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Supporting Information

Peptides-templated synthesis of wavelength-tunable fluorescent gold nanoparticles

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Experimental

Synthesis of P2 and P3 stabilized Au NPs

Preparation of P2 stabilized Au NPs (denoted as P2-Au NPs) was conducted at 50 °C. Typically, 0.0391g P2 was dissolved in 10 mL NaOH (15 mM) and sonicated for 5 min, then 3.125 mL $HAuCl_4$ solution (4 mM) was added into the solution and stirred for another 5 min. Afterwards, 125 μL freshly prepared $NaBH_4$ (10 mM) was introduced and the reaction was allowed to proceed under vigorous stirring for 6 h.

Preparation of P3 stabilized Au NPs (denoted as P3-Au NPs) was conducted at 37 ºC. Typically, 5 mL $HAuCl_4$ aqueous solution (4 mM) was mixed with 5 mL P3 solution (4 mM) in a small vial. Subsequently, 2.5 mL NaOH solution (50 mM) was introduced and stirred for another 5 min, followed by the addition of 125 μL freshly prepared $NaBH_4$ (10 mM) and the reaction solution was incubated for 4 h.

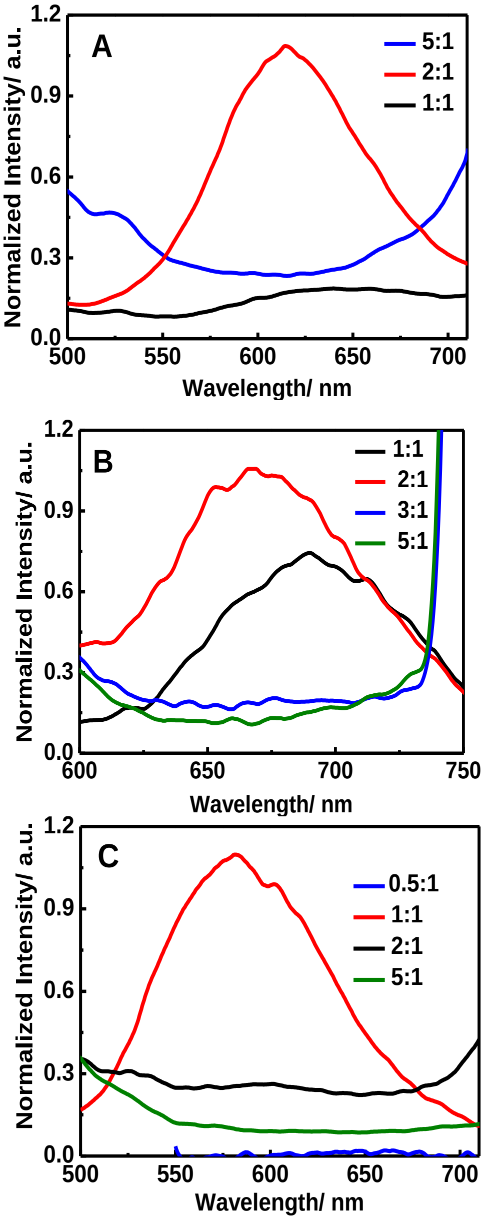

Fig. S1 Fluorescence spectra of the reaction solutions with different molar ratios of the peptide to $AuCl_4^{-1}$ upon excitation at 370 nm: (A) P1/Au; (B) P2/Au; (C) P3/Au.

