Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supporting Information

Green synthesis of fluorescent hydrophobic carbon quantum dots and their use for 2,4,6-trinitrophenol detection

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Experiment

Titration method: For example, detection of TNP at the existence of TNT. The initial fluorescence spectrum of HCDs dispersed in THF was recorded, to this was firstly added the TNT, but a very weak intensity change was observed upon TNT addition. Then, TNP solution (equal concentration and volume to TNT) was added to the TNT-containing solution, this resulted in significant fluorescence quenching. The trend was also repeated in the subsequent addition cycles and the quenching efficiency of TNP remained unaffected (Figure S2). Similar experiments for other nitro compounds were also performed.

Particle size decided from the XRD data (Fig. S1): The single broad peak at 2θ = 21.48° in XRD pattern was fitted to get a value of FWHM was 0.077 rad. By using Scherrer equation ($D = (K\times\gamma) / (B\times\cos\theta)$), K was 0.89, γ was 0.154 nm, the particle size was calculated to be 1.8 nm.

Supplementary figures and tables

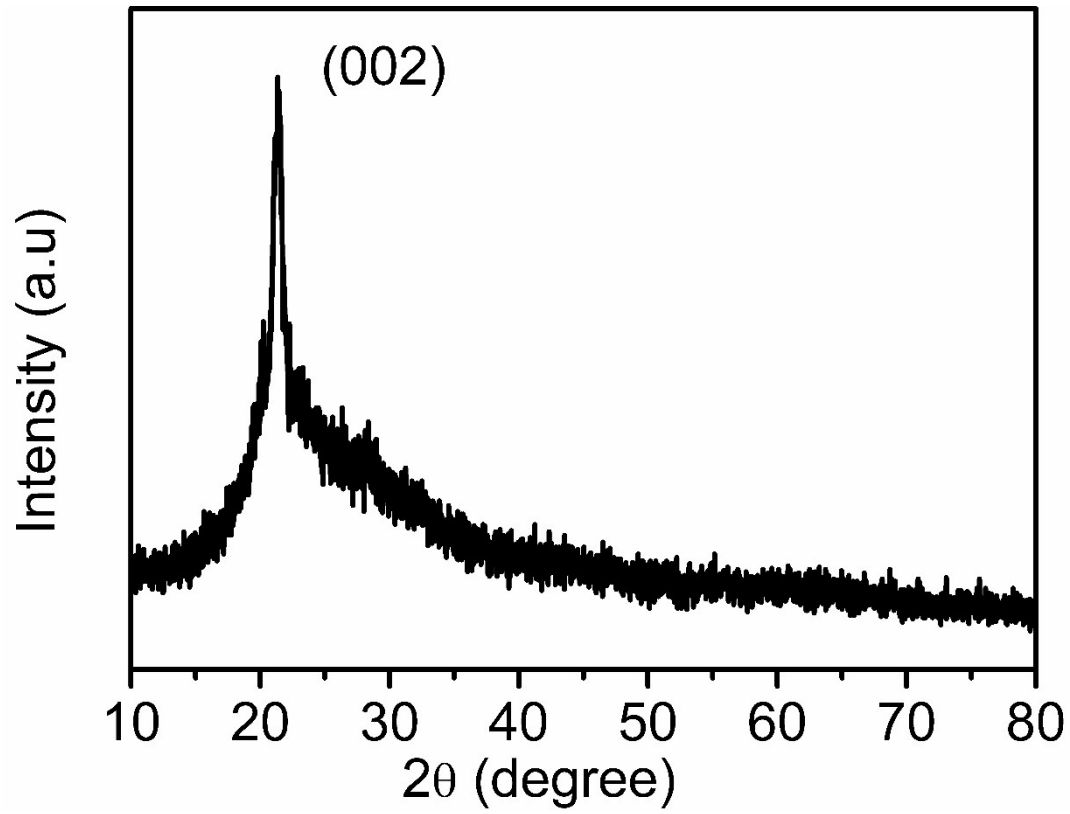

Fig. S1 XRD pattern of HCDs.

Table S1 Comparison of different methods for the determination of TNP.

Method	Media	Linear range	Detection limit	Reference
N-GQDs	H_2O	1-60 μM	0.30 μM	1
Graphitic carbon nitride	H_2O	0-10 μM	8.2 nM	2
Alq3-based nanosphere	H_2O	0.22-30 μM	0.14 μM	3
MoS_2 quantum dots	H_2O	0.099-36.5 μM	95 nM	4
CDs	H_2O	0-100 μM	22 nM	5
Fluoranthene derivative	Ethanol	Over 0-10 μM	0.09 μM	6
Graphene derivative	H_2O/THF(v/v=9:1)	Bend up in 0-7μM	1.31 μM	7
Organic cage	DCM	Bend up in 0-24 μM	0.03 μM	8
HCDs	THF	1-110 μM	1.8 μM	This work

Table S2 Fluorescence quenching constant (K_{sv}) and correlation values of different analytes.

