

Supporting Information

Investigation of plasmonic signal enhancement based on long range surface plasmon resonance with gold nanoparticle tags

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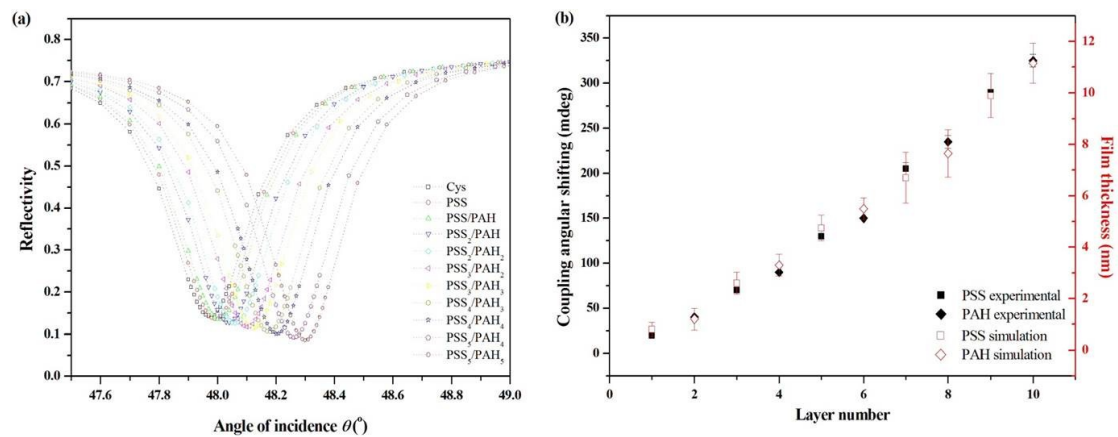


Figure S1 (a) Layer by layer buildup of PEMs on LRSPR sensors. (b) Experimental and theoretical results of the film thickness with regards to the deposition layers.

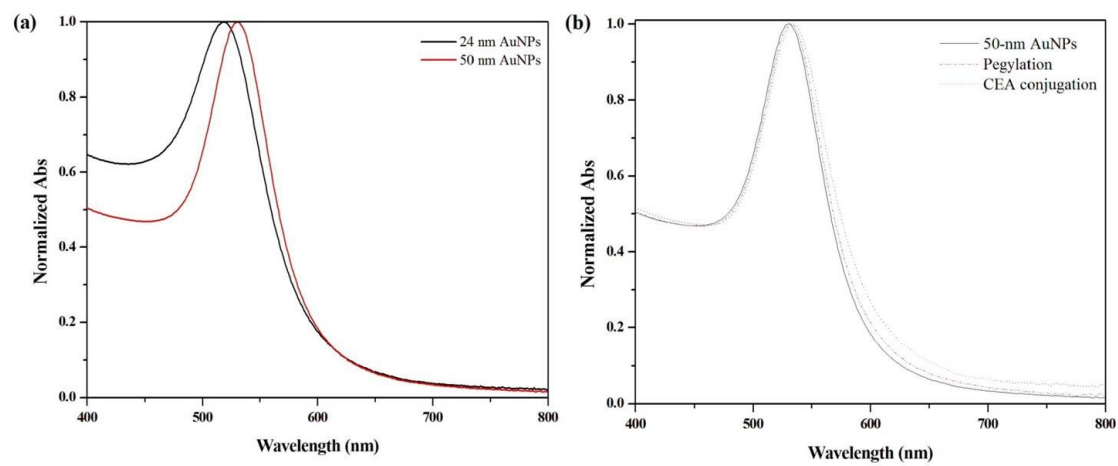


Figure S2 (a) UV-Vis spectra of as-synthesized 24 nm and 50 nm AuNPs. (b) UV-Vis spectra evolution of 50 nm of AuNPs

