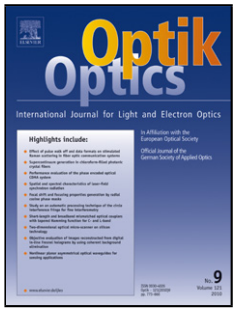

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Effects of noncircular inner scatterers on absolute photonic band gap of 2D triangular annular photonic crystals

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Abstract

Using the plane wave expansion method, the photonic band gap (PBG) structures of quasi 2D triangular annular photonic crystals (PCs) with square and hexagonal inner scatterers have been calculated. We investigate the effects of structural parameters on absolute PBGs for silicon (Si)-based and germanium (Ge)-based annular PCs. The results reveal that the optimal inner scatterer shape is hexagonal. Moreover, we discuss the PBGs as a function of inner scatterer orientation. As for silicon annular PCs, utilization of high refractive index or anisotropic tellurium (Te) rods can lead to the formation of larger absolute PBGs.

Keywords: Absolute photonic band gap; Silicon annular photonic crystal; Anisotropic tellurium

1. Introduction

Within the past decades, there has been great interest in the study of PCs [1,2], both theoretically and experimentally, due to their unique ability to control the flow of light at optical wavelength scale [3]. PCs, periodic dielectric materials with a photonic band gap, enable one to control the optical emission properties of materials placed inside them. Many of the promising applications of two- and three- dimensional PCs depend on the location and width of PBGs [4-9].

Although three-dimensional (3D) PCs suggest the most interesting idea for novel applications, two-dimensional (2D) PCs have also been strongly studied, since they can be fabricated more easily than 3D ones and may be employed in optical and electronic devices [10]. Moreover, 2D structures were widely utilized in light emitting