Nitro aromatics	K_{sv}	Correlation coefficient
TNP	2.6×10^4	0.995
TNT	1.9×10^3	0.996
DNT	1.0×10^3	0.975
NT	7.9×10^2	0.970
NP	7.6×10^2	0.969
NB	5.6×10^2	0.978

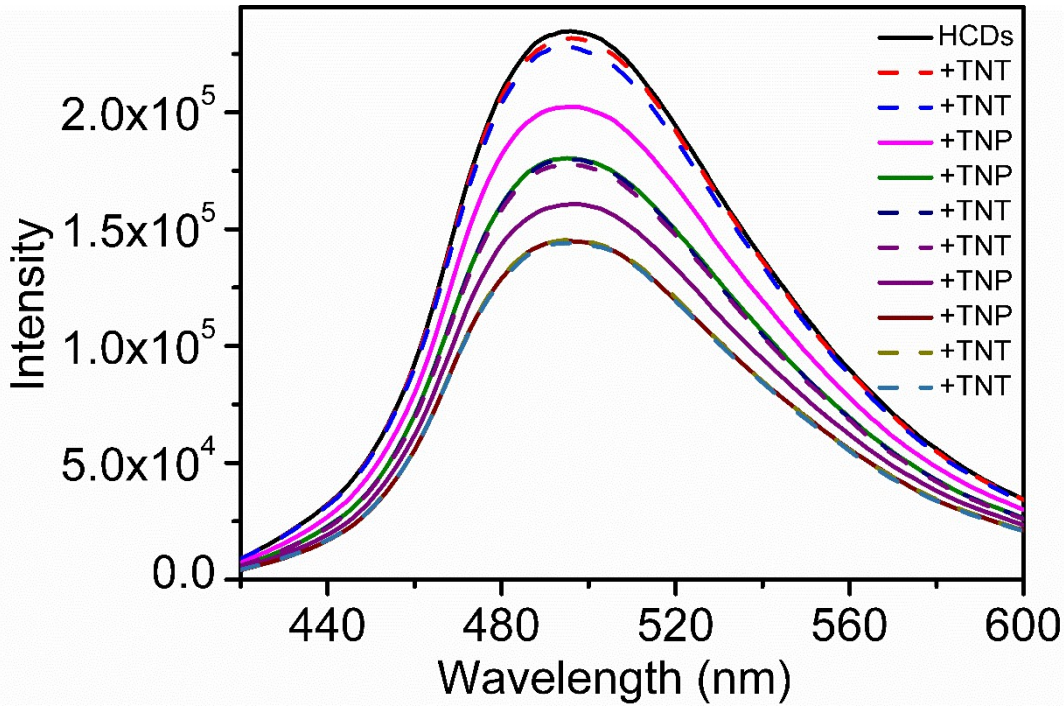

Fig. S2 Emission spectrum of HCDs upon addition of the THF solution of TNT followed by TNP (dashed line for TNT added and solid line for TNP added).

Table S3 The fluorescence lifetime decay fitting of the HCDs in different concentrations of TNP analysis.

Sample	τ_1 (ns)	%	τ_2 (ns)	%	χ^2	Lifetime (ns)
HCDs	3.34	18.24	9.91	81.76	1.027	9.45
HCDs + 24 μM TNP	3.36	18.41	9.96	81.59	1.042	9.49
HCDs + 48 μM TNP	3.15	16.66	9.85	83.34	1.077	9.45
HCDs + 96 μM TNP	3.37	18.34	9.97	81.66	1.000	9.50

