Supporting Information

Controllable and Robust Dual-Emissive Quantum Dot Nanohybrids as Inner Filter-based Ratiometric Probes for Visualizable Melamine Detection

Jing Wang, Xinyue Liu, Liang Huang, Jiening Jin, Chenxing Jiang, Daquan Li, Huimin Wen, and Jun Hu*

College of Chemical Engineering, Zhejiang University of Technology. Hangzhou 310014, PR China.

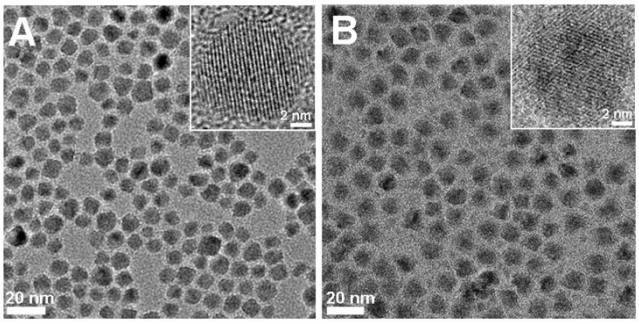

Fig. S1. TEM images of G-QDs (A) and R-QDs (B). Inset is an enlarged image of a single QD.

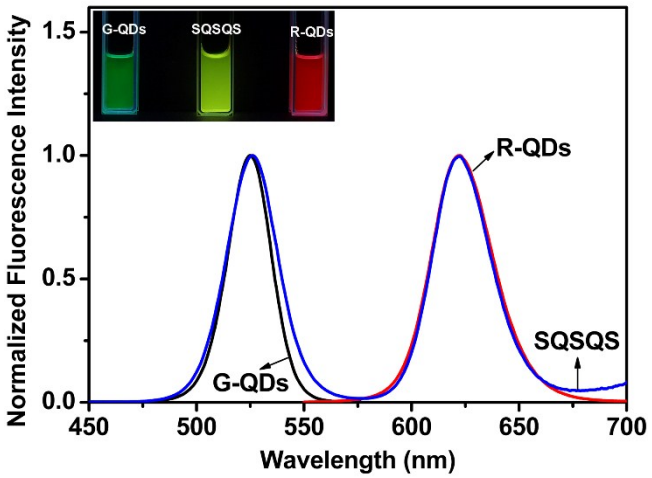

Fig. S2. Fluorescence emission spectra of G-QDs, R-QDs, and SQSQS. Inset images are the corresponding fluorescence photos under a 365 nm UV lamp.

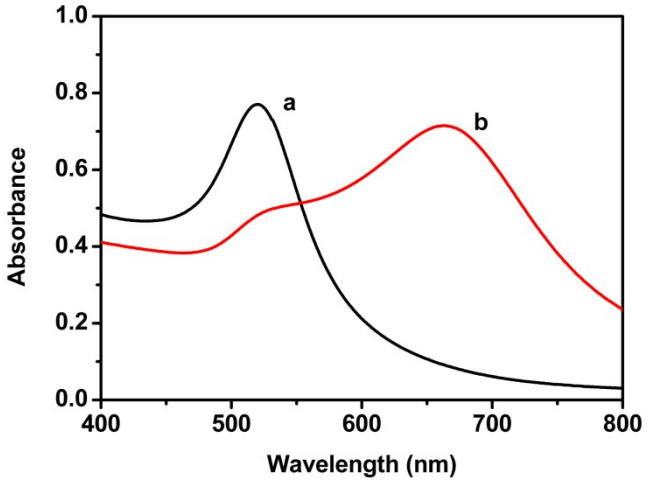

Fig. S3. UV−vis spectra of AuNPs (a) before and (b) after adding 0.96 μM melamine.

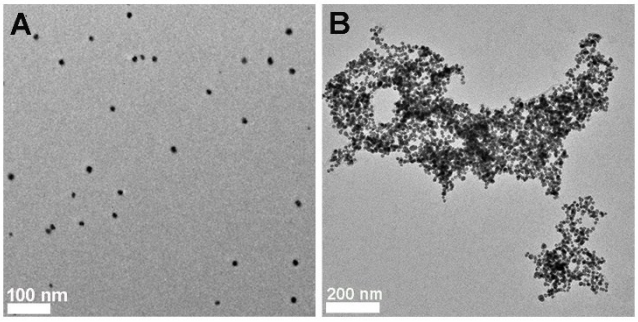

Fig. S4. TEM images of AuNPs (A) before and (B) after adding 0.96 μM melamine.

