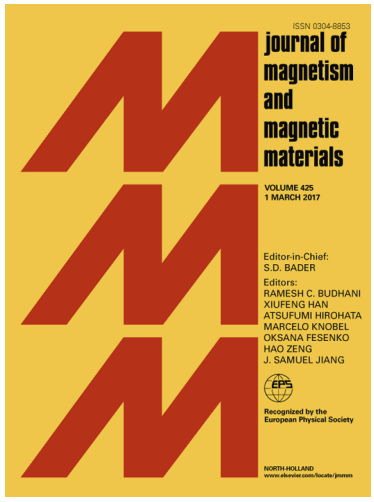

Nonreciprocal optical isolation via graphene based photonic crystals

S. Roshan Entezar, M. Karimi Habil

PII: S0304-8853(17)33119-0
DOI: https://doi.org/10.1016/j.jmmm.2017.10.017
Reference: MAGMA 63231

To appear in: *Journal of Magnetism and Magnetic Materials*

Received Date: 17 January 2017
Revised Date: 21 July 2017
Accepted Date: 3 October 2017

Please cite this article as: S. Roshan Entezar, M. Karimi Habil, Nonreciprocal optical isolation via graphene based photonic crystals, *Journal of Magnetism and Magnetic Materials* (2017), doi: https://doi.org/10.1016/j.jmmm.2017.10.017

Nonreciprocal optical isolation via graphene based photonic crystals

S. Roshan Entezar[1,*], M. Karimi Habil

Physics Department, University of Tabriz, Tabriz, Iran

Abstract

The transmission properties of a one-dimensional photonic crystal containing graphene mono-layers are studied using the transfer matrix method. It is shown that the structure can be used as a polarization-selective nonreciprocal device which discriminates between the two circularly polarized waves with different handedness impinging in the same direction. This structure may be utilized in designing optical isolators for the circularly polarized waves due to the gyrotropic behavior of the graphene mono-layers under the perpendicularly applied external magnetic field. Moreover, the effect of an external magnetic field and the chemical potential of the graphene mono-layers on the band gap of the structure are investigated.

Keywords: `Circularly polarized wave; Graphene mono-layer; Optical isolator; Photonic crystal.`

1. Introduction

Spatially nonreciprocal devices such as all-optical diodes and isolators are widely considered to be the key components for the next generation of all-optical signal processing. Replacing relatively slow electrons with photons as carriers of information would substantially increase the speed and the bandwidth of telecommunication systems, leading to a real revolution of the telecom industry. The optical nonreciprocity leads to different properties for opposite propagation directions of electromagnetic waves. A nonreciprocal

*Corresponding author: S. Roshan Entezar
Tel: ++984133392688 Fax: ++984133341244
[1] *Email address:* s-roshan@tabrizu.ac.ir