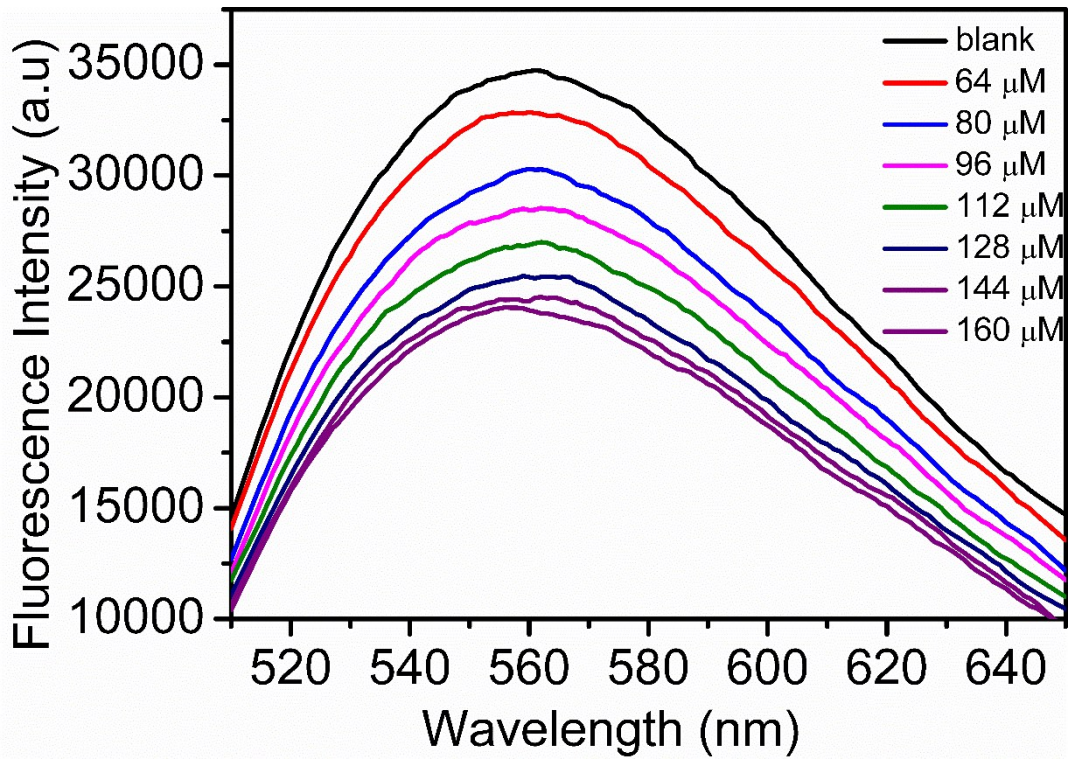

Fig. S3 Emission spectra of the HCDs excited at 500 nm in the presence of various concentrations of TNP.

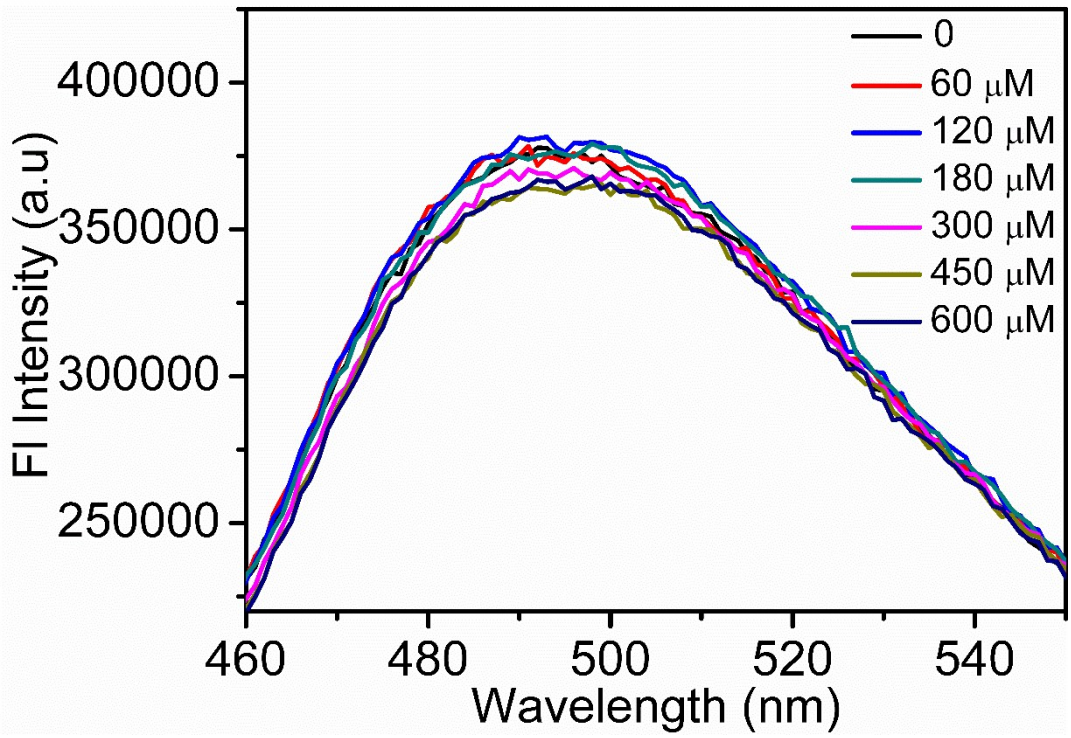

Fig. S4 Emission spectra of HCDs in the presence of various concentrations of trifluoroacetic acid.