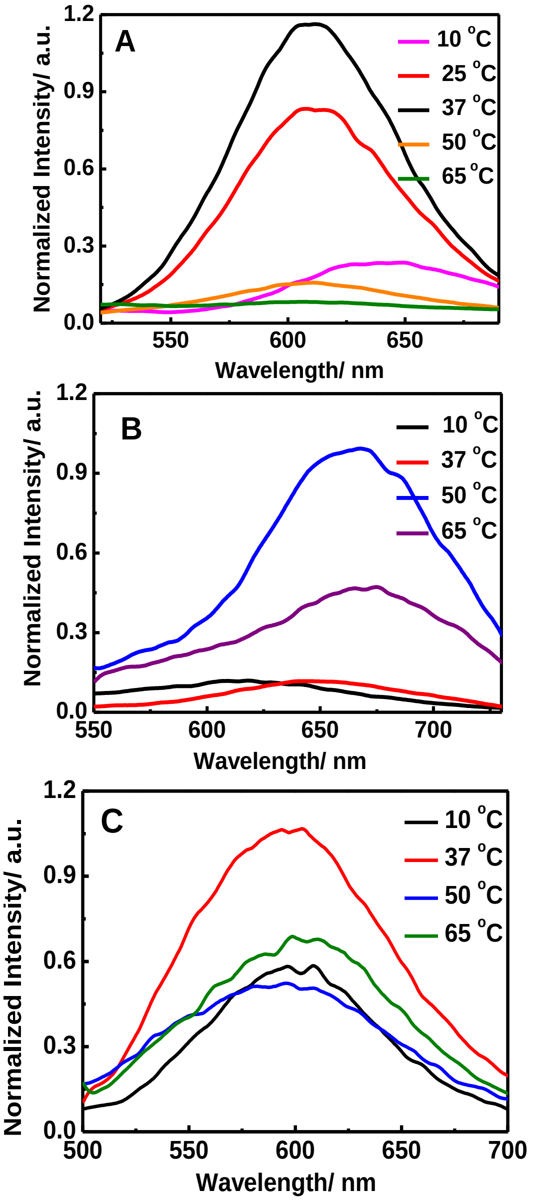

Fig. S2 Temperature-dependent emission spectra of the reaction solution upon excitation at 370 nm: (A) P1-Au NPs; (B) P2-Au NPs; (C) P3-Au NPs.

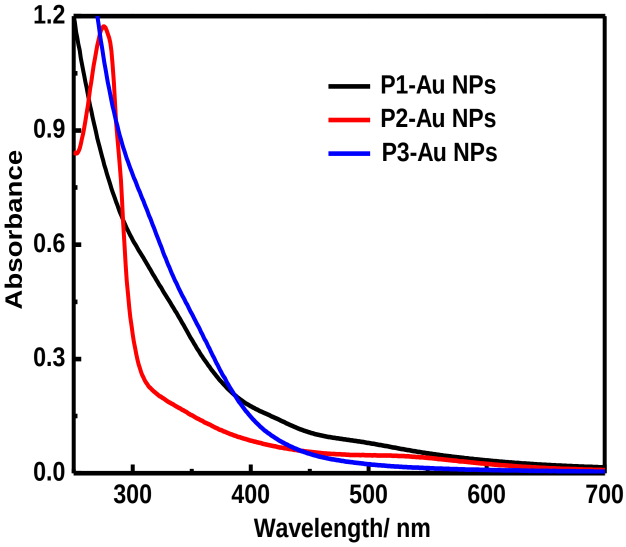

Fig. S3 UV-vis absorption spectra of the Au NPs synthesized with three different peptides.

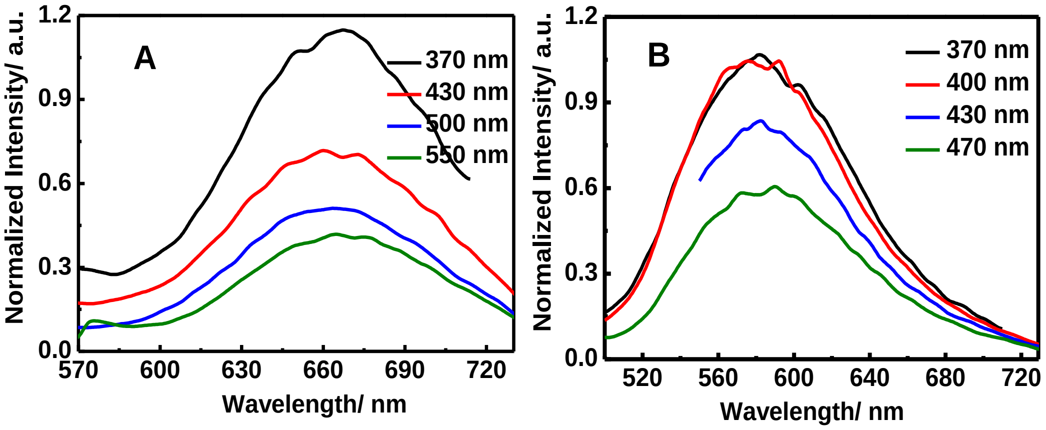

Fig. S4 Fluorescence spectra of the P2-Au NPs (A) and P3-Au NPs (B) obtained at different excitation wavelengths.

