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(Research Article)
Opto-acoustical filter based on phoxonic crystal ring resonator

S.Z. Aboutalebi, A. Bahrami*
Faculty of Electrical Engineering, Sahand University of Technology

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Abstract

In this paper, a phoxonic crystal structure is designed that shows a complete phononic and photonic ban gap and is capable to guide the optical waves with transverse magnetic polarization and acoustic waves. The materials used in the structure are nylon and molybdenum, which have suitable refractive index and elastic constant. Also, it is worth of noting that the filling factor is 28% for the proposed structure, which causes easy fabrication. The proposed structure is a phoxonic filter that represents only a given frequency or wavelength in the output. This is performed by passing through ring resonators, having the minimal frequency width or wavelength. Given that it is difficult to match light and sound in phoxonic structures, the structure has advantages including better sound and light coupling between input and output, frequency and wavelength sharpness, and low frequency width or wavelength, compared to phononic or photonic ring resonator-based filters, due to the triangular ring and also causes the improvement of output results and increased output quality. Methods of finite element, plane wave expansion, and finite difference time domain are used for simulation.

Keywords: Phoxonic crystals, Elastic constants, Band gap, Filling factor.

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* Corresponding author E-mail: bahrami@sut.ac.ir

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