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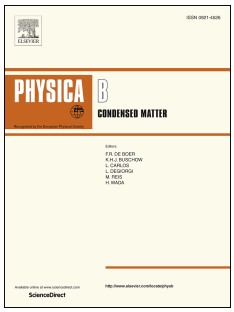

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Effects of hydrostatic pressure on the band structure in two-dimensional semiconductor square photonic lattice with defect

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Abstract

Using the plane wave expansion method, we studied the effects of hydrostatic pressure on the structure of TM bands in two-dimensional square-lattice photonic crystals. These crystals are composed of infinite cylindrical rods of GaAs embedded in air background. Initially, we studied regular photonic crystals (without defects) and found that by increasing the hydrostatic pressure at a fixed temperature, the band structure shows a shift at high frequencies due to the decrease of the radius of the rods and the dielectric constant of the GaAs semiconductor. On the other hand, using the supercell technique, a point defect $L1$ is introduced, which consists in the missing of a GaAs post in the photonic crystal. We found a defect mode inside the photonic band gap, which shows a shift at high frequencies as the hydrostatic pressure increases at a fixed temperature.

Keywords: Photonic crystal, hydrostatic pressure, defect mode, plane wave expansion method.

1. Introduction

Photonic crystals (PC) represent a new class of optical materials in which the dielectric constant is a periodic function in space [1]. PCs can control and

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