Supporting information

Facile synthesis of highly luminescent nitrogen-doped graphene quantum dots for the detection of 2,4,6-trinitrophenol in aqueous solution

*Liping Lin[a], Xinhong Song[a], Mingcong Rong[a], Tingting Zhao[c], Yiru Wang[a], Xi Chen[a,b]**

[a]Department of Chemistry and the MOE Key Laboratory of Spectrochemical Analysis & Instrumentation, College of Chemistry and Chemical Engineering, Xiamen University, Xiamen 361005, China

[b]State Key Laboratory of Marine Environmental Science, Xiamen University, Xiamen, 361005, China

[c]Xiamen Huaxia Vocational College, Xiamen, 361005, China

* Corresponding author. Tel: +86 592 2184530; Fax: +86 592 2184530; E-mail address: *xichen@xmu.edu.cn*

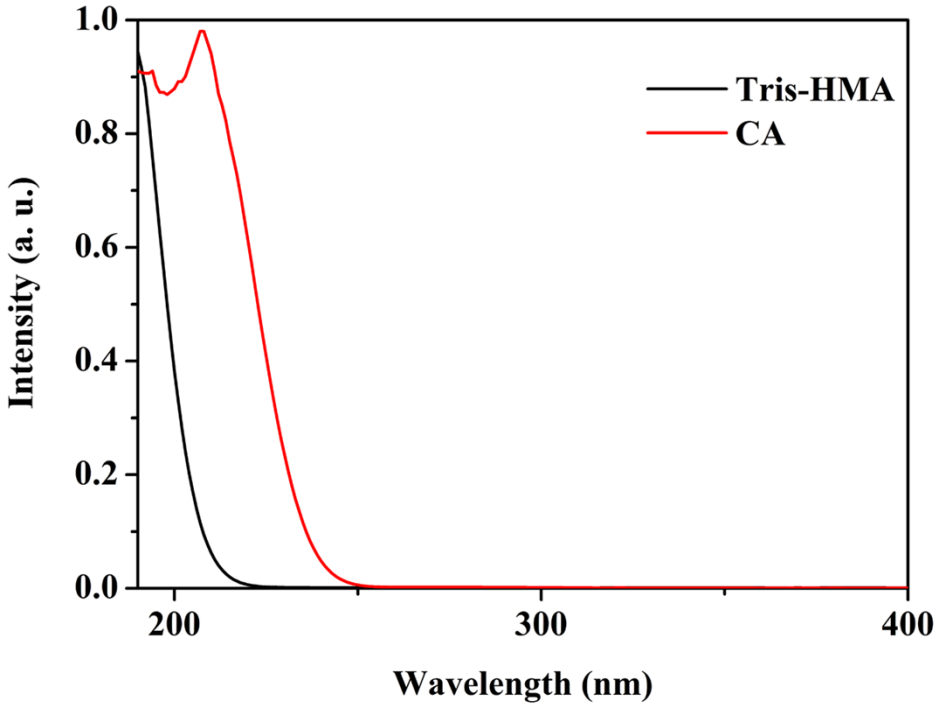

Fig. S1 UV–Vis absorption spectra of CA and Tris-HMA.