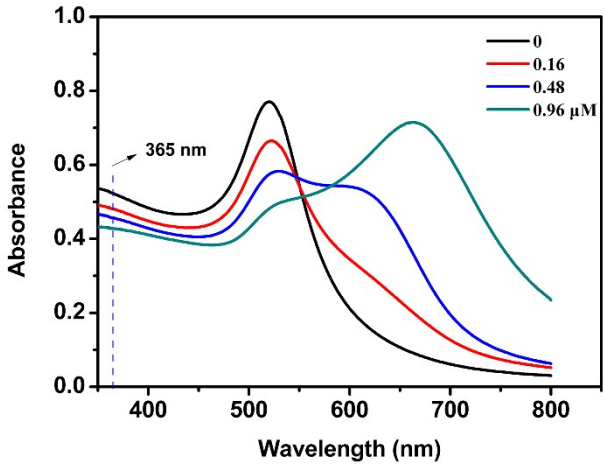

Fig. S5. UV-vis absorption spectra of AuNPs with different concentrations of melamine.

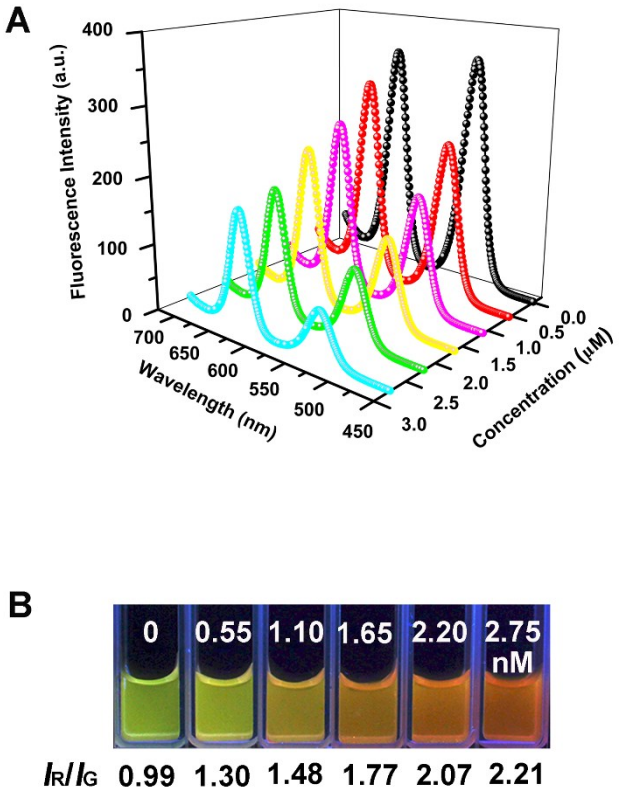

Fig. S6. (A) Fluorescence spectra of SQSQS (45 μg mL^{-1}) in the presence of various concentrations of AuNPs. The concentrations of AuNPs are 0, 0.55, 1.10, 1.65, 2.20, and 2.75 nM. (B) The corresponding fluorescence photos under a 365 nm UV lamp and fluorescence intensity ratio ($I_{627}/I_{528)}$ of SQSQS.

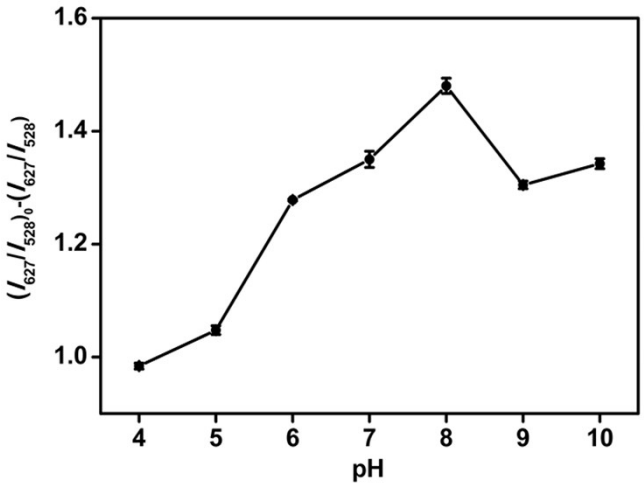

Fig. S7. Effects of pH on the fluorescence ratio I_{627}/I_{528} (n = 3). $(I_{627}/I_{528})_0$ and (I_{627}/I_{528}) are the intensity ratio before and after adding 0.8 μM melamine, respectively.

