

A highly sensitive and selective resonance Rayleigh scattering method for bisphenol A based on the aptamer-nanogold catalysis of H₂AuCl₄-vitamine C particle reaction

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Absorption spectra

There is only one surface plasmon resonance (SPR) absorption peak at 518 nm for the GNs. Figure 1S indicated that Apt-GN was aggregated nonspecifically in the condition of pH 7.6 Na₂HPO₄-NaH₂PO₄ buffer solution, which showed a weak SPR peak at 518 nm. Upon addition of BPA, Apt-GN specifically combined with BPA to form dispersed BPA-Apt-GN conjugates, the SPR absorption peak increased at 518 nm.

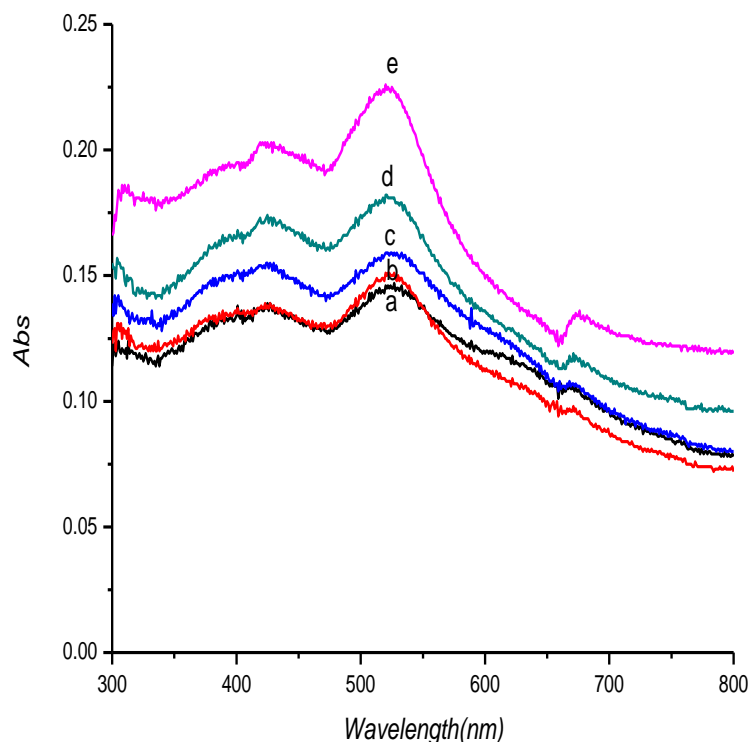


Figure 1S Absorption spectra of the BPA-Apt-GN system

a: 2.7×10^{-5} mol/L Apt-GN-pH7.6 PBS; b: a-66.7 ng/mL BPA; c: a-133.3 ng/mL BPA; d: a-333.3 ng/mL BPA; e: a-666.7 ng/mL BPA

Scanning electron microscope

The reaction solution of BPA-Apt-GN system was obtained by the procedure, and centrifugation and ultrasonic

dispersion of the reaction solution were made twice to prepare sample solution. Then, a 5.0 μL of the sample solution was added to a clean silicon wafer, natural drying, the sample was placed in a scanning electron microscope, to obtain the scanning electron micrograph (Figure 2S). Figure 2Sa showed that Apt-GN particles dispersed in solution. In the absent of BPA, the Apt-GNs were aggregated and formed big aggregation in the pH 7.6 $\text{Na}_2\text{HPO}_4\text{-NaH}_2\text{PO}_4$ buffer solution (Figure 2Sb). When the concentration of BPA increased, Apt-GN reacted specifically with BPA to form BPA-Apt-GN conjugates that were dispersed in PBS buffer solution stably (Figure 2Sc), which led to the aggregates reduced, that is agreement with the RRS results.

