Dual mode detection of amifostine based on gold nanoparticles and sulfanilic acid functional graphene quantum dots

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1. The preparation of GO by the modified Hummers method

Typically, 1.0 g of graphite powder was added to 25 mL H_2SO_4 (98%) and stirred 30 min. Afterwards, 3.5 g $KMnO_4$ was added and the mixture was stirred for 30min in an ice bath, and then stirred at 35 °C for 1h. Next, the mixture was diluted by 90 mL distilled water and the temperature was increased to 90 °C stirred for another 30 min. Subsequently, another 90 mL diluted water was added and then 10 mL of 30% H_2O_2 solution was added. The color of the mixture changed to bright yellow quickly. The resulting mixture was washed with distilled water several times and purified in a dialysis bag with a molecular weight cutoff of 10000 Da against deionized water until the pH of the solution became neutral. After that, the solution was dried under vacuum to remove water. Finally, some black GO powder was obtained.

2. The preparation of GQDs by the chemical oxidation of GO

1.0 g GO was dissolved in 30 mL H_2SO_4 (98%) and stirred 15 min, Afterwards, 5.0 g $KMnO_4$ was added and the mixture was stirred for 30min in an ice bath, and then stirred at 40 °C for 1h, Next, the mixture was diluted by slowly dropwise adding 120 mL distilled water, afterward, 10

mL of 30% H_2O_2 solution was added. The solution became transparent and color of the solution changed to bright yellow quickly. Finally, the solution was purified in a dialysis bag with a molecular weight cutoff of 1000 Da against deionized water to obtain a pure GQDs solution. Finally, the brightly orange GQDs solution was obtained.

3. Effect of NaCl concentration on SGQDs and SGQDs-AuNPs system

Citrate-capped AuNPs inclined to aggregate in the salty aqueous solution, resulting in the aggregation of AuNPs. Moreover, the concentration of NaCl concentration can also affect the fluorescence of SGQDs. As shown in Fig. S4, we can see both SGQDs and SGQDs-AuNPs almost kept constant when the level of NaCl was less than 1 mmol L^{-1}. And the obvious effect on the fluorescence of SGQDs and SGQDs-AuNPs can be observed when further increased the level from 2 to 10 mmol L^{-1}.

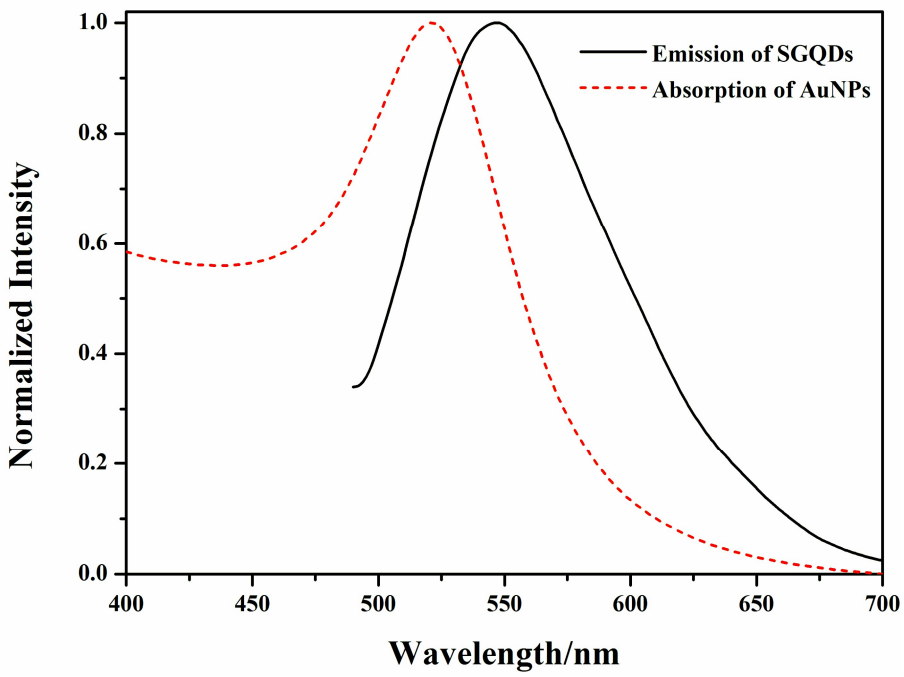

Fig. S1 The absorption spectrum of AuNPs (red dash line) and fluorescence spectrum of SGQDs (black solid line).

