

COMPLEX PHOTONIC BAND STRUCTURES IN A PHOTONIC CRYSTAL CONTAINING LOSSY  
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Abstract

In this work, complex photonic band structure (CPBS) in a semiconductor-dielectric photonic crystal (SDPC) operating at terahertz frequencies is theoretically investigated. The SDPC is air/(S/D)N/air where the dielectric layer D is SiO<sub>2</sub>, the semiconductor layer S is an intrinsic semiconductor InSb, and N is the number of periods. Using the experimental data for the strongly temperature-dependent plasma frequency and damping frequency for InSb, we calculate the CPBS for the infinite SDPC at distinct operating temperatures. The CPBS is then compared with the calculated transmittance, reflectance, and absorptance as well in the finite SDPC. Based on the calculated CPBS, the role played by the loss factor (damping frequency), in InSb is revealed. Additionally, from the calculated transmittance spectra, we further investigate the cutoff frequency for the SDPC. The dependences of cutoff frequency on the number of periods and the filling factor of semiconductor layer are numerically illustrated.

Keyword：光子帶隙結構