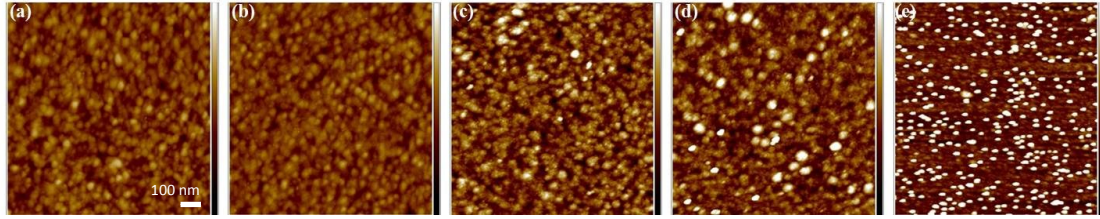


Figure S3 AFM images of (a) bare gold, (b) Cys functionalized surface, (c) (PSS/PAH)₅ functionalized surface, (d) low coverage of 24 nm of AuNPs adsorption on (PSS/PAH)₅, and (e) high coverage of 24 nm of AuNPs adsorption on (PSS/PAH)₅.

Table S1 Analysis of AFM images correspond to Figure S3.

	Bare gold	Cys	(PSS/PAH) ₅	Low coverage	High coverage
Surface Area (μm ²)	1.02	1.02	1.08 ± 0.01	1.07 ± 0.01	1.28 ± 0.02
Projected Area (μm ²)	1.00	1.00	1.00	1.00	1.00
Image R _q (nm)	1.7 ± 0.1	1.5 ± 0.1	2.7 ± 0.1	2.9 ± 0.1	4.7 ± 0.4
Image R _a (nm)	1.4 ± 0.1	1.2 ± 0.1	2.1 ± 0.1	2.1 ± 0.1	3.1 ± 0.1
Image R _{max} (nm)	13.6 ± 1.0	12.0 ± 1.0	25.8 ± 1.3	33.3 ± 2.6	47.4 ± 6.9
Volume fraction (%) [*]	-	-	-	1.0 ± 0.5	6.9 ± 0.1

* The volume fraction was calculated from AFM images (1 μm x 1 μm) with the following formula:¹

$$f \% = \frac{N \cdot \frac{1}{6} \pi d_{NP}^3}{d_{NP} \cdot A} \times 100$$

N : the number of particles, d_{NP} : particle diameter, A : image of area

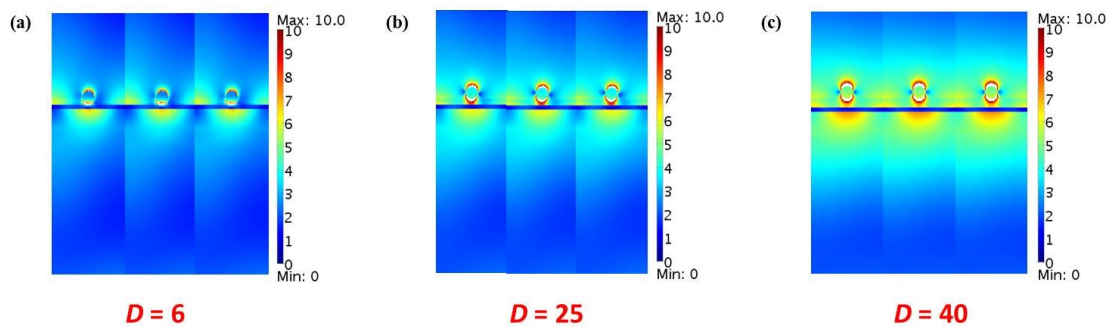


Figure S4 Simulated field enhancement distributions of 50 nm AuNPs on LRSPR sensors with pitch at 300 nm for dielectric thickness D (a) $D = 6$ nm, (b) $D = 25$ nm, (c) $D = 40$ nm.