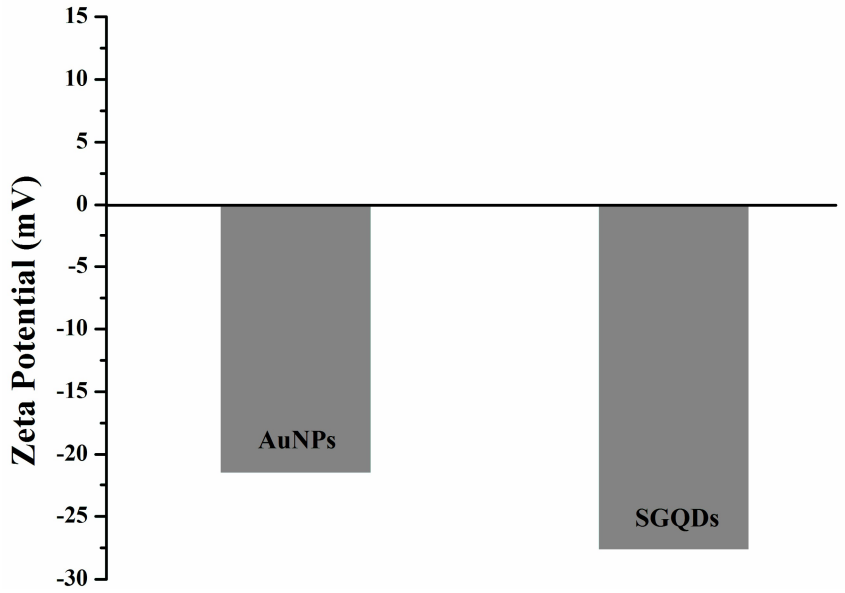

Fig. S2 The zeta potentials of AuNPs and SGQDs in 1 mmol L^{-1} phosphate buffer (pH 7.4)

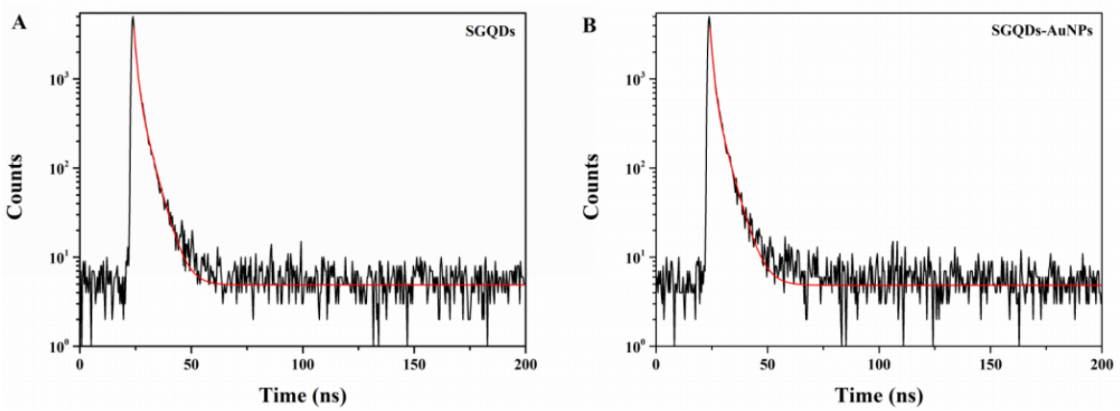

Fig. S3 The fluorescence decay curves of SGQDs (A) and SGQDs-AuNPs system (B) under 400 nm excitation.

Table S1 Fitting Parameters of the SGQDs and SGQDs-AuNPs

Category	A	B_1	B_2	τ_1 (ns)	τ_2 (ns)	τ_{AV} (ns)
SGQDs	4.886	50.79	49.21	1.133	4.325	2.70
SGQDs+AuNPs	4.843	53.54	46.46	1.148	4.515	2.71
Fit	$A+B_1\exp(-t/\tau_1)+B_2\exp(-t/\tau_2)$					

