ANALYSIS OF TUNABLE MULTIPLE-FILTERING PROPERTY IN A PHOTONIC CRYSTAL CONTAINING STRONGLY EXTRINSIC SEMICONDUCTOR

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Abstract

In this work, we analyze the tunable multiple-filtering property at infrared frequency in a finite semiconductor-dielectric photonic crystal (SDPC), (AB)PA, where A is a strongly extrinsic semiconductor, n-type germanium (n-Ge). B is a dielectric material, and P is the number of periods. It is found that multiple filtering phenomenon can be obtained in the region where the permittivity of n-Ge is negative. The number of resonant peaks is found to be equal to P. With the permittivity of n-Ge being concentration-dependent, these resonant peaks can be shifted as a function of impurity concentration. The analysis indicates that such an SDPC can work as a tunable multichannel filter which is of technical use for the semiconductor applications in optical communications.

Keyword：Multichannel filter, Semicinductor-Dielectric Photonic Crystal, Extrinsic Semiconductor, Permittivity