Supporting Information

Fluorescence Sensing Method for Brilliant Blue with Gold Nanoclusters Based on Inner Filter Effect

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Quantum yield measurement

The quantum yield (Φ) of AuNCs was determined by comparing the integrated fluorescent intensities (excitation at 274 nm) and absorbance values (at 274 nm) of the AuNC samples with those of rhodamine B. The quantum yield was calculated using equation (1), where Φ is the quantum yield, k is slope, η is the refractive index of the solvent, S is the standard and X is the sample.

$$\Phi_x = \Phi_s \left(\frac{K_x}{K_s}\right)\left(\frac{\eta_x}{\eta_s}\right) \quad (1)$$

Estimation of the suppressed efficiency of BB on the IFE of AuNCs

The IFE feasibility was estimated using the following equation:

$$\frac{F_{cor}}{F_{obsd}} = \frac{2.3dA_{ex}}{1-10^{dA_{ex}}} 10^{gA_{em}} \frac{2.3sA_{em}}{1-10^{-sA_{em}}} \quad (2)$$

where F_{obsd} is the measured fluorescence of AuNCs upon addition of BB at 600 nm. F_{cor} is the fluorescence corrected with eq 2 by removing IFE from F_{obsd}. A_{ex} and A_{em} are the absorbance of AuNCs upon addition of BB at 274 nm and 600 nm, respectively, and s (the excitation beam thickness), g (the distance between the edge of the excitation beam and the edge of the cuvette) and d (the width of the cuvette) are 0.1, 0.4, and 1 cm, respectively. The maximum value of the correction factor (CF, F_{cor}/F_{obsd}) could not exceed 3. Table S2 summarizes the absorbance and fluorescence intensity of AuNCs upon addition of different concentrations of BB. The CF for IFE at each concentration of BB was calculated according to eq 2. Furthermore, the observed and corrected fluorescence efficiency was figured out after addition of different concentrations of BB into the AuNCs solution. The suppressed efficiency of IFE was calculated from the following equation:

$$E_{obsd} = 1 - \frac{F_{obsd}}{F_{obsd,0}} \quad (3)$$

$$E_{cor} = 1 - \frac{F_{cor}}{F_{cor,0}} \quad (4)$$

where E_{obsd} and E_{cor} are the observed and corrected fluorescence

quenching efficiencies after adding different concentrations of BB into the AuNCs solution, respectively. $F_{obsd,0}$ and $F_{cor,0}$ are the observed and corrected fluorescence intensities of the AuNCs in the absence of BB, respectively. As shown in Figure S7, we found that the suppressed efficiency of IFE for BB to AuNCs reached as high as 88% of the total suppressed efficiency, indicating that the suppressed efficiency mainly comes from IFE.

Figure S1 Absorption spectra of BB (0.1 μM) in the presence and absence of AuNCs.

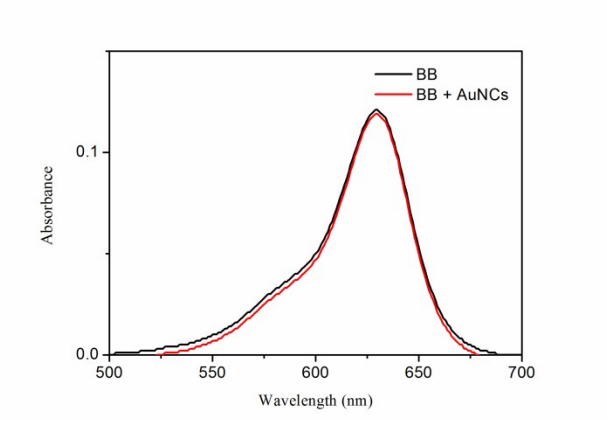

Figure S2 (A) Effect of different concentrations of AuNCs on the fluorescence intensity of the system in the absence (line1) and presence (line 2) of BB, and (B) the effect of different concentrations of AuNCs on the fluorescence quenching efficiency.