τ = lifetime in nanoseconds

τ_{av} = Average lifetime in nanoseconds

B= amplitude

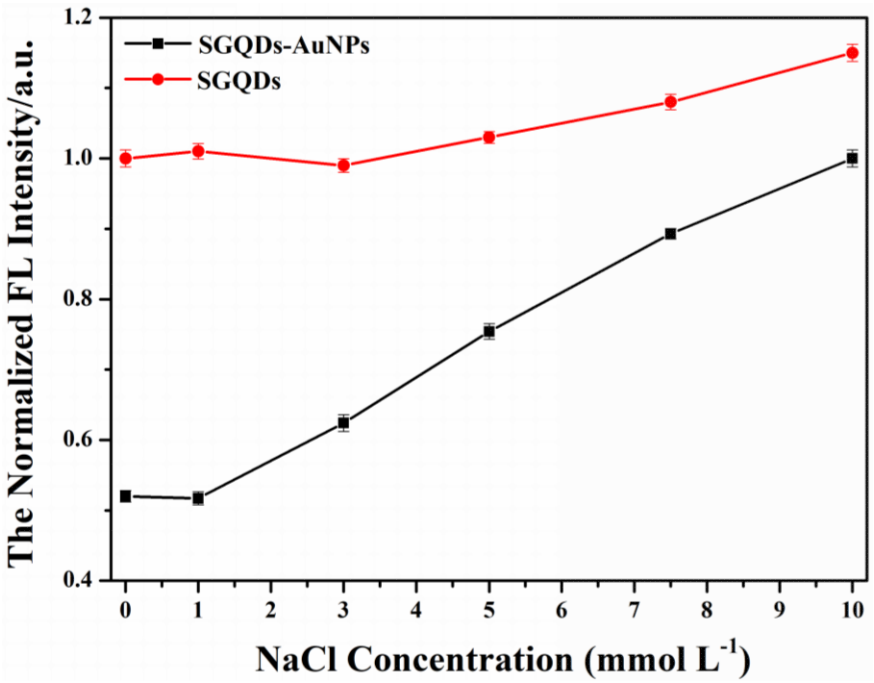

Fig. S4 The effect of NaCl concentration on the fluorescence intensity of SGQDs and SGQDs-AuNPs.

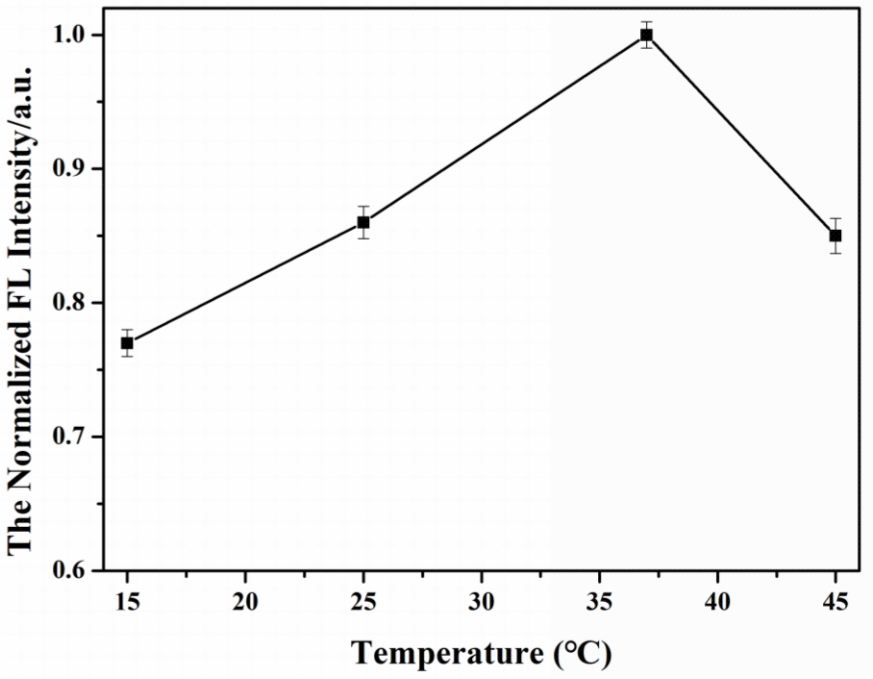

Fig. S5 The effect of incubation temperature on the fluorescence intensity of SGQDs-AuNPs-Amifostine-ALP system.

Table S2 The comparison of different method for the detection of amifostine

Detection method	LOD	Linear range	Ref
HPLC	0.15 μM	0.15-12.5 μM	29
HPLC	0.25 μM	0.37-50.37 μM	30
Capillary electrophoresis	0.6 μM	0.6-1.4 μM	31
Fluorometry	0.12 μM	0.5-25 μM	32
Fluorometry	0.4 nM	1-175 nM	This work