Immobilized Gold Nanoparticle Based Plasmonic Assay Platform for Biomolecule and Microorganism Detection

P-05.2-21

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Plasmonic sensors are suitable tools for study of molecular interactions. Localized Surface Plasmon Resonance (LSPR) based sensors detect spectral changes associated with intramolecular interactions between analyte molecules and recognition elements. Due to its label-free and highly sensitive features, LSPR based methods have high potential for biosensing applications. In this study, we aim to develop a sensitive, label-free, rapid and simple biosensing platform. For this purpose, a novel refractive index (RI) sensitivity enhancement methodology is proposed by immobilizing gold nanoparticles (GNPs) for platform-based LSPR. Fabrication of platform was carried out by GNP synthesis, immobilization of GNPs on polystyrene solid support, and growth of GNPs. Validation of response to RI changes of developed sensor platform was carried out by tests with varying concentrations of sucrose and ethanol. Then as a proof-of-concept, detection ability and detection limit determination of *E.coli* BL21 (DE3) and protein Bovine Serum Albumin (BSA) was carried out. Adsorption of *E.coli* BL21 (DE3) via bulk interactions showed that the developed LSPR platform exhibit high enough binding affinity for bacteria detection, and was able to detect down to concentrations as low as 10^2 CFU/ml. Immune capturing of BSA via anti-BSA antibody showed that the developed LSPR platform was able to detect BSA protein–antibody interaction down to 10 µM concentration range.

Herein we propose an LSPR-based sensing platform, promising possibility of application in immunoassays and also in microorganism monitoring. The platform simplifies current procedures and enhances sensitivity; both in terms of molecular size of analyte and analyte concentration.