Three-Dimensional Chiral Photonic Crystals in the THz Regime Exhibiting Weyl Points with Topological Charges

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Abstract Recently, the existence of multiple Weyl points was theoretically shown for chiral woodpile photonic crystals [1]. These Weyl points carry topological charges and thus lead to the emergence of backscattering-immune gapless surface states, making the photonic crystal a topological photonic insulator. The proposed photonic crystal structure consists of chirally stacked rods made of a perfect electric conductor (PEC), forming a hexagonal lattice. The structure parameters are designed to obtain isolated Weyl points in the THz regime. Polymer structures are fabricated using three-dimensional laser lithography and subsequently coated with silver via polymer sensitization and electroless deposition. For a silver film thickness well above the skin depth of the THz radiation, a material optically comparable to a bulk PEC can be realized. Measurements of the angle resolved transmission spectra using photoconductive antennas as THz sources and detectors will be carried out soon. From these spectra one can obtain the band structure and hence show the existence of the Weyl points.

Reference

1. Chang M, Xiao M, Chen W, Chan CT (2017) Multiple Weyl points and the sign change of their topological charges in woodpile photonic crystals. *Phys Rev B* 95:12

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