

A High-Resolution Refractive Index Sensor Based on a Magnetic Photonic Crystal

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Abstract : In this study, we demonstrate a high-resolution refractive index sensor based on a magnetic photonic crystal (MPC) composed of a triangular lattice array of air holes embedded in Si matrix. A microcavity is created by changing the radius of an air hole in the middle of the photonic crystal. The cavity filled with gyrotropic materials can serve as a refractive index sensor. The shift of the resonant frequency of the sensor is obtained numerically using finite difference time domain method under different ambient conditions having refractive index from $n = 1.0$ to $n = 1.1$. The numerical results show that a tiny change in refractive index of $\Delta n = 0.0001$ is distinguishable. In addition, the spectral response of the MPC sensor is studied while an external magnetic field is present. The results show that the MPC sensor exhibits a dramatic improvement in resolution.

Keywords : magnetic photonic crystal, refractive index sensor, sensitivity, high-resolution

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