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Gyroid photonic crystal with Weyl points SIYING PENG, HONGJIE CHEN, HARRY ATWATER, Thomas J. Watson Laboratory of Applied Physics, California Institute of Technology, Pasadena, California 91125, United States — Weyl points are degenerate energy states resulting from band crossing of linear dispersions in three dimensional momentum space. Unlike Dirac points in the two dimensional systems, Weyl points have been shown to be stable and the associated surface states are predicted to be topological surface states. These topologically protected surface states may potentially lead to various interesting phenomena such as backscattering immune transport. We fabricate and characterize photonic crystals in the infrared regime with Weyl points present in their band structures. Full wave FDTD simulations were utilized to optimize the unit cell size and material index of the gyroid structures. Three dimensional two-photon lithography method was used to fabricate optimized geometry from simulations in to polymers. We used sputtering process to coat the polymer structure with high index materials such as amorphous silicon at low temperature conformally. Optical properties of these gyroid geometries with high effective refractive index are characterized with angled resolved FTIR in order to map out the bulk and surface band structures in the momentum space. Initial FTIR measurement at normal incidence has shown strong absorption related to both structured polymer and a-Si structures.

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