A strategy for ultrasensitive detection of cancer biomarker based on localized surface plasmon resonance response of a single Au nanoparticle

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A biosensor based on localized surface plasmon resonance (LSPR) response of a single Au nanoparticle was fabricated for highly sensitive detection and quantification of cancer biomarker. The LSPR response of single Au nanoparticles was obtained by tracking the wavelength shift of the resonant Rayleigh light scattering spectra of single Au nanoparticles using a dark-field microspectroscopy system. Using prostate specific antigen as a model, a LSPR λmax shift of about 2.75 nm was recorded by primary immunoresponse corresponding to 0.1 pg/mL of the target antigen. However, the sensitivity of the immunoassay could be quite enhanced by a sandwich strategy. A PSA polyclonal antibody was used as an amplifying agent in the strategy. As a result, the detectable minimum concentration at 0.1 pg/mL was detected with a LSPR λmax shift of about 4.96 nm. The results indicate that this approach could significantly contribute for fabrication of ultrasensitive biosensors, allowing quantitative analysis of cancer-associated protein.