and measurement of polymer based periodic materials for applications as tunable optics, control of phonon flow and ballistic/blast mitigation.

Thursday, November 10 at 12:15 pm in Room 1315 Chemistry