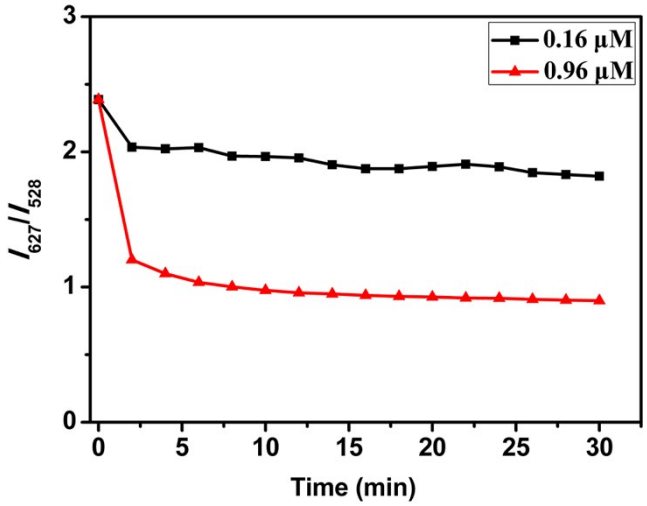

Fig. S8. Effects of reaction time on the fluorescence ratio I_{627}/I_{528} (n = 3), the data were taken at the interval of 2 min.

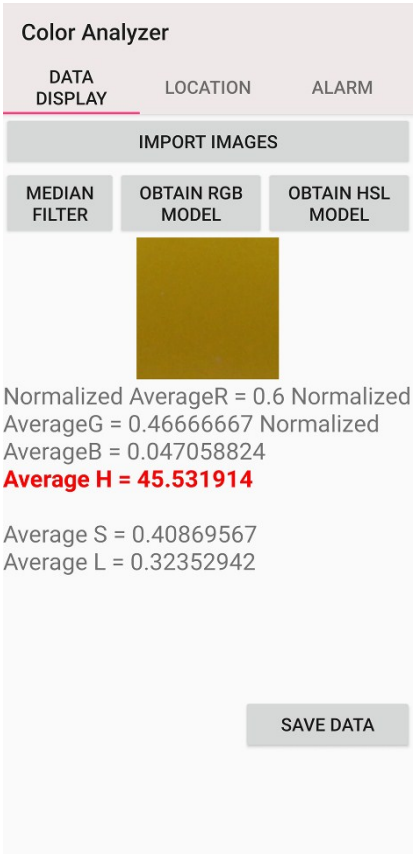

Fig. S9. “Color Analyzer” app for analyzing the hue value.

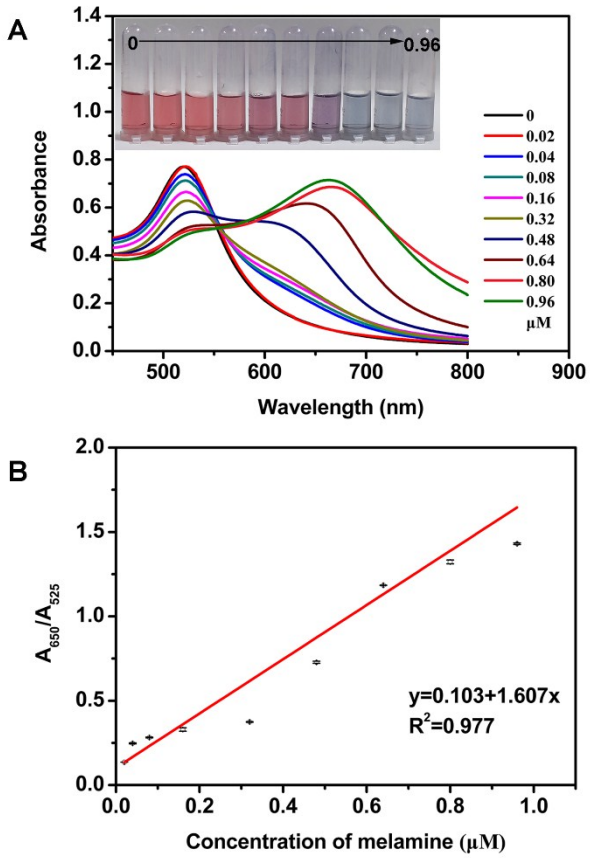

Fig. S10. (A) UV-vis absorption spectra of AuNPs with different concentrations of melamine. The inset are corresponding photographs. (B) The corresponding plot of A_{650}/A_{525} versus melamine concentration. The spectral and visual detection limits are 15.7 and 80 nM, respectively.