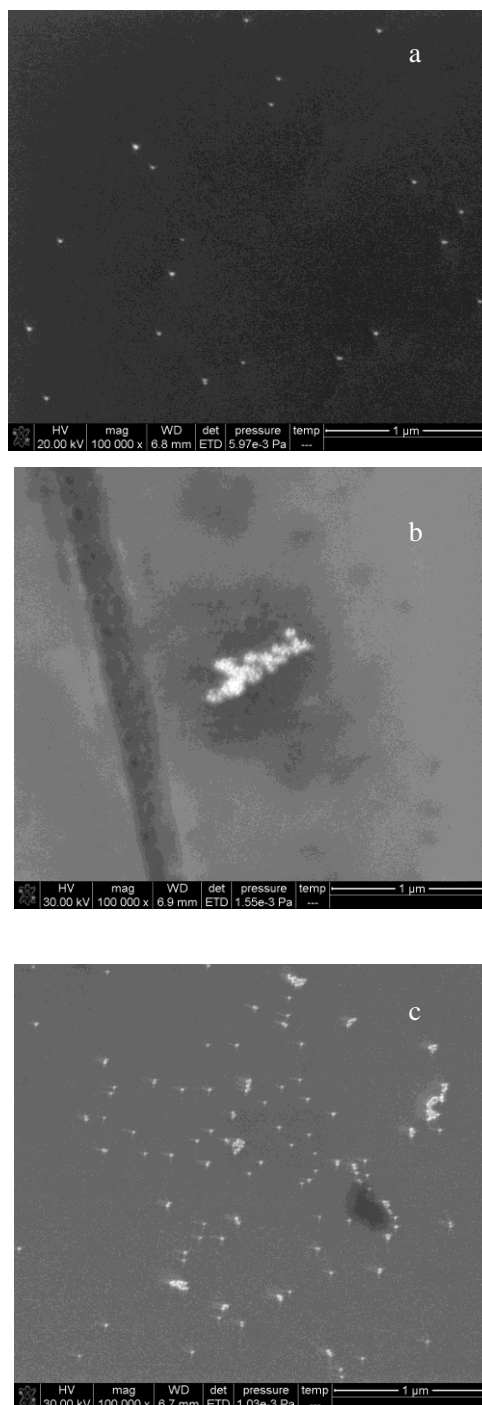


Figure 2S Scanning electron microscope images

a: 2.7×10^{-5} mol/L Apt-GN; b: 5.17 $\mu\text{g/mL}$ Apt-GN-pH7.6 PBS; c: a-1 $\mu\text{g/mL}$ BPA.

Preparation conditions of the Apt-GN probe

Effect of NaCl concentration

The effect of NaCl concentration on the GN labeled-aptamer was examined. A 200 μL of 47.3 $\mu\text{g/mL}$ GN was added into each 5mL marked tube, a certain amount of 2.0 mol/L NaCl was added, after 10min, the solution was diluted to 2.0mL. The RRS intensity at 380 nm ($I_{380\text{nm}}$) was recorded. Table 1S showed that when the NaCl concentration was more than 0.013 mol/L, the $I_{380\text{nm}}$ increased slightly. Thus, a 0.013 mol/L NaCl concentration was chosen for use.

Table 1S Effect of NaCl concentration on the $I_{380\text{nm}}$

NaCl(μL)	0	5	10	15	20	30	40
$I_{380\text{nm}}$	188	617	929	808	911	834	812

Selection of labeling pH

The effect of pH on the GN labeled aptamer was examined. A 200 μL of 47.3 $\mu\text{g/mL}$ GN was added into each 5mL marked tube and the pH adjusted to 3.0-9.0 using 0.1mol/L HCl and 0.1mol/L K_2CO_3 , and 100 μL of 0.5 $\mu\text{mol/L}$ aptamer was added, after 10min, 10 μL of 2.0 mol/L NaCl was added. After 30min, the solution was diluted to 1.5mL. The RRS intensity at 520 nm ($I_{380\text{nm}}$) was recorded. Table 2S showed that when the pH was more than 5.0, the $I_{380\text{nm}}$ decreased slightly, owing to GN being coated by aptamer. Thus the GN could not aggregate in NaCl solution. A pH 6.5 was chosen for use.

Table 2S Effect of pH on the $I_{380\text{nm}}$

pH	3.0	3.5	4.0	4.5	5.0	6.0	6.5	7.5	8.0	9.0
$I_{380\text{nm}}$	544	344	282	316	246	279	240	244	231	271

Selection of aptamer amount

A 200 μL of 2.4×10^{-4} mol/L GN was added into each 5mL marked tube and the pH adjusted to 6.5. Then, different amounts of 0.5 $\mu\text{mol/L}$ aptamer were added, then ultrasound 10min, 10 μL of 2.0 mol/L NaCl was added. After 30min, the solution was diluted to 1.5mL. The RRS intensity at 520 nm ($I_{380\text{nm}}$) was recorded. Table 3S showed that when aptamer amount was more than 100 μL , the $I_{520\text{nm}}$ decreased slightly. Thus, 100 μL of aptamer was chosen for use.

Table 3S Effect of aptamer amount on the $I_{380\text{nm}}$

Apt(μL)	0	20	50	80	100	130	160	290	250	300
$I_{380\text{nm}}$	910	438	254	370	253	234	215	263	214	279

Table 4S The effect of ultrasonic and standing form on the $I_{380\text{nm}}$

Reaction form	$I_{380\text{nm}}$	RSD(%)
Standing	1362, 1240, 1327, 1275, 1119, 1391, 1579, 1677, 1705	14.4
Ultrasonic	1238, 1250, 1256, 1237, 1252, 1375, 1368, 1238, 1330	4.5