Surface Plasmon Resonance (SPR) based biosensor using MXene as a BRE layer and Magnesium Oxide (MgO) as an Adhesion layer

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Abstract

In this paper a plasmonic sensor consist of bimetallic layer of Ag and Au, a nono-thin layer of two dimension material MXene and a thin layer of Magnesium oxide (MgO) is proposed to operate in visible region. By using Kretschmann configuration based structure and transfer matrix method, the change in the refractive index of liquid Biosample have been observed at a fixed incident wavelength. By using the distinctive properties of $\text{Ti}_3\text{C}_2\text{T}_x$ MXene and MgO we have investigated the performance of Surface Plasmon Resoance (SPR) biosensor. Significant performance parameters like Sensitivity, Figure of Merit (FoM) and Detection Accuracy (DA) calculated for different cases to prove the capability of proposed sensing structure. We also compared the sensitivity and sharpness of SPR curve obtained when using conventional adhesion layers like titanium (Ti), chromium (Cr), tantalum (Ta). A detailed investigation is carried out to observe the role of polymer as an adhesion layer and its thickness impact on FoM and resonance angle sharpness. The concept of Long range SPR (LR-SPR) and Short range SPR (SR-SPR) also discussed.

Full Text

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