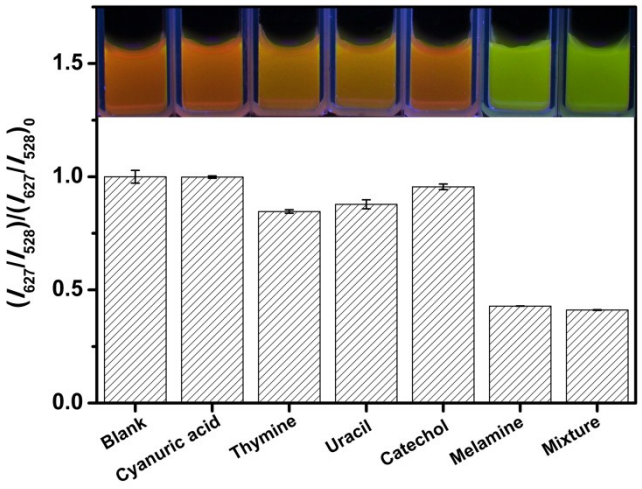

Fig. S11. Fluorescence response of the optimized probe in the presence of cyanuric acid, thymine, uracil, catechol and melamine (from left to right), the concentration of melamine was 1 μM, other molecules were 2 μM.

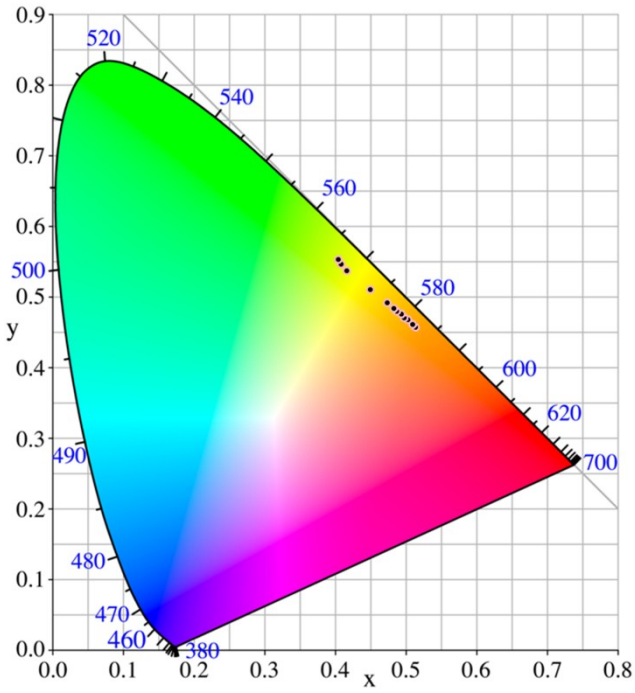

Fig. S12. Use the emission spectrum data to calculate a standard color for each concentration by performing a CIE calculation.

Table S1. The comparison of melamine detection by colorimetric and ratiometric fluorescence probes.

Methods	System	Spectral Detection		Visual Detection		References
		Linear range (μM)	LOD (nM)	Linear range (μM)	LOD (nM)	
Colorimetric	MTT-stabilized AuNPs	0.004 – 0.2, 0.28 – 0.440	0.2	-	20	45
Colorimetric	Peroxidase-AuNPs	0.001 – 0.8	0.2	-	500	46
Colorimetric	$NaHSO_4$-optimized AuNPs	-	-	-	200	47
Colorimetric	NT-AuNPs	0.20 - 0.45	3.5	-	3.0×10^3	48
Colorimetric	Triton X-100-AuNPs	0.75–1.75	5.1	-	1.0×10^3	49
Colorimetric	MA-AuNPs	48 - 333	3.2×10^4	-	2.4×10^5	50
Colorimetric	Aptamer- AuNPs	8 - 238	4.0×10^3	-	1.2×10^4	51
Ratiometric Fluorescence	MIP@QDs	0.1 - 0.8	38	-	-	52
Ratiometric Fluorescence	Ply-BFSA OFNs@Au NCs	-	680	-	-	53
Ratiometric Fluorescence	CNDs/GSH@Au NCs	0.1 - 30	29.3	-	-	54
Ratiometric Fluorescence	MIP-g/r-QDs	0.4 - 8	100	-	-	55
Ratiometric Fluorescence	SQSQS@ AuNPs	0.02 - 0.96	7	0.02-0.96	18	This work

Table S2. The spiking/recovery experiments results of melamine detection by HPLC.

Detection Method		Added (μM)	Found (Average μM)	Recovery (%)	RSD (%)
HPLC	pure milk	0	Not Detected	-	1.9
		0.20	0.174	87.2	8.0
		0.50	0.432	86.4	2.8
		0.80	0.696	87.0	1.1
	milk powder	0	Not Detected	-	2.2
		0.20	0.216	108	4.6
		0.50	0.448	89.6	2.7
		0.80	0.680	85.0	1.8

Data are expressed as mean ± standard deviation (n = 3).