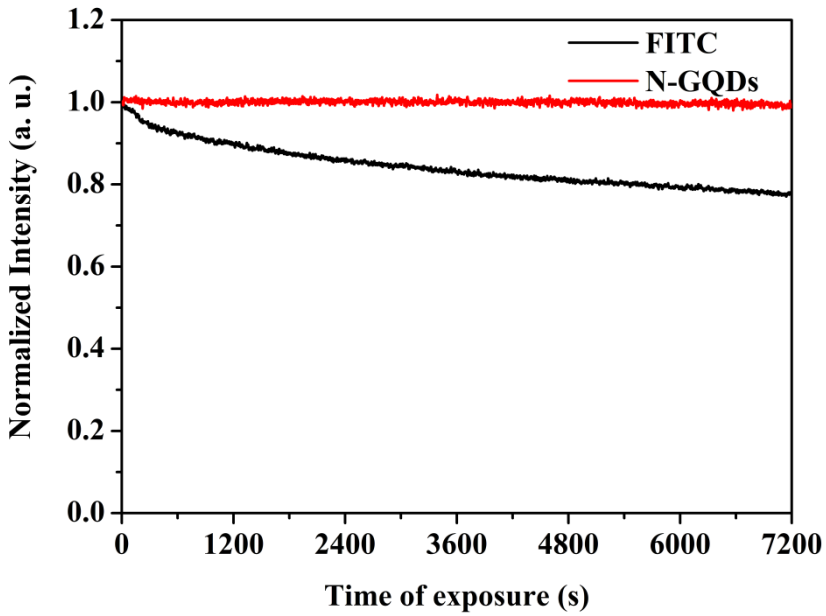

Fig. S2 Photostability of the N-GQDs and FITC under continuous irradiation for 2 h.

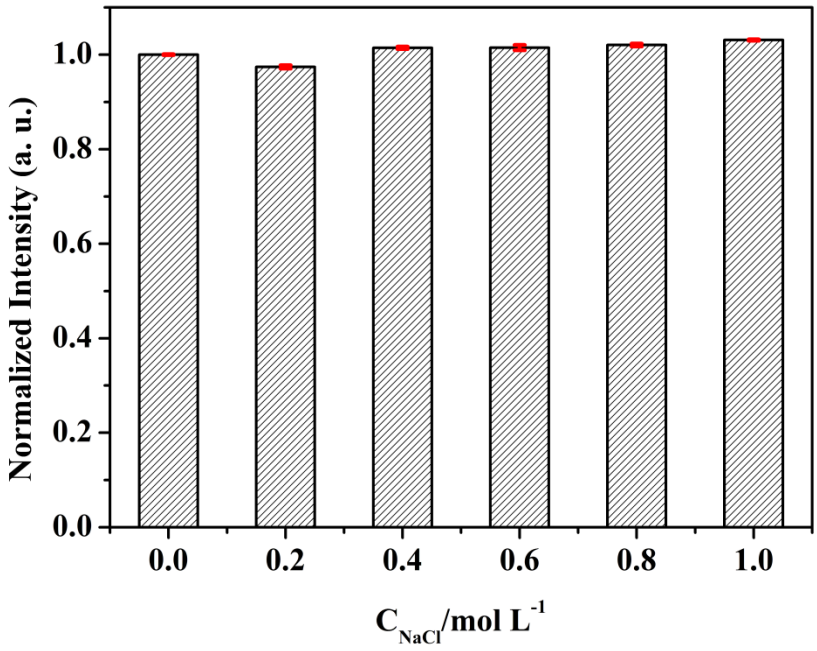

Fig. S3 The effect of NaCl concentration on N-GQDs fluorescence intensity.