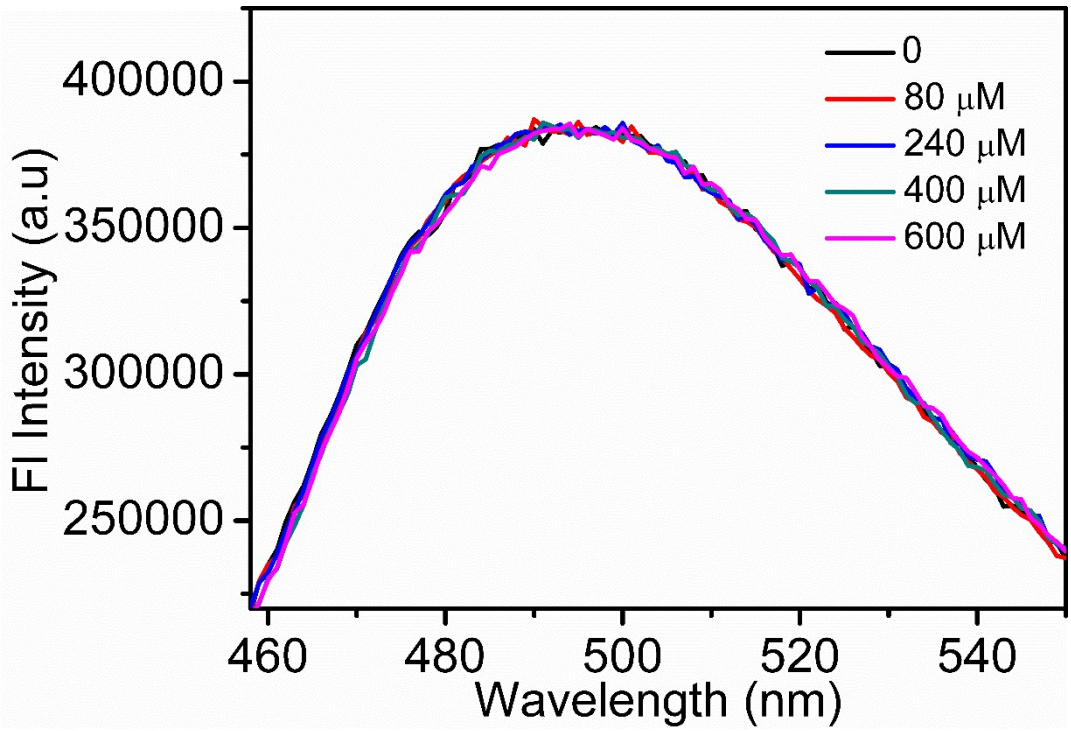

Fig. S5 Emission spectra of HCDs in the presence of various concentrations of p-Toluenesulfonic acid.