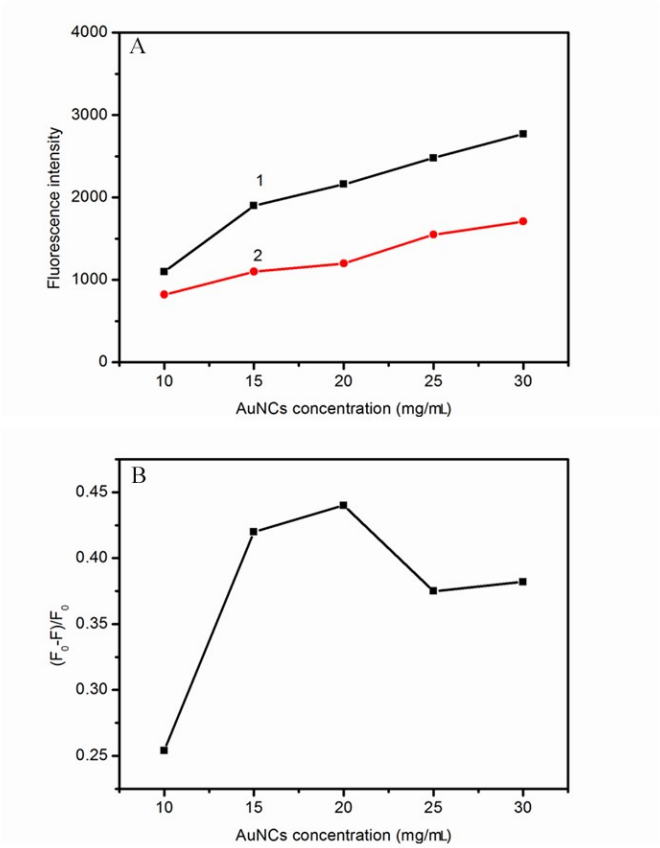

Figure S3 (A) Effect of pH on the fluorescence intensity of the system in the absence (line 1) and presence (line 2) of BB, and (B) the effect of pH on the fluorescence quenching efficiency.

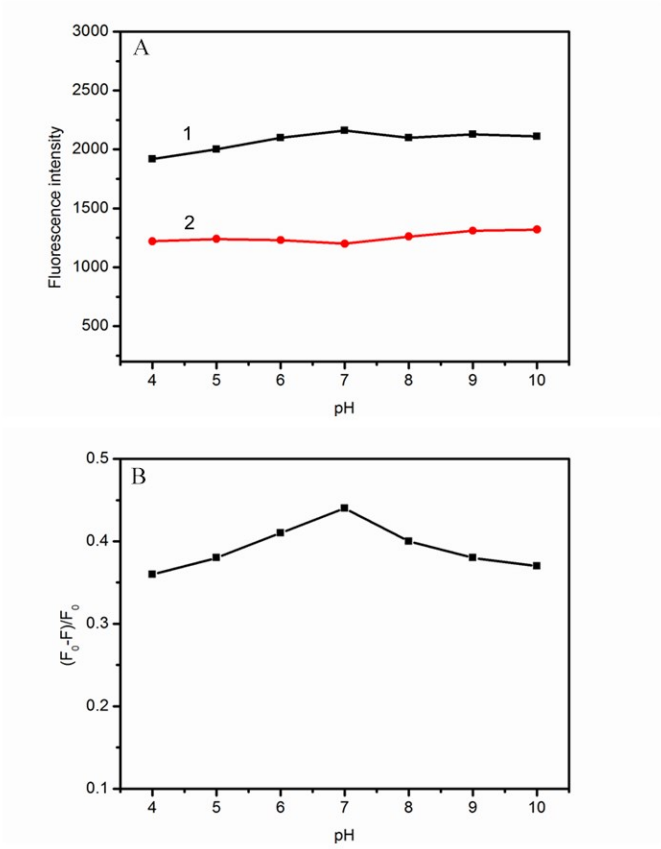

Figure S4 Effect of different incubation times on the fluorescence intensity of the system.

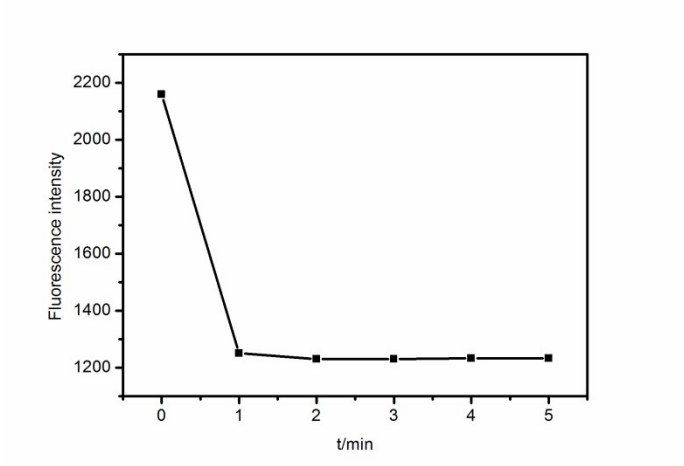

Figure S5 (A) The fluorescence decay and exponential fitting curve of AuNCs without BB. (B) The fluorescence decay and exponential fitting curve of AuNCs with BB.

