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Effect of Gold Nanoparticle Growth on Sensitivity of Transmission Surface Plasmon Resonance IgG Immunosensor

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In this work, anti-human IgG conjugated with 5 nm gold nanoparticle (AuNP) and in situ AuNP growth methods were used to enhance transmission surface plasmon resonance (TSPR) signal from specific binding of IgG. High efficiency TSPR transducer was fabricated from DVD-R grating that were coated with gold thin film by thermal evaporation technique. Transmission spectrum associated with surface plasmon resonance from the gold coated grating was detected by a UV-vis spectrometer through a fiber optic and used to monitor in situ adsorption of biomolecules on the gold surface. In construction process of IgG immunosensors, the gold surface on grating structure was functionalized with carboxylic group by self-assembled monolayer of 11-mercaptoundercanoic acid. The IgG from human serum was pre-immobilized on the gold surface by covalent bonding of the activated carboxylic group on the gold surface and amine group on IgG protein. The specific binding of anti-IgG were in situ monitor by intensity shift of transmission peak of TSPR spectra. The observed sensitivity form binding of anti-IgG conjugated with AuNP was higher than that of unconjugated anti-IgG. Furthermore, the bound AuNPs on adsorbed anti-IgG were grown in $HAuCl_4$ solution to further enhance the TSPR intensity or peak shift. This enhancement of TSPR signal by conjugation and growth of AuNP represents a potential for immunosensor applications.

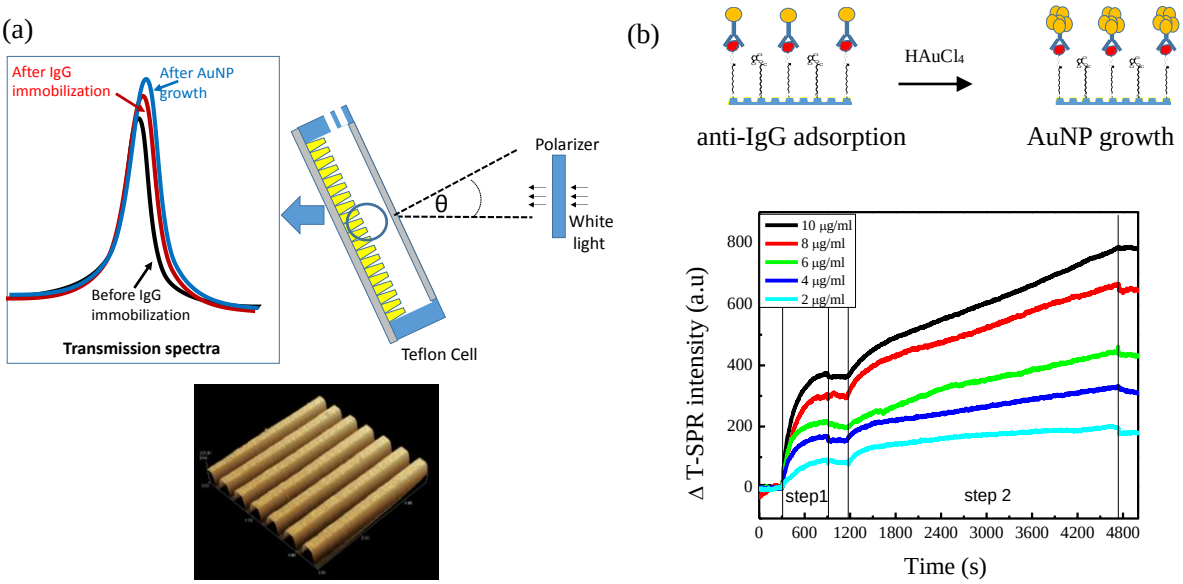

Figure 1 (a) Schematic diagram of TSPR biosensor and AFM image of the gold coated DVD-R grating (b) TSPR properties during the adsorption of anti-IgG conjugated AuNP (step1) and AuNP growth (step 2).