Supporting Information

Controlled Protein Embedment onto Au/Ag Core Shell Nanoparticles for Immuno-Labeling of Nanosilver Surface

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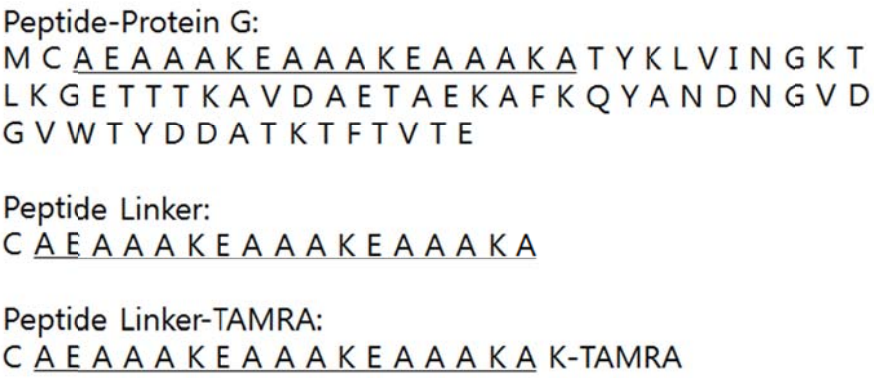


Figure S1 Amino acid sequences of peptide-fused protein G construct (Peptide-Protein G), a synthetic helical peptide linker with (Peptide Linker-TAMRA) or without a TAMRA dye (Peptide Linker). A rigid helical peptide sequence is indicated underline.

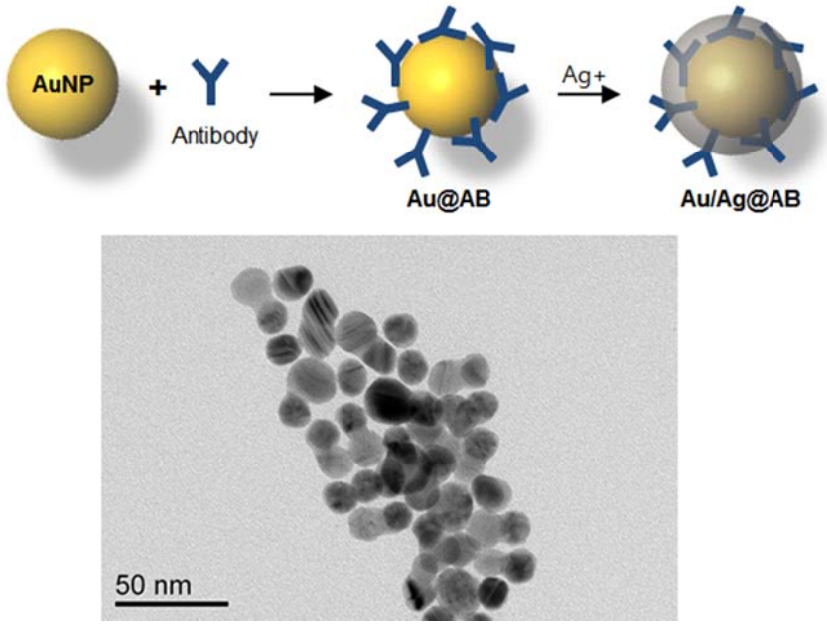
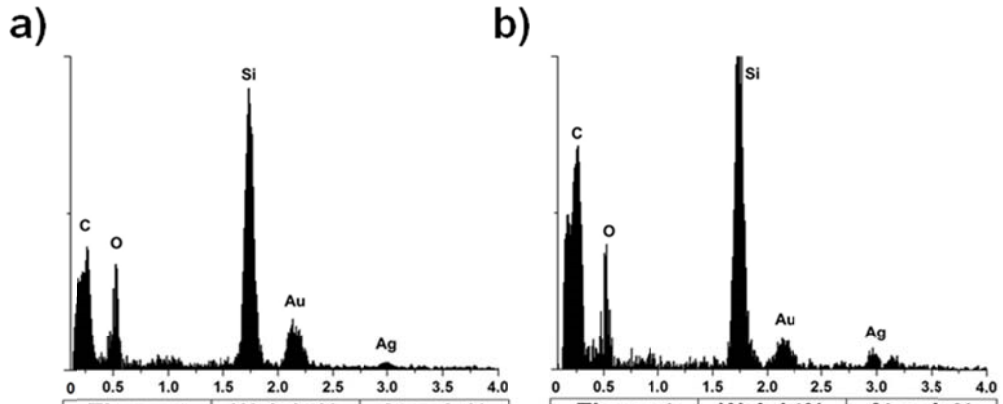


Figure S2 TEM image of silver deposited Au@AB (Au/Ag@AB).