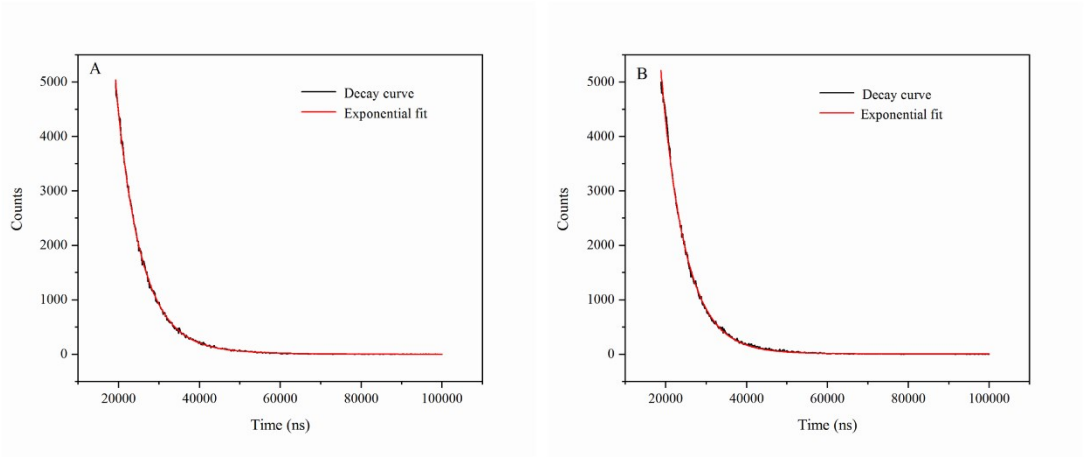

Figure S6 Photostability of the AuNCs measured with a fluorescence spectrophotometer at 10 min intervals (λ ex = 274 nm).

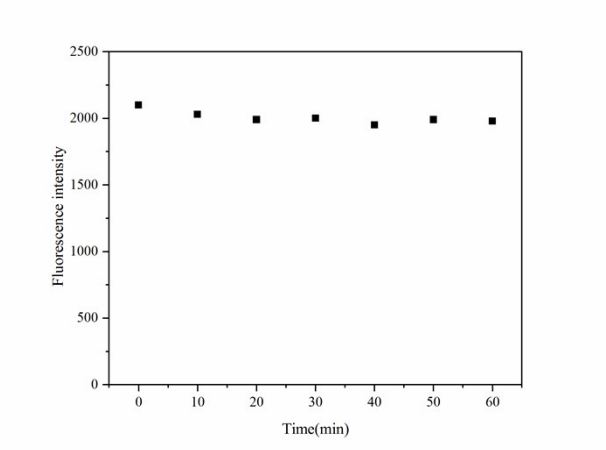

Figure S7 Suppressed efficiency of observed and corrected fluorescence intensity. Suppressed efficiency (E, %) of observed (black line, E_{obsd}) and corrected (red line, E_{cor}) fluorescence intensity, with removal of IFE from E_{obsd} measurements for AuNCs after each addition of different

concentrations of BB.

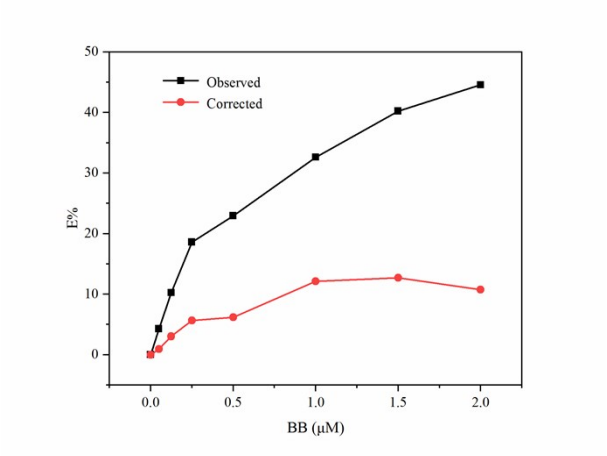

Table S1 Comparison of analytical performance of some assays for BB detection.

Methods	Liner range (μM)	LOD (μM)	Ref.
HPLC	9.45 - 378.36	0.015	1
SERS	-	6.306	2
Spectrophotometry	2.52 - 12.61	0.176	3
Spectrophotometry	0.063 - 4.414	0.02	4
Electrochemistry	0.05 - 25.22	0.005	5
Fluorometry	4.5 - 40	0.35	6
Fluorometry	6.306 - 81.98	3.776	7
This work	0.05 -7.5	0.0167	

Table S2. IFE of BB on the Fluorescence of the AuNCs

BB (μM)	A_{ex}	A_{em}	F_{obsd}	F_{cor}	CF	E_{obsd}	E_{cor}
0	0.501	0.008	2150	3633.5	1.69	0	0
0.05	0.512	0.028	2058	3599.1	1.75	0.0427	0.0094
0.125	0.526	0.057	1930	3523.5	1.83	0.1023	0.0303
0.25	0.575	0.082	1750	3428.9	1.96	0.1860	0.0563
0.5	0.583	0.122	1657	3408.7	2.06	0.2293	0.0618
1	0.586	0.186	1449	3193.8	2.20	0.3260	0.1210
1.5	0.597	0.213	1285	3171.7	2.29	0.4023	0.1271
2	0.599	0.378	1192	3242.2	2.72	0.4456	0.1077

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