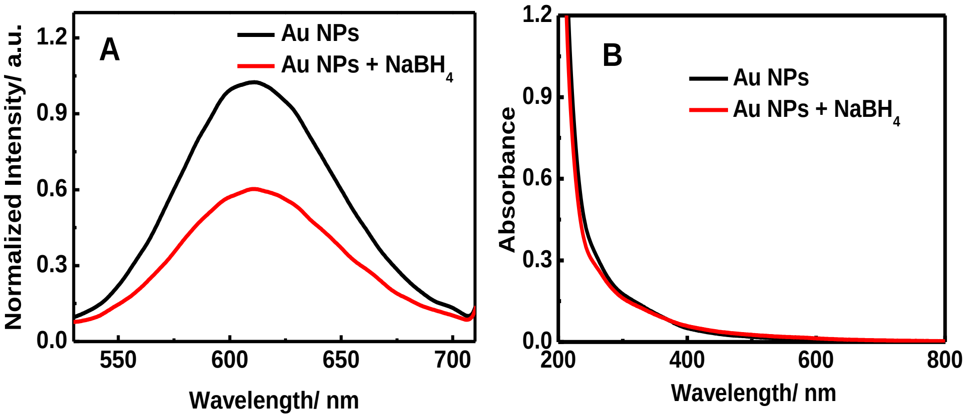

Fig. S5 Fluorescence (A) and absorption (B) spectra of the P1-Au NPs before (black line) and after (red line) the addition of $NaBH_4$.

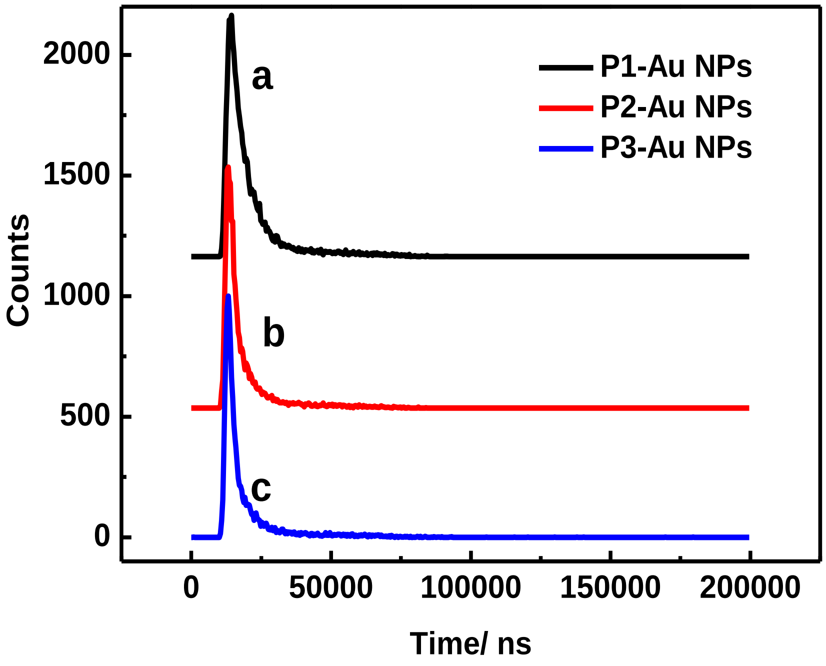

Fig. S6 Fluorescence lifetime of the as-prepared Au NPs upon excitation at 370 nm: (a) P1-Au NPs; (b) P2-Au NPs; (c) P3-Au NPs. The luminescence decay was fitted to a single-exponential decay.

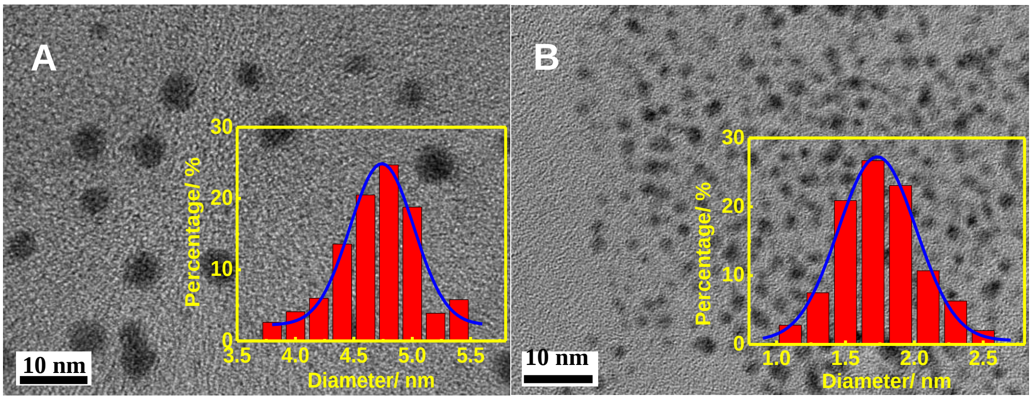

Fig. S7 TEM images of the (A) P2-Au NPs and (B) P3-Au NPs. Inset shows the corresponding size distribution histogram, obtained from analysis of over 100 individual particles.