Element	Weight%	Atomic%
Ag	14.74	23.99
Au	85.26	76.01
Total	100.00	100.00

Element	Weight%	Atomic%
Ag	37.49	52.28
Au	62.51	47.72
Total	100.00	100.00

Figure S3 Single-particle X-ray energy dispersive spectroscopy (EDS) analysis of the prepared Au/Ag core shell nanoparticles, (a) Au/Ag@PG-1 and (b) Au/Ag@PG-2.

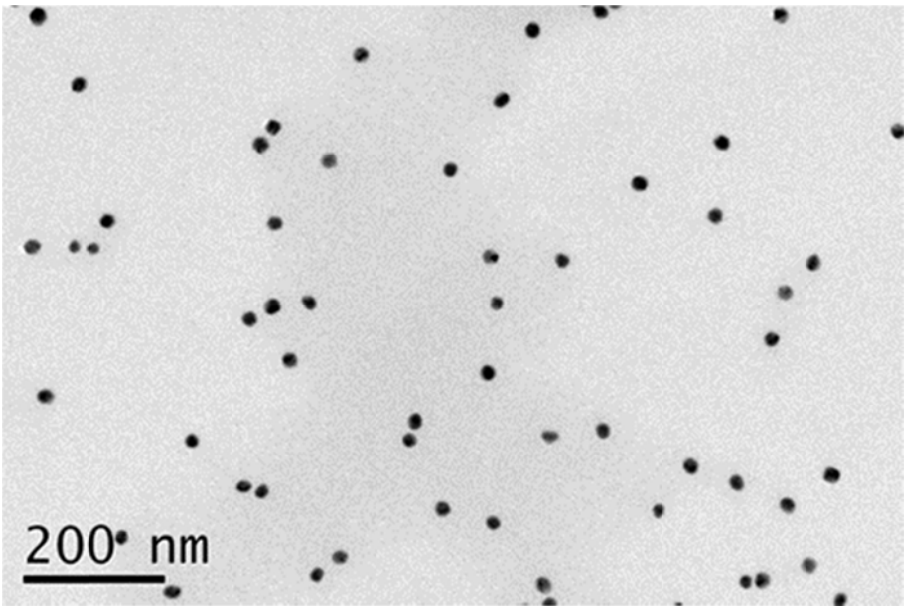


Figure S4 TEM image of Au/Ag@PG-AB.

