Patterned PCF Containing Disordered Suspended Particles in Hollow Core—An Innovative Platform for Optofluidic Sensing

Yogesh Dixit

K.N.P.G. College Gyanpur Bhadohi India

Achyutesh Dixit (✉ acdixit55@gmail.com)

Muzaffarpur Institute of Technology <https://orcid.org/0000-0003-1147-2524>

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Abstract

The unique and striking characteristics of the photonic crystal fiber (PCF) with patterned dielectric rods have been reported for last decades, providing applications in the field of prototype sensors and more recently in optofluidic sensing. The proposed PCF sensor contains an empty core injected with disordered suspended particles (such as Cs_2 , CCl_4 , C_6H_6) surrounded by n-type solid semiconductor material (P_2O_5 -doped silicate) and suspended plasma dielectric rods. The effect of intensity of field and concentration of doped semiconductor material on band structure has been analyzed, respectively, by using the plane wave expansion method. The sensitivity of PCF towards various analytes has been measured by the change in the band structure. The results reported in this work are very useful for constructing an optoelectronic device, useful in medical science and ultrahigh-band width signal processing.

Full Text

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Figures

Figure 1

Cross sectional structure of developed PCF preform with hollow core and suspended rods.

Figure 2

On-axis band structure of the hexagonal PCF with high filling factor of plasma dielectric rods.

Figure 3

On-axis band structure of hexagonal PCF with same filling factor of plasma dielectric rods but in the presence of (a) chloroform, (b) toluene & (c) benzene in core respectively.