Enhancement of surface plasmon resonance using colloidal gold nanoparticles embedded in a silica layer

J. Jung, J. Lee, J. Choi, J. Cheng, M. Park, J. Hyun*
Seoul National University, Republic of Korea

It presents a strategy for the signal enhancement of surface plasmon resonance (SPR) biosensors using colloidal gold nanoparticles (AuNPs) and a silica layer. We describe the methods for the deposition of a silica-stabilized AuNP layer on a gold film, namely an enhanced-SPR chip (E-SPR chip). The E-SPR chip shows significant changes in its SPR signals when biomolecules are attached to its surface, as compared to a normal Au surface. These characteristics are closely related to the SPR effect as determined using prostate-specific antigen (PSA). The detection limit of the E-SPR chip is determined to be 0.01 ng mL\(^{-1}\) for a PSA immunoassay. The use of an E-SPR chip makes it possible to enhance signals 1000-fold compared to the signals obtained by conventional SPR sensing. The enhancement of the SPR spectral shift results from the coupling of the surface plasmon and particle plasmons through the application of a silica-stabilized AuNP layer on the gold surface.

Keywords: surface plasmon resonance, Gold nanoparticles, Biosensor, Prostate specific antigen