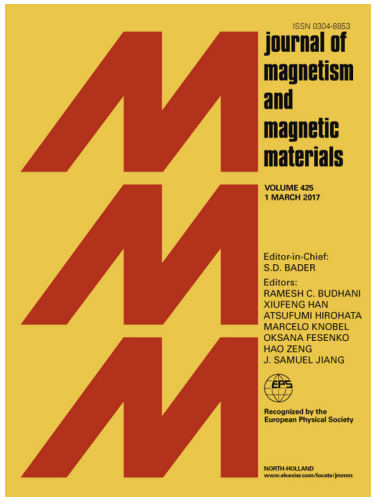

Research articles

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BAND STRUCTURE PECULIARITIES OF MAGNETIC PHOTONIC CRYSTALS

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In this work we studied light diffraction in magneto-photonic crystals (MPC) having large magneto-optical activity and modulation large depth. The case of arbitrary angles between the direction of the external static magnetic field and the normal to the border of the MPC layer is considered. The problem is solved by Ambartsumian's modified layer addition method. It is found that there is a new type of non-reciprocity, namely, the relation $R(\alpha) \neq R(-\alpha)$ takes place, where R is the reflection coefficient, and α is the incidence angle. It is shown the formation of new photonic band gap (PBG) at oblique incidence of light, which is not selective for the polarization of the incident light, in the case when the external magnetic field is directed along the medium axis. Such a system can be used as: a tunable polarization filter, polarization mirror, circular (elliptical) polarizer, tunable optical diode, etc.

Keywords: photonics, magneto-photonic crystals, eigen polarizations, diffraction, transmission, photonic band gap, optical diode

1. Introduction

Due to the recent success and development of methods and technologies of creating new materials, the photonic crystals (PCs) and metamaterials continue to be in the focus of researchers' attention. Of great interest are also theoretical calculations for new models of photonic crystal structures. PCs have Photonic Band Gaps (PBGs) in their spectra of transmission, and the frequency width and frequency location of these PBGs can be controlled either by external fields or just by modifying their internal stacked structure [1-3]. Optical devices constructed on the basis of PCs lead to the intelligent, high-speed operation, multi-functional and tunable properties and possess favorable traits such as: compactness; small loss; high reliability and compatibility. PCs and metamaterials can be divided into the following two