Soft Lithographic Plasmonic Based Refractive Index Sensor

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**Abstract**

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A soft-patterned lithography-mediated patterning technique of metal nanoparticles is employed to fabricate an enhanced localized surface plasmon resonance (LSPR) sensor. The metal nanoparticles like gold and silver, with varying shapes, sizes, surface characteristics and internal structures, have shown plasmonic characteristics, known as localized surface plasmon resonance (LSPR). These particles have received much attention from the scientific community in the past few years due to their excellent optoelectronic characteristics, high surface-to-volume ratio, outstanding biocompatibility and low toxicity. They have piqued the interest of researchers worldwide for their extensive utilization in fields including biology, engineering, and contemporary medicine. One such focused area of research is point-of-care detection for early and accurate diagnosis of life-threatening diseases targeting frugal healthcare. In view of this, we have developed a soft lithography based patterned flexible substrate utilizing the moulding of CD/DVD patterns on a PDMS substrate to monitor the real-time change in the LSPR property with respect to the change in the refractive index of the surrounding medium. Further, the patterned substrates are immobilised with plasmonic metal nanoparticles of gold. A change in absorbance and wavelength shift was observed in the presence of glycerol as the surrounding media. Interestingly, a significant increase in the absorbance was also observed when different concentrations of cholesterol were added to the system. In addition, COMSOL Multiphysics was employed for the theoretical modelling of the experimental observations for a better understanding of the phenomenon. These plasmonic optoelectronic substrates with LSPR characteristics have better sensitivity towards biosensing applications.

**Keywords:** Nanoparticle, COMSOL Multiphysics, biosensor, LSPR.