Signal enhancement of SPR biosensors: a practical approach to a femto-molar Level detection

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A biochip based on surface plasmon resonance was fabricated to detect prostate specific antigen-α 1-antichymotrypsin (PSA-ACT complex). To reduce non-specific binding and steric hindrance effect, the chemical surface of the sensor chips was constructed by using various oligo(ethylene glycol) mixtures. Using the chip surfaces and sandwich enhancement assay, PSA-ACT complex in HBS buffer and human serum was detected at 10.2 and 18.1 ng/ml, respectively. The result indicates that this approach could satisfy our goal without modifying the secondary interactant. Moreover, colloidal gold nanoparticles (AuNPs) and precipitation of an insoluble product formed by HRP-biocatalyzed oxidation of 3, 3'-diaminobenzidine (DAB) in the presence of H2O2 were also used to enhance the signal obtained from the surface plasmon resonance (SPR) biosensor. As a result, AuNPs showed their enhancement as being consistent with other previous studies while the enzyme precipitation using DAB substrate was applied for the first time and greatly amplified the SPR detection. The limit of detection was found as low as 27 pg/ml of PSA/ACT complex (or 300 fM).