

Supporting information

Full-color Tunable Photoluminescent Carbon Dots Based on Oil/Water Interfacial Synthesis and Their Applications

Hongchong Guo, Bo You*, Shuyan Zhao, Yihao Wang, Gang Sun, Yujie Bai, Lei Shi

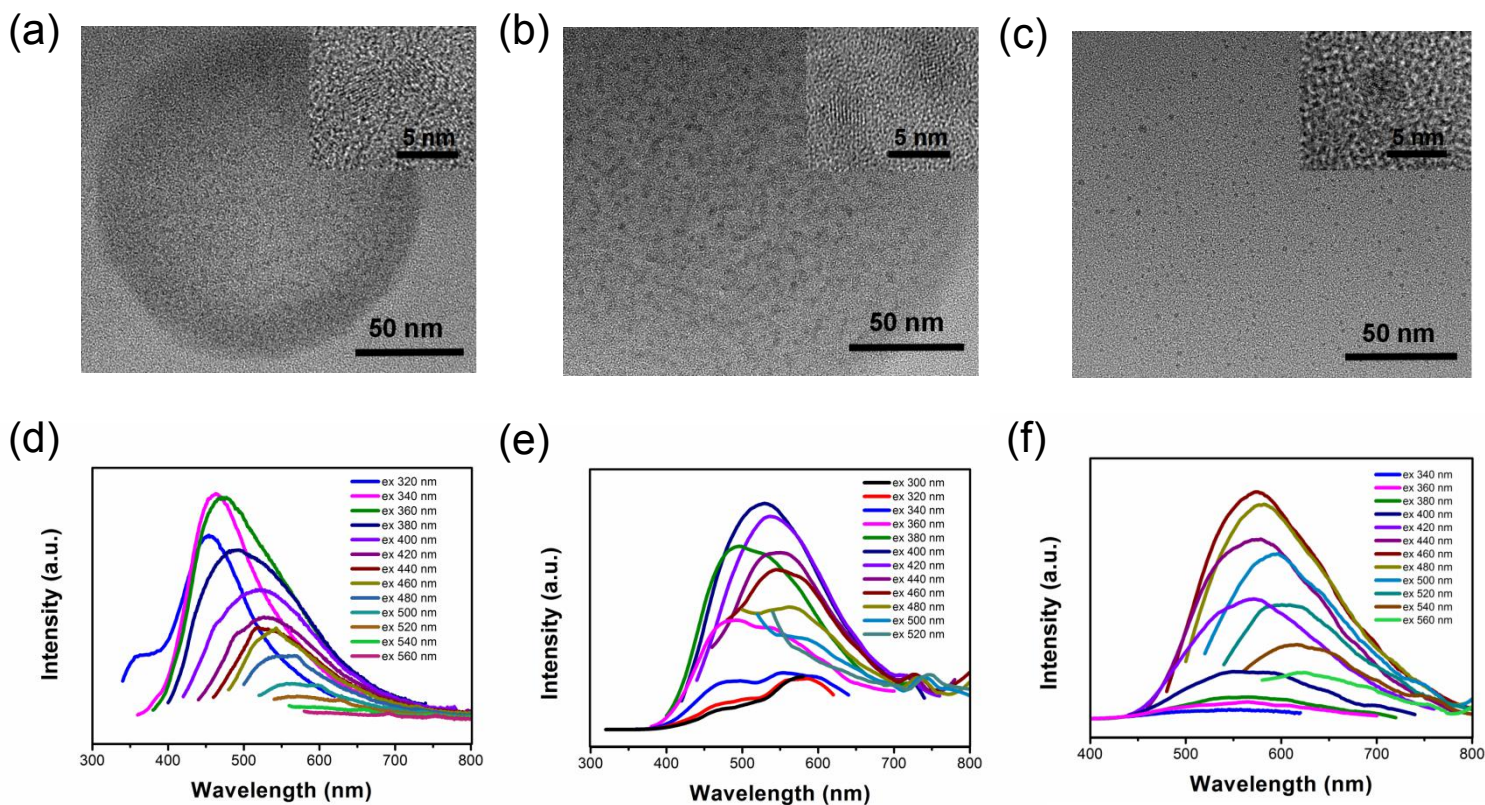
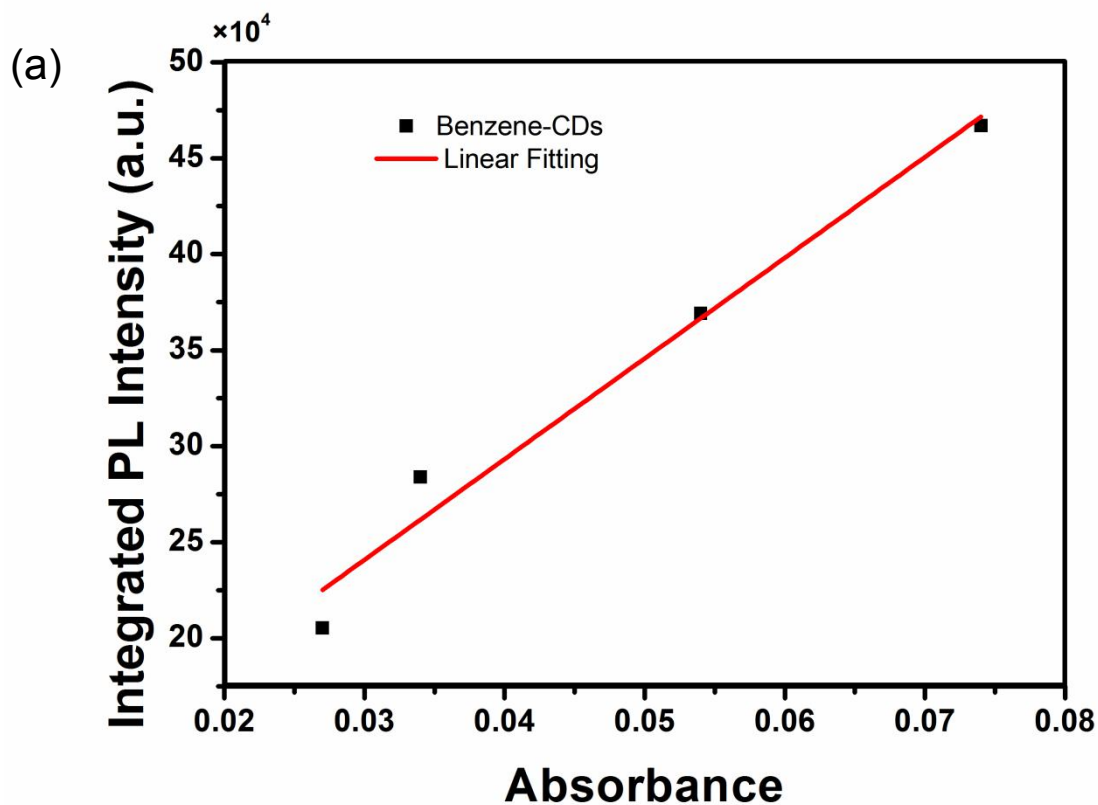
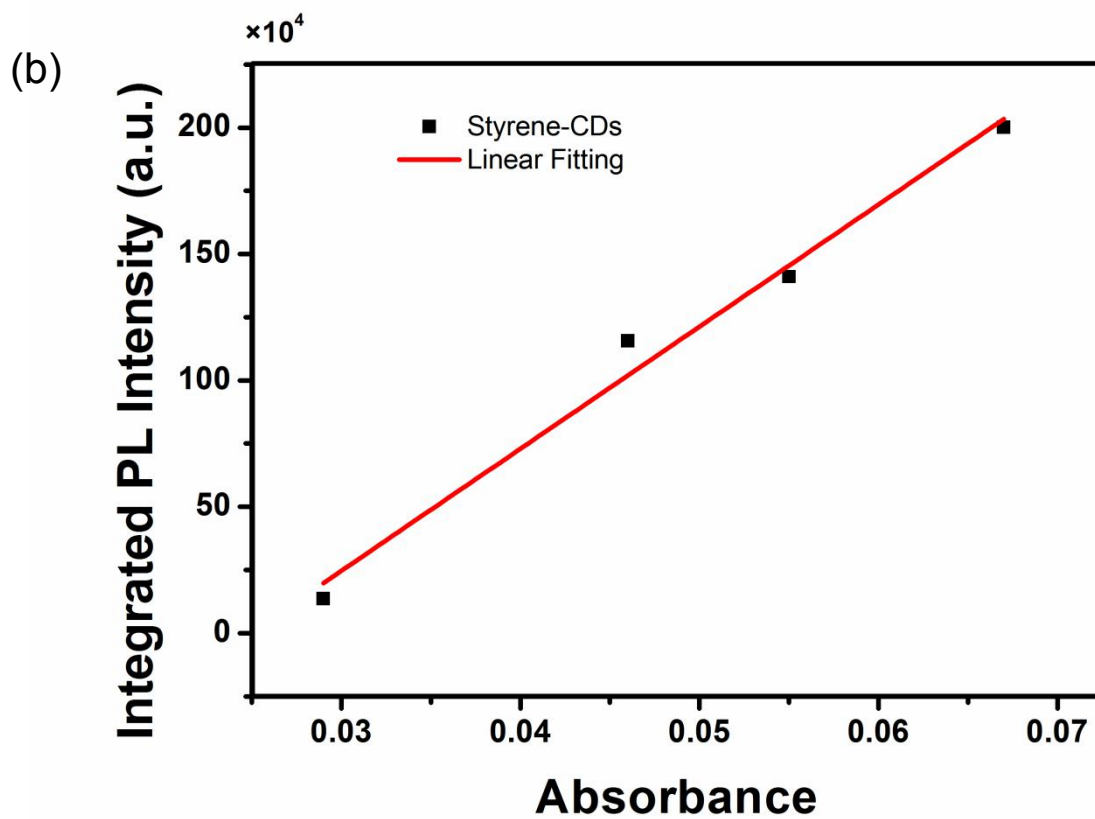


