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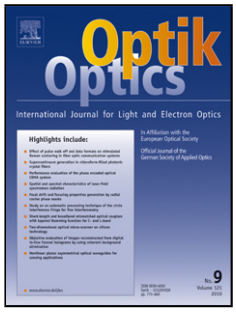

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Characterization of One Dimensional Liquid Crystal Photonic Crystal Structure

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Abstract:

In this paper, one-dimensional photonic crystal with periodic multilayers of dielectrics and central nematic liquid crystal (NLC) defect is presented and analyzed. The transmission and field distribution of the transverse magnetic (TM) mode through the suggested design are studied using finite element time domain method. The effect of the structure geometrical parameters on the transmission of the TM mode is investigated and analyzed. Further, the impacts of the rotation angle of the director of NLC and temperature are also studied. The numerical results show that the reported design can be used as an optical filter around a wavelength of 1300 nm which is very important for communication applications. Additionally, the suggested design has high tunability due to the infiltration of the NLC material.

Keywords: *Photonic crystals, Bandgap, Liquid crystal, Finite element method, Transmission, Field distribution.*

1. Introduction:

The photonic crystal (PhC) is a periodic structure with a forbidden bandgap of certain frequency ranges. The electromagnetic mode of a frequency within the photonic bandgap (PBG) cannot propagate through the PhCs due to the reflection and refraction at the boundaries of the alternating materials [1-3]. However, the allowed modes have high transmission through

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