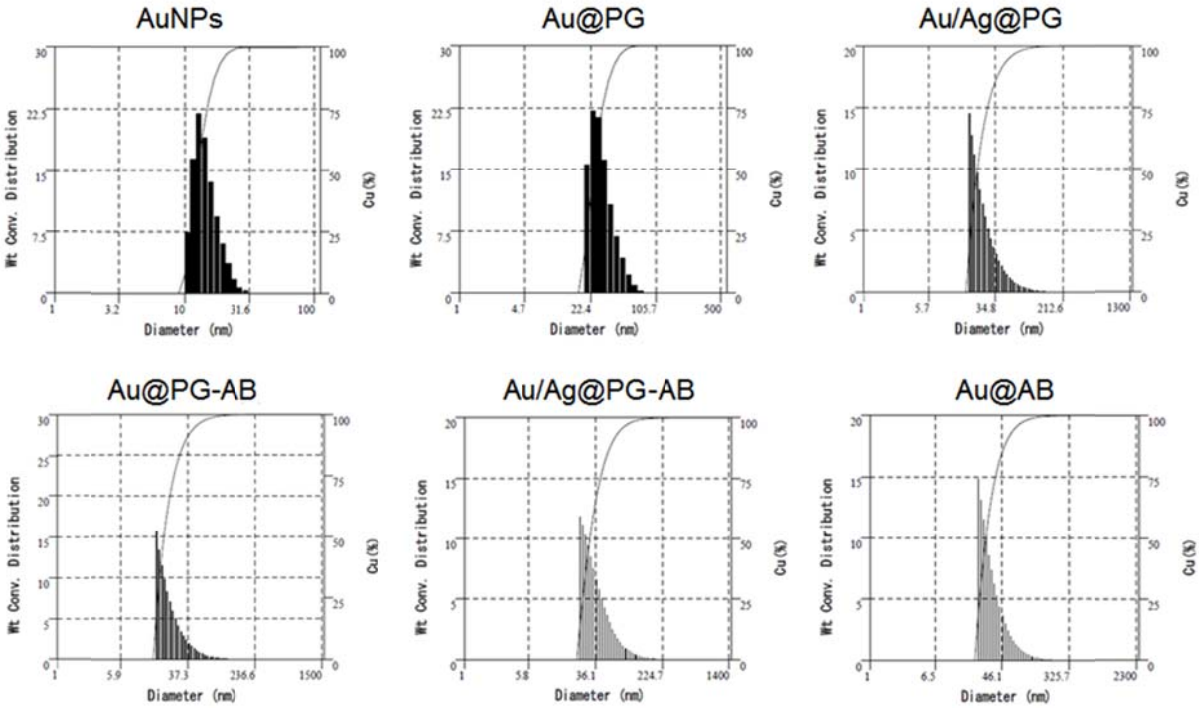


Figure S5 Direct light scattering (DLS, ELS-Z of Otsuka electronics) measurements: AuNPs (d = avg. 14.1 ± 3.1 nm); Au@PG (d = avg. 28.3 ± 8.5 nm); Au/Ag@PG (d = avg. 29.1 ± 7.0 nm); Au@PG-AB (d = avg. 33.4 ± 7.7 nm); Au/Ag@PG-AB (d = avg. 34.5 ± 8.4 nm); Au@AB (d = avg. 38.3 ± 19.8 nm). Histograms show weight conversion (Wt. Conv.) distributions of the particles.

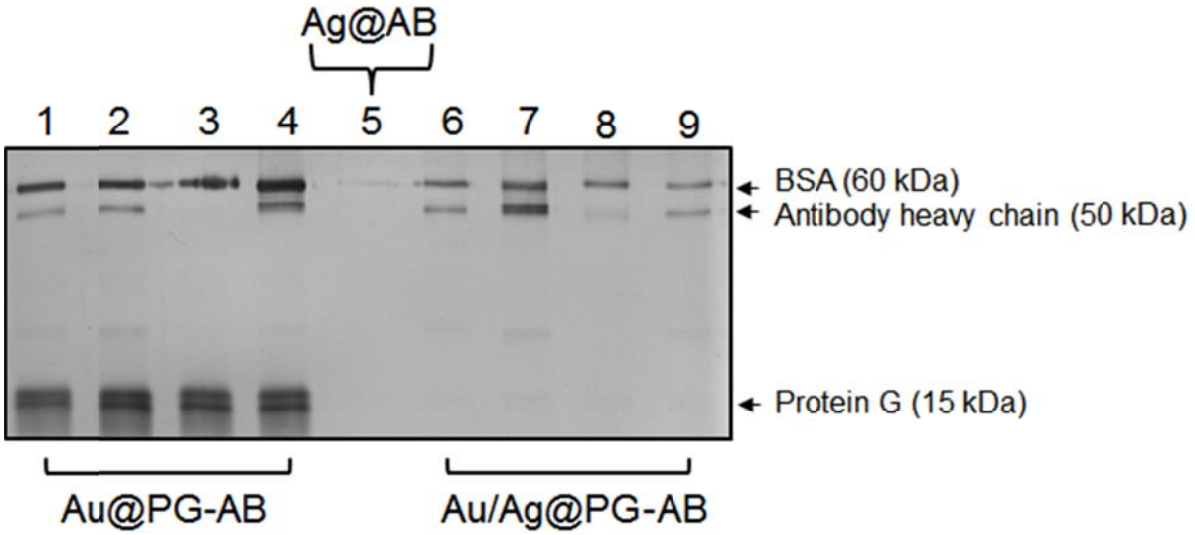


Figure S6 15% SDS-PAGE analysis of antibodies bound to Au@PG conjugates before (Au@PG-AB; lanes 1-4) and after the silver shell formation (Au/Ag@PG-AB; lanes 6-9): human IgG (lanes 1 & 6); IL-6 antibody (lanes 2 & 7); biotin antibody (lanes 3 & 8); CCL20 antibody (lanes 4 & 9). Nonspecific antibody adsorption to AgNP surface was also examined (Ag@AB; lane 5). Particle blocking BSA, antibody heavy chain, and protein G proteins were indicated.