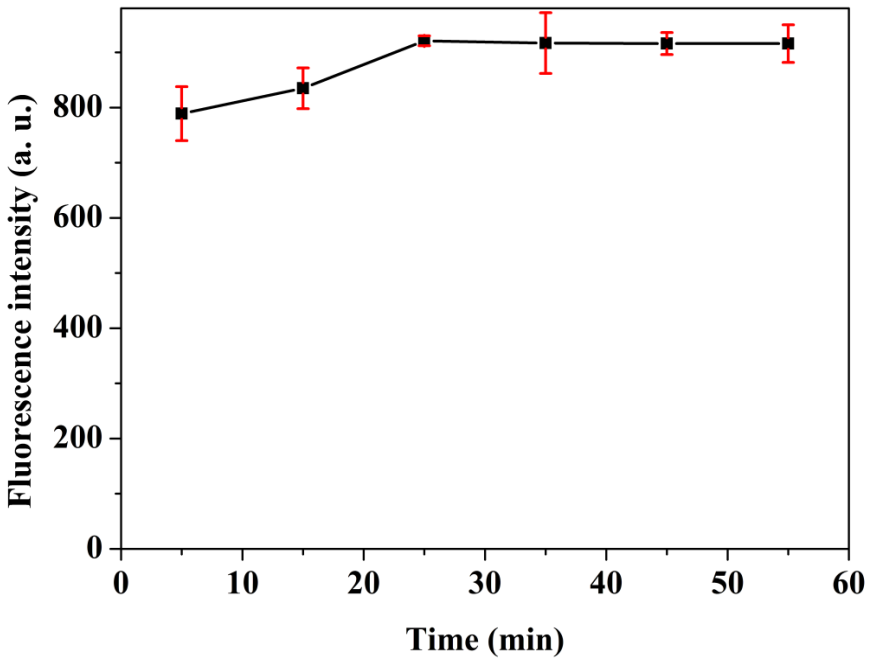

Fig. S4 Effect of incubation time on the fluorescence quenching of the N-GQDs based fluorescence sensor toward TNP analysis. Conditions: 10 μL N-GQDs + 200 μL HAc-NaAc (pH 8.0, 0.2 mM) + 10 μM TNP.

Table S1 Fluorescence quenching constant ($K_{S\text{-}V}$) and correlation values of different analytes

Analytes	$K_{S\text{-}V}$	Correlation coefficient
TNP	2.850×10^{4}	0.9944
TNT	2.291×10^{2}	0.9879
2,4-DNP	7.030×10^{2}	0.9826
2,4-DNT	1.688×10^{3}	0.9910
4-NT	4.840×10^{2}	0.9826
NB	1.259×10^{3}	0.9926
Phenol	1.389×10^{3}	0.9872
Methylbenzene	1.476×10^{3}	0.9891

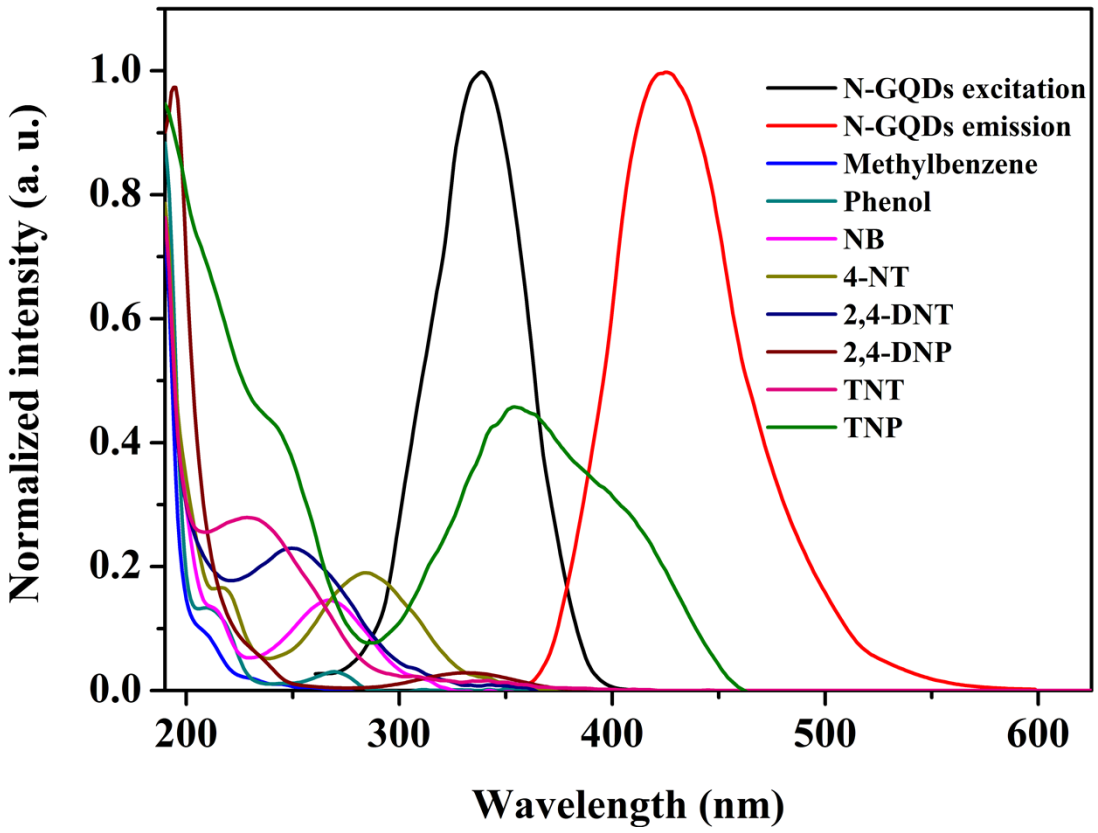

Fig. S5 Excitation and emission spectra of the N-GQDs and the absorption spectra of different compounds.