Figure S1 HRTEM of CDs and FL spectra by other benzene series in catalytic-oxidation system: (a) and (d) benzene-CDs; (b) and (e) benzyl alcohol-CDs; (c) and (f) xylene-CDs.



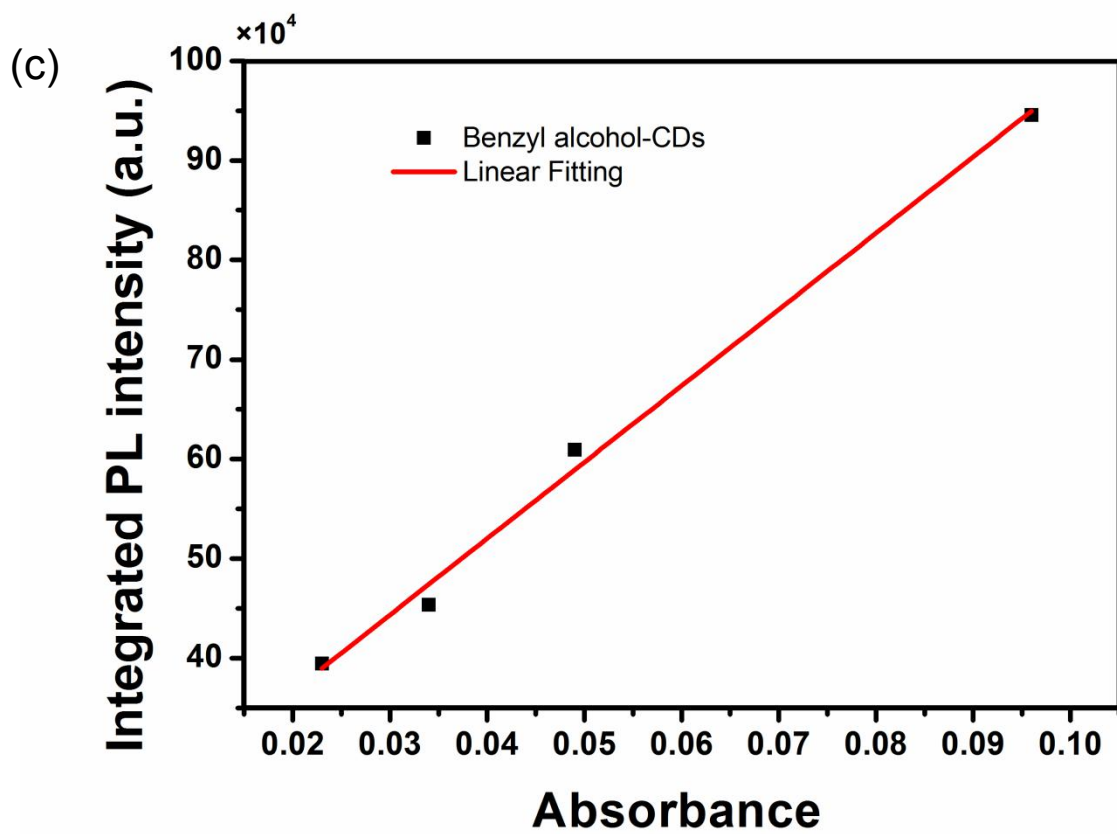
Benzene-CDs

Abs	0.074	0.054	0.06	0.034	0.027
