Abstract

Recently, Porous Silicon (PS) is emerged as novel and unique material as a stable nano scale optical sensor device. In this work, one dimensional (1D) Photonic Bandgap (PBG) structures such as single layer (SL), Distributed Bragg Reflector (DBR) and Microcavity (MC) using PS material are suggested as optical sensor applications. Design and simulations are relying on the Bruggeman’s Effective Medium Approximation (BEMA) and the Transfer Matrix Method (TMM) to predict the optical properties of 1D-PSPBG sensor device structures. By analyzing the reflectance spectra, wavelength shift ($\Delta \lambda$) has been obtained, which showed good linear relationship with refractive index of the void. Sensitivity analysis showed that MC structure performs best as 1D-PSPBG optical sensor device due to its structural and optical properties. The results reported here are useful for the design and prediction of the response of optical sensor devices using 1D-PSPBG structures.

References


Index Terms

Computer Science
Applied Sciences

Keywords
Porous silicon; Photonic Band gap Structures; Bruggeman’s Effective Medium Approximation; simulation of Optical Sensor Device.