Table S2 The three decay components and their ratios for the fluorescence lifetime of the N-GQDs in different concentrations of TNP analysis

Sample	τ_1 (ns)	%	τ_2 (ns)	%	τ_3 (ns)	%	Lifetime (ns)
N-GQDs	5.29	18.97	12.26	78.58	0.32	2.45	10.64
N-GQDs + 40 μM TNP	4.72	15.62	11.89	81.98	0.34	2.4	10.50
N-GQDs + 100 μM TNP	4.73	23.55	10.84	74.3	0.39	2.15	9.18

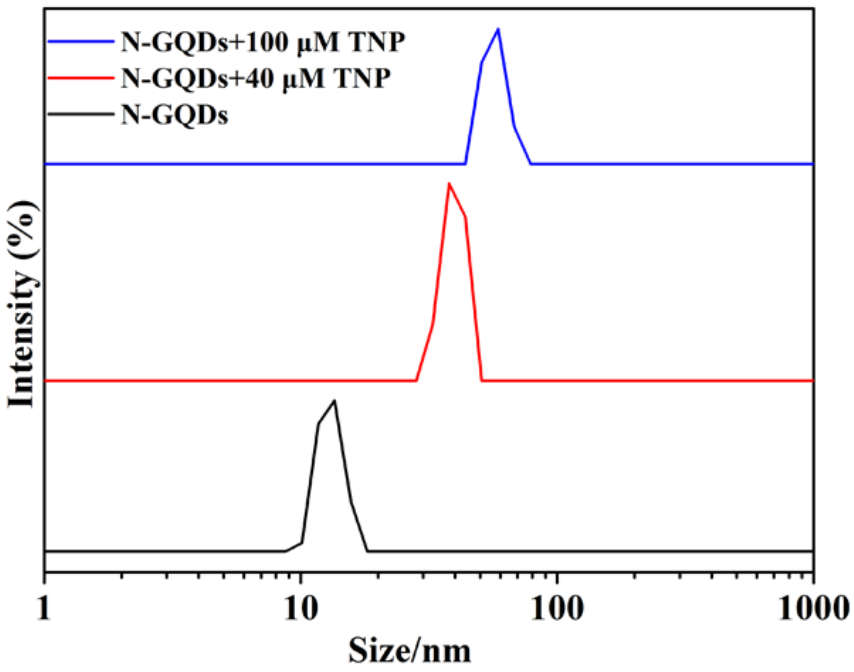

Fig. S6 Hydrodynamic diameter of the N-GQDs (black line) and the N-GQDs in the presence of 40 μM TNP (red line) and 100 μM TNP (blue line) at pH 8.0 measured using the DLS method.

Table S3 Comparison of different methods for the determination of TNP.

Method	Linear range	Detection limit	References
N-GQDs	1-60 μM	0.3 μM	Present method
2,6-diamino pyridine functionalized graphene oxide system	N/A	~125 ppb	1
8-hydroxyquinoline aluminum (Alq3)-based bluish green fluorescent composite nanospheres	0.05−7.0 μg/mL (0.22-30 μM)	32.3 ng/mL (0.14 μM)	2
Photoluminescent MoS_2 quantum dots	0.099-36.5 μM	95 nM	3
Upconversion luminescence $NaYF_4$@PSI−NH nanosensor	0.01−4.5 μg/mL (0.04-19.6 μM)	9.6 ng/mL (0.04 μM)	4
Amine-capped carbon dots	N/A	1 μM	5

References

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