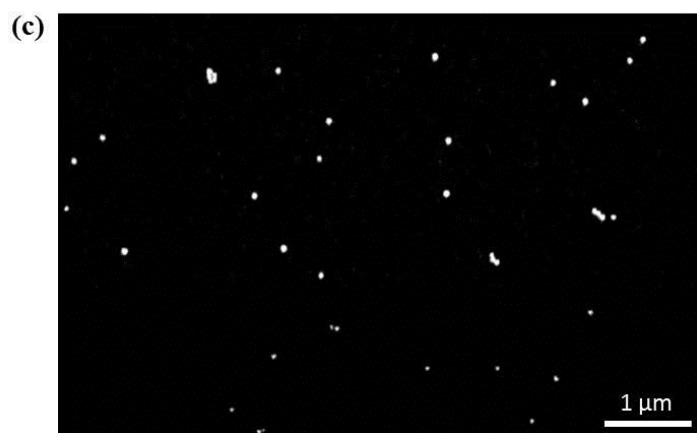
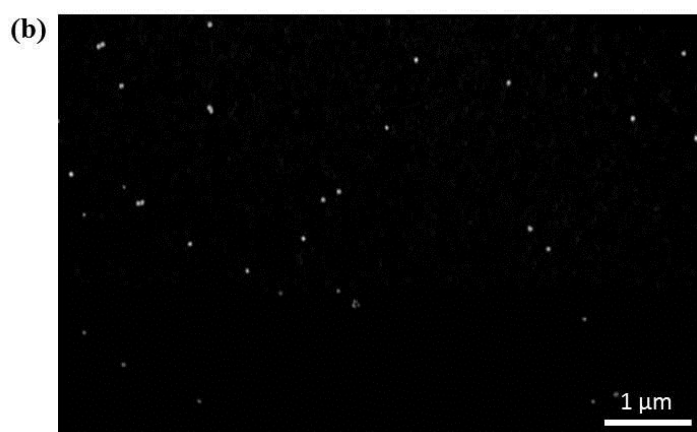
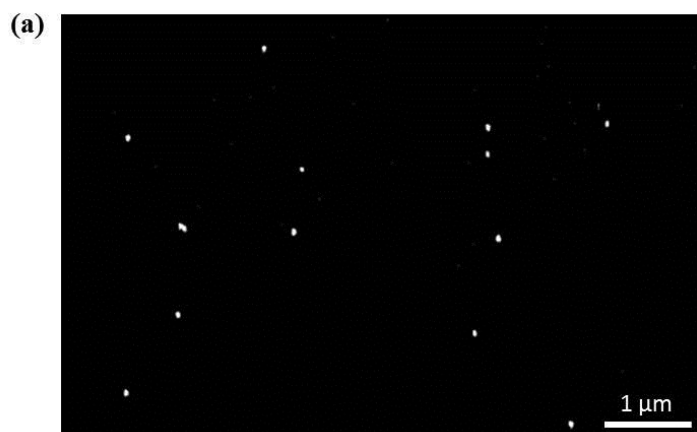


Figure S5. Representative SEM images of SPR sensors after the amplification of CEA with 50 nm AuNPs at CEA concentration of (a) 10 ng/mL, (b) 100 ng/mL and (c) 1000 ng/mL.

