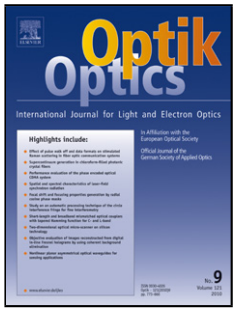

Title: Performance study of metallic clad planar waveguide sensors in presence of graphene layer

Authors: Gulab Chand Yadav, Gaurav Sharma, Sushil Kumar, Vivek Singh

PII: S0030-4026(17)31009-4
DOI: http://dx.doi.org/10.1016/j.ijleo.2017.08.109
Reference: IJLEO 59572

To appear in:

Received date: 8-5-2017
Accepted date: 21-8-2017

Please cite this article as: Gulab Chand Yadav, Gaurav Sharma, Sushil Kumar, Vivek Singh, Performance study of metallic clad planar waveguide sensors in presence of graphene layer, Optik - International Journal for Light and Electron Opticshttp://dx.doi.org/10.1016/j.ijleo.2017.08.109

Performance study of metallic clad planar waveguide sensors in presence of graphene layer

Gulab Chand Yadav[1], Gaurav Sharma[1], Sushil Kumar[2], Vivek Singh[1,*]

[1]Department of Physics, Institute of Science, Banaras Hindu University, Varanasi 221005, India
[2]Department of Physics, Dayal Singh College University of Delhi, Delhi 110003, India

***Correspond to:**
Dr. Vivek Singh
Department of Physics
Institute of Science
Banaras Hindu University
Varanasi –221005 [U.P.] India.
e-mail : viveks@bhu.ac.in,
viveksingh.bhuphysics@gmail.com
Ph. No. (+91) 9450170919

Abstract

In this paper, the performance of two metal clad planer waveguide based sensor in presence of a graphene layer just before or after the guiding layer is studied and compared. The analyses of waveguides are performed by analytical approach based on transfer matrix theory. In TM mode analysis, the dispersion characteristics of proposed waveguides show both the SPR mode and the waveguide modes. The penetration depth of SPR mode is increased with the graphene layer thicknesses in one considered configuration of waveguide and decreased in other considered configuration of waveguide. However, comparisons in considered waveguides are made on the basis of their sensitivity, detection accuracy and quality factor through the waveguide modes. It is observed that all these parameters are highly depends on the graphene layer thickness near the cutoff film thickness of waveguide modes due to the high penetration depth of light in cover media. Away from cutoff region, the presence of graphene layers before or after the guiding layer provides almost similar results. Based on obtained results, it is easy to choose an appropriate position and thickness of graphene layer for the guided-wave and radiated-wave applications.

Keywords- metal clad waveguide, optical sensor**,** graphene film, sensitivity, quality factor.

I. INTRODUCTION

During past few years, remarkable progress has been made in the development of planar waveguide based sensors and these sensors are widely used in medical diagnostics [1], enzyme detection, food adulteration [2], drug diagnostics [3], humidity measurement [4] etc. due to its high sensitivity, selectivity, and low detection time. Also, to generate the sensing