Study of defect modes in photonic band structure of magnetic photonic crystals by means of Green's function

N. Ansari[a] **and M.M. Tehranchi**[a, b]

[a]Laser and Plasma Research Institute, Shahid Beheshti University, Evin, 1983963113 Tehran, Iran

[b]Physics Department, Shahid Beheshti University, Evin, 1983963113 Tehran, Iran

In this paper, we create an analytical model to investigate the localized defect modes associated with a defect cell inserted into a one dimensional magnetic photonic crystal (MPC). The structure is a magnetic superlattice with alternative layers of two different magnetic permeability containing a defect cell which is a layer of different nature (material or/and size) from the other layers. This leads to appearance of several localized defect modes within the photonic band gap. By inserting a defect into an MPC, it is possible to create highly localized defect modes within the photonic band gap (PBG). The design of controllable defect modes in MPCs requires predictive formulas for the frequency dependence of the defect modes on physical parameters of MPCs. Here, we develop an analytical approach based on the transfer matrix and Green's function methods to calculate the frequency and number of the defect modes which can be controlled easily by varying parameter values of the constituent layers of the MPC. An exact formula for the frequency of the defect modes is derived for both TE and TM polarizations at arbitrary angle of incidence.

9.7 cm

13.4 cm

Subject category :

5. Nano-structure, Surfaces, and Interfaces

Presentation mode :
oral

Corresponding author :
M.M. Tehranchi

Address for correspondence :
Laser and Plasma Research Institute, Shahid Beheshti University, Evin, 1983963113 Tehran, Iran

Email address :
teranchi@cc.sbu.ac.ir