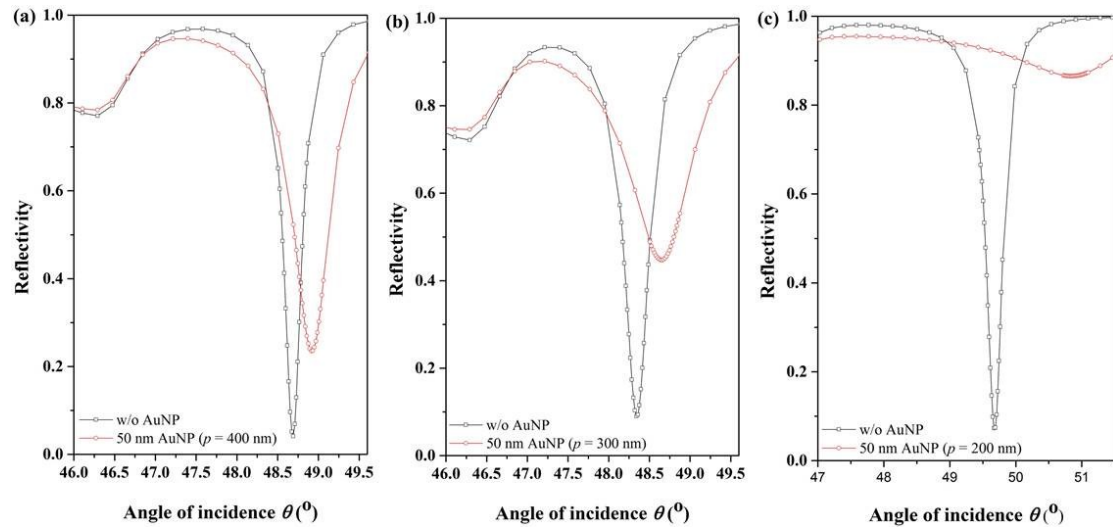


Figure S6. Simulated SPR angular spectra of 50 nm AuNPs on LRSPR sensors at the dielectric thickness of 25 nm for different pitches (a) $p = 400$ nm, (b) $p = 300$ nm and (c) $p = 200$ nm

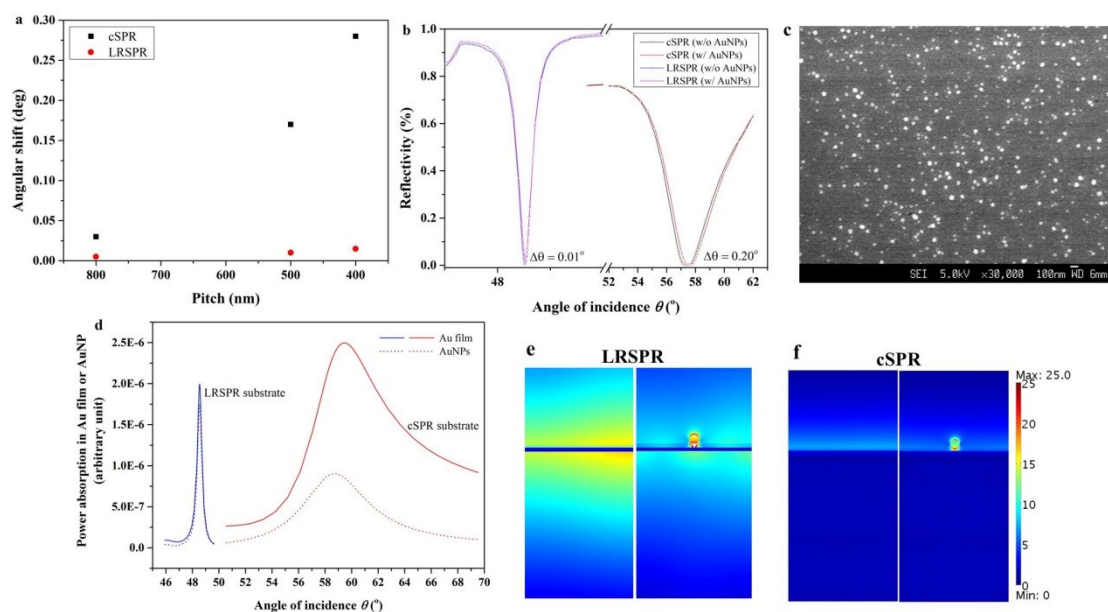


Figure S7. (a) Simulated SPR angular shifts versus pitches with the adsorption of 36 nm AuNPs for cSPR and LRSPR sensors; (b) Experimental angular spectra for cSPR and LRSPR with the adsorption of 36 nm AuNPs at $p = 415$ nm; (c) SEM image of cSPR sensor with the adsorption of 36 nm AuNPs; (d) Simulated power absorption in Au film and AuNPs for cSPR and LRSPR substrates; Field enhancement distributions with the adsorption of 36 nm AuNPs at $p = 500$ nm for (e) LRSPR and (f) cSPR substrates.

References

- 1 Golden, M. S.; Bjornnes, A. C.; Georgiadis, R. M. *J. Phys. Chem. C* 2010, **114**, 8837.