Discussion: Antibody adsorption to AgNPs was highly inefficient as shown in lane 5. Biotin antibody was not immobilized to ProteinG-AuNP conjugates. Monoclonal mouse IgG1 form of biotin antibody was unable to bind to protein G, while IL-6 and CCL20 antibodies (from goat) effectively bind to protein G.

Figure S7 *In vitro* binding experiments. A series of diluted PSA solutions were spotted on an NC membrane. Antibody-conjugated Au/Ag core shell NPs via embedded protein G (Au/Ag@PG-AB) and antibody adsorbed AuNPs (Au@AB) were treated to the PSA spotted membrane.

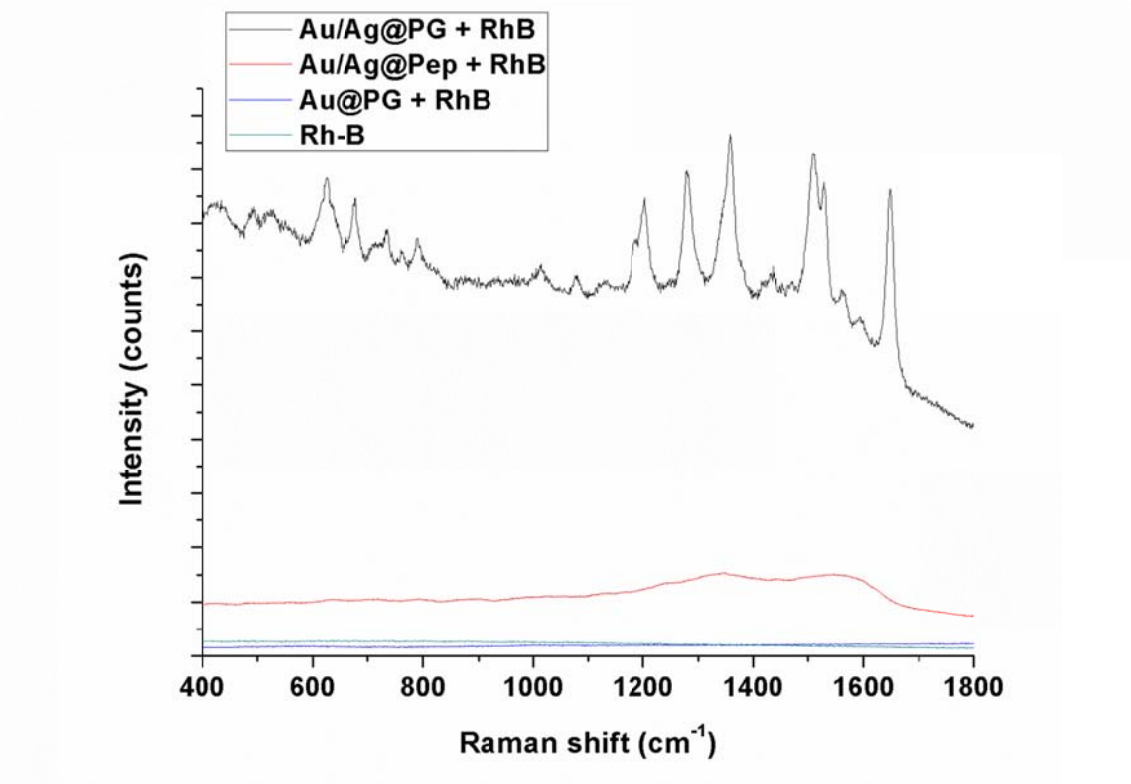


Figure S8 Raman spectra of surface treated Rhodamin B dye (RhB). RhB was deposited on antibody adsorbed gold chip surfaces additionally covered with Au/Ag@PG (black), Au/Ag@peptide (red), and Au@PG (green). RhB was also deposited on the gold chip without any nanoparticles (blue). Typical Raman peaks of RhB in the 1200~1700 cm^{-1} region are 1200, 1282, 1361, 1510, 1533 and 1652 cm^{-1}, which agree nicely with above surface-enhanced Raman spectra (Au/Ag@PG + RhB).