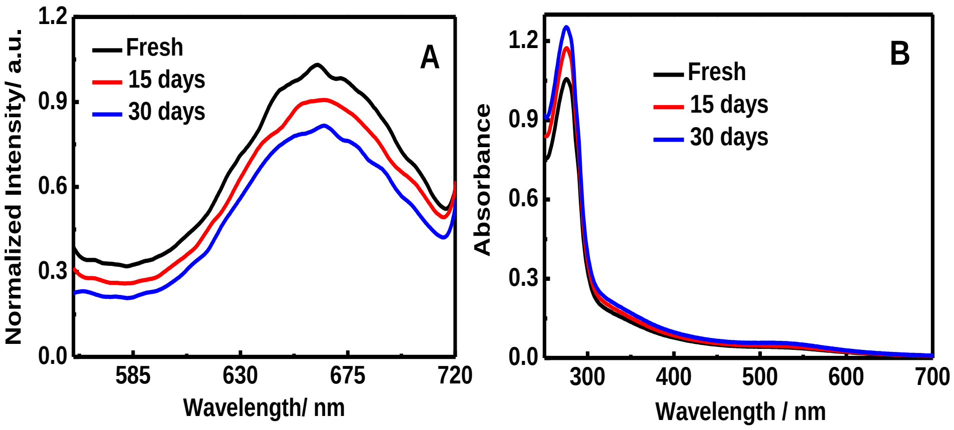

Fig. S8 Fluorescence spectra (A) and absorption spectra (B) of the P2-Au NPs in the phosphate solution (25 mM, pH = 7.4) as a function of time. The Au NP solutions were stored at 4 °C.

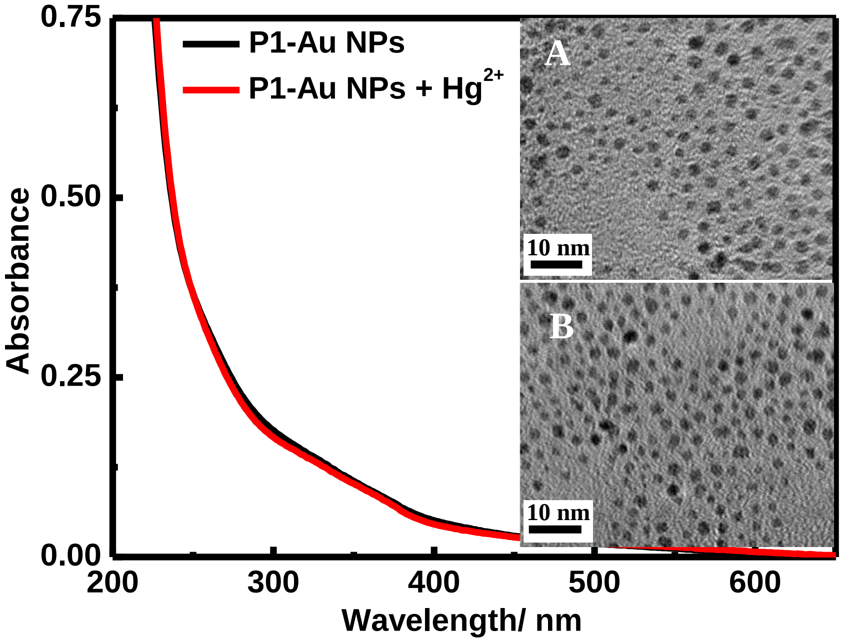

Fig. S9 UV-vis absorption spectra of the P1-Au NPs in the absence (black line) and presence of 20 μM Hg^{2+} (red line). Inset: TEM images of the P1-Au NPs before (A) and after (B) the addition of 20 μM Hg^{2+}.

