Surface plasmon resonance sensor using by indium tin oxide nanostructure

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Indium Tin Oxide (ITO) thin films is a well-known transparent conductive oxide, which finds application in different fields such as solar cells and sensors. This material has also been used in the important field of sensors, more specifically in conductimetric gas sensors [1]. Teranishi' group [2] found that ITO nanoparticles had the surface plasmon resonance (SPR) frequencies in the near-infrared region which are similar to those of noble metals [3].

The reflection coefficients and parameter of polarization difference of the internal reflection coefficients of s- and p-polarized radiation [3] of the multi-layered structure can be simulated by using transfer matrix approach for N-layer model. In the present study, we have 3 layers (quartz prism, ITO layer and sensing medium). The refractive index as a function of wavelength for the quartz prism is given by Sellmeier relation. The dielectric function of ITO nanofilms can be obtained by fitting the literature data in the Drude model. The dielectric function of the ITO nanoparticles arrays can be obtained using the Maxwell Garnett model. The sensing mediums were taken vapors of ethanol and methanol and liquid mediums.

Spectral and angular sensitivity to small changing of sensing medium of SPR technique were studied at the changing of films thickness or different values of the volume fraction ITO. Creation of plasmonic sensor chips based on the ITO nanostructure for registration gas, alcohol vapors and effect molecular binding is perspective.

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