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Sensitivity Enhancement in Graphene Based Surface Plasmon Resonance (SPR) Biosensor

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Abstract : A lot of research work is going on in the field of graphene based SPR biosensor. In the conventional SPR based biosensor, graphene is used as a biomolecular recognition element. Graphene adsorbs biomolecules due to carbon based ring structure through sp2 hybridization. The proposed SPR based biosensor configuration will open a new avenue for efficient biosensing by taking the advantage of Graphene and its fascinating nanofabrication properties. In the present study, we have studied an SPR biosensor based on graphene mediated by Zinc Oxide (ZnO) and Gold. In the proposed structure, prism (BK7) base is coated with Zinc Oxide followed by Gold and Graphene. Using the waveguide approach by transfer matrix method, the proposed structure has been investigated theoretically. We have analyzed the reflectance versus incidence angle curve using He-Ne laser of wavelength 632.8 nm. Angle, at which the reflectance is minimized, termed as SPR angle. The shift in SPR angle is responsible for biosensing. From the analysis of reflectivity curve, we have found that there is a shift in SPR angle as the biomolecules get attached on the graphene surface. This graphene layer also enhances the sensitivity of the SPR sensor as compare to the conventional sensor. The sensitivity also increases by increasing the no of graphene layer. So in our proposed biosensor we have found minimum possible reflectivity with optimum level of sensitivity.

Keywords : biosensor, sensitivity, surface plasmon resonance, transfer matrix method
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