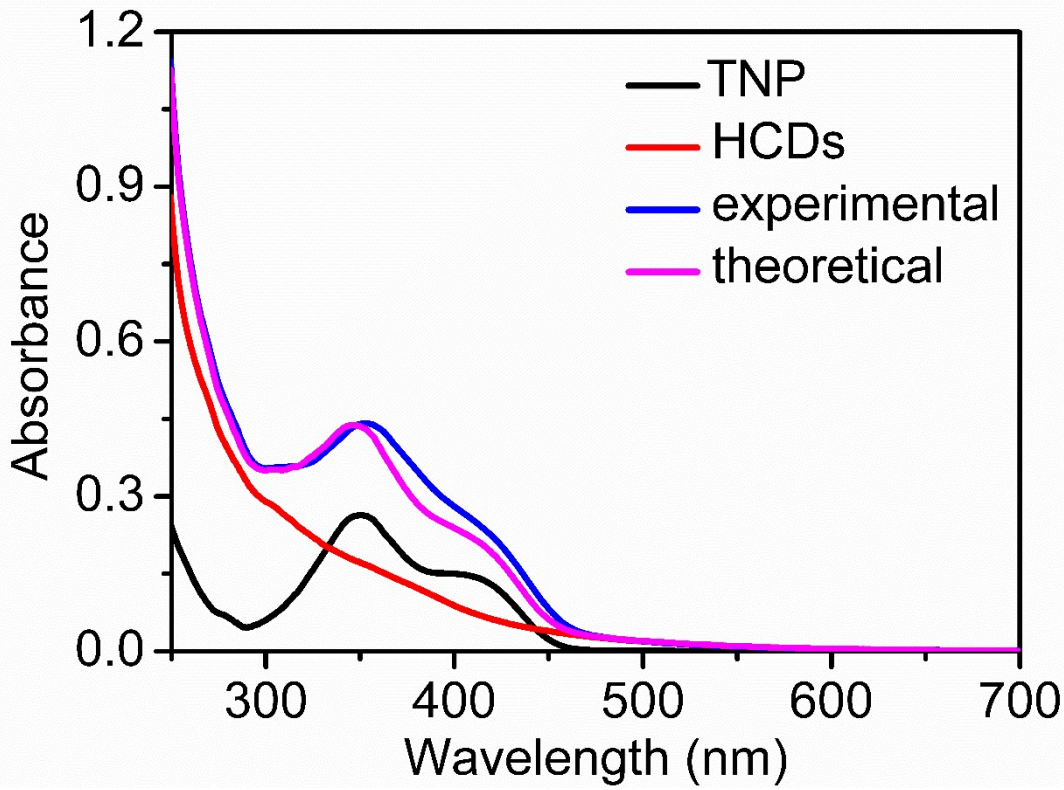

Fig. S6 UV/Vis absorption spectra of the HCDs and TNP in THF, and the theoretical and experimental spectra of the sum of the HCDs and TNP.

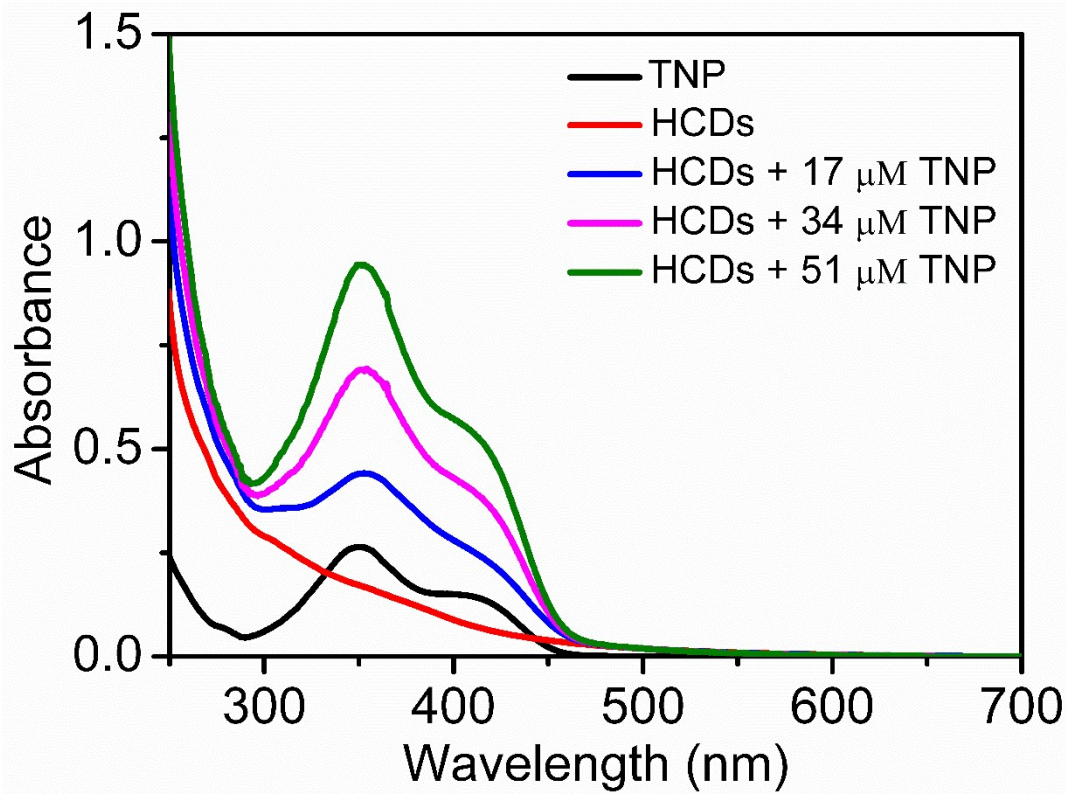

Fig. S7 UV/Vis absorption spectra of the HCDs, TNP and the mixture with different concentrations of TNP.

References

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