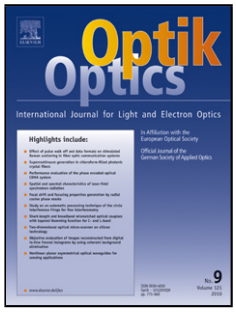


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# Characterization of a Thermal Sensor Based on One-Dimensional Photonic Crystal with Central Liquid Crystal Defect

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**Abstract**

The temperature dependence and sensitivity of a one-dimensional photonic crystal (1D PhC) nematic liquid crystal (NLC) thermal sensor is theoretically investigated. In the present work, finite element method (FEM) was used to evaluate the transmission of the suggested 1D PhC thermal sensor. The effect of the inserted nematic liquid crystal (NLC) and the temperature have been studied and analyzed. Here a simulation is considered for NLC (MLC-9200-100) as a thermal sensor. The concept of temperature-dependent thermal sensor application of photonic crystal is presented and studied in both TE and TM modes of the incident beam. The sensitivity, quality factor, and crosstalk of the suggested 1D PhC thermal sensor are evaluated at different values of liquid crystal thickness $d_{LC}$.

**Keywords:** *Photonic crystals, Bandgap, Liquid crystal, Finite element method, Transmission, Thermal sensor*

## 1. Introduction

Photonic crystals (PhCs) have achieved lots of a significant concern and research due to their peculiar applications[1-4]. PhCs are a novel class of the optical material,