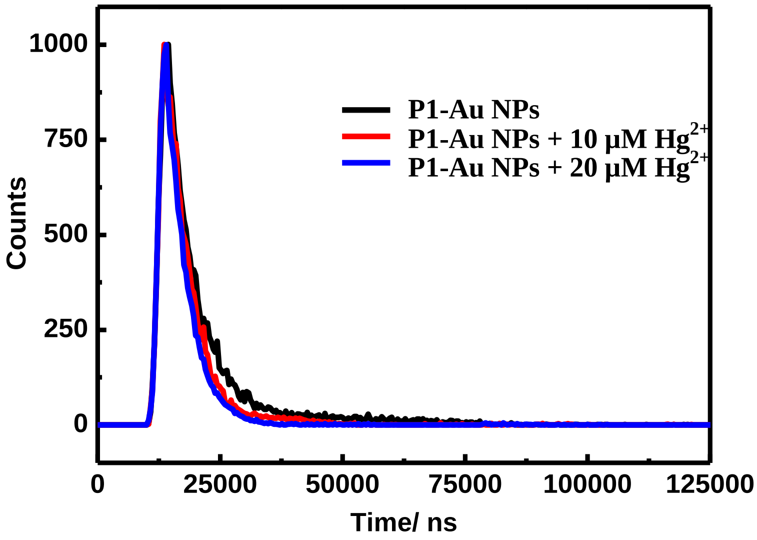

Fig. S10 Fluorescence decay of the P1-Au NPs in the absence (black line) and presence of 10 μM (red line) and 20 μM Hg^{2+} (blue line).

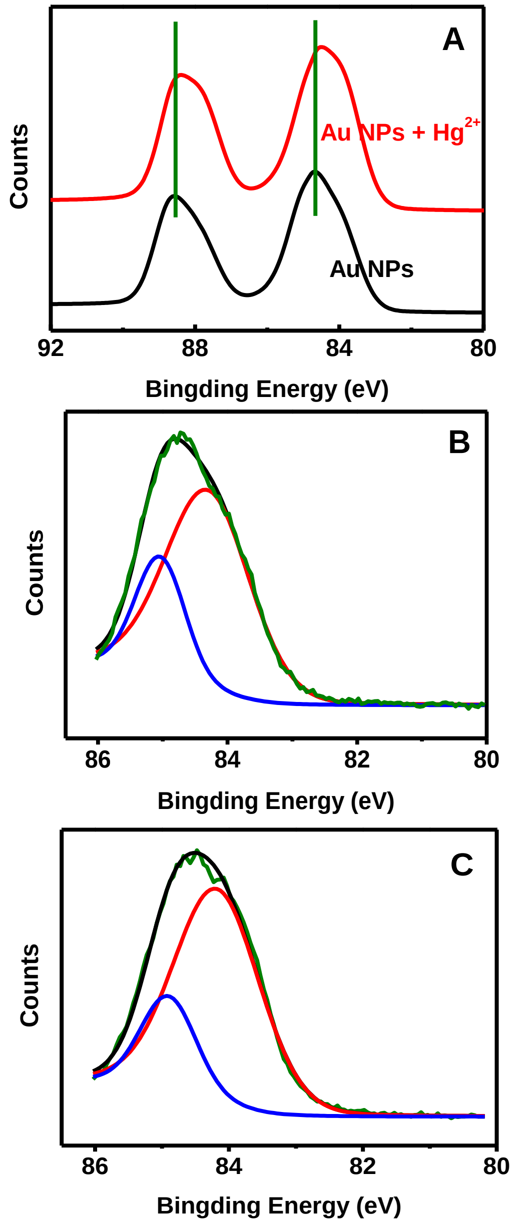

Fig. S11 (A) XPS spectra showing the binding energies of Au4f of P1-Au NPs in the absence (black line) and presence (red line) of Hg^{2+}, respectively. (B) and (C) are the $Au4f_{7/2}$ spectrum of P1-Au NPs in the absence and presence of Hg^{2+}, respectively. After deconvolution of the Au4f spectrum, two peaks at 84.1 and 85.0 eV are found, which correspond to Au^0 and Au^+, respectively. Based on the area ratio between the two peaks, the Au^+ ratio is measured to be 16% (B) and 13% (C).

Table S1 Fluorescent Au NPs prepared using different peptides as the templates.

Peptide	Sequence	Maximum Emission / nm	Ref.
Insulin	GIVEQCCTSICSLYQLENYCN (A) FVNQHLCGSHLVEALYLVCGERGFFYTPKT (B)	670	1
Glutathione	ECG	610	2
P1	CALNN	611	This work
P2	DDCAGGEYDTFPYWDD	668	This work
P3	CDDDDD	580	This work

Table S2 Comparison of the performances of the Au NPs synthesized with different templates.

	Linear Range (nM)	LOD (nM)	Ref.
P1-Au NPs	50 - 25000	5.0	This work
BSA-Au NPs	1-20	0.5	3
Lysozyme-Au NPs	10-5000	10.0	4
DHLA-Au NPs	1-10000	0.5	5
11-MUA-Au NPs	10-10000	5.0	6
Lys VI-Au NPs	1 - 600	0.5	7

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