Integrated PL	466904	369052	349934	283904	205433
Slope	5.24×10^6				
QY	0.26 %				

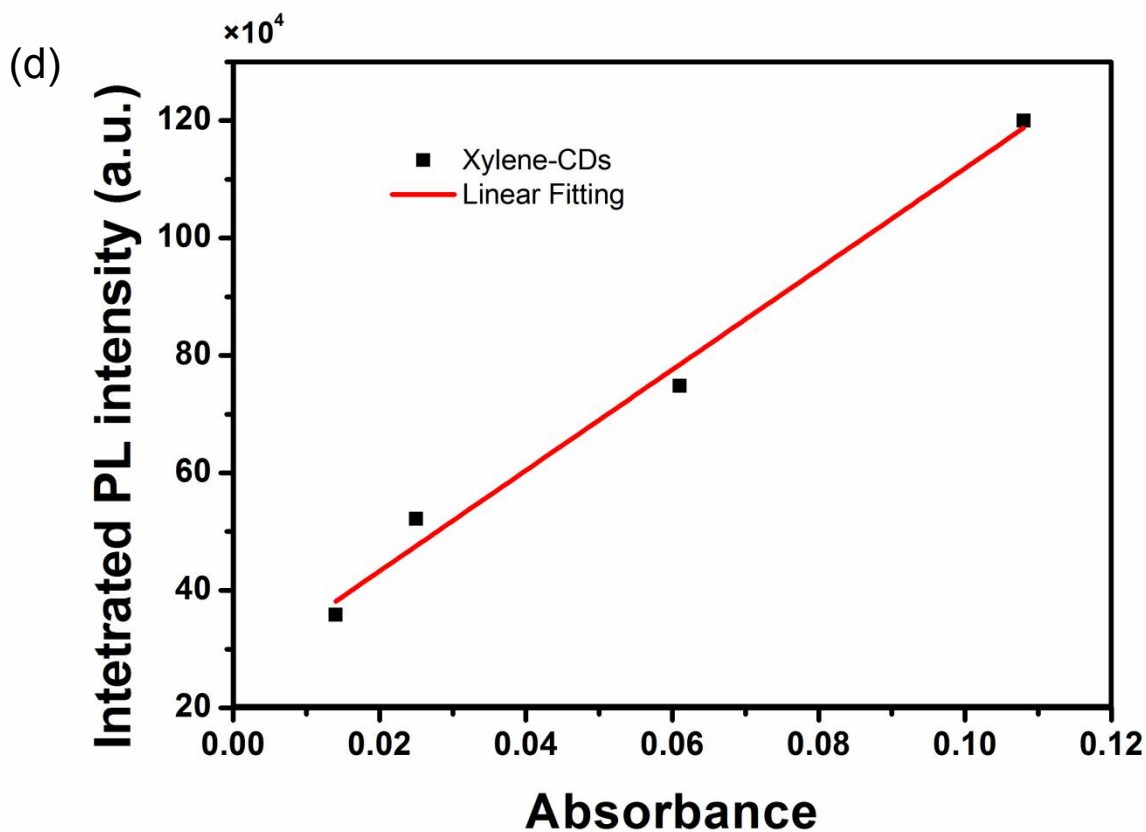


Styrene-CDs

Abs	0.067	0.059	0.055	0.029	0.046
Integrated PL	2002334	2044069	1410596	136974	1156289
Slope	4.83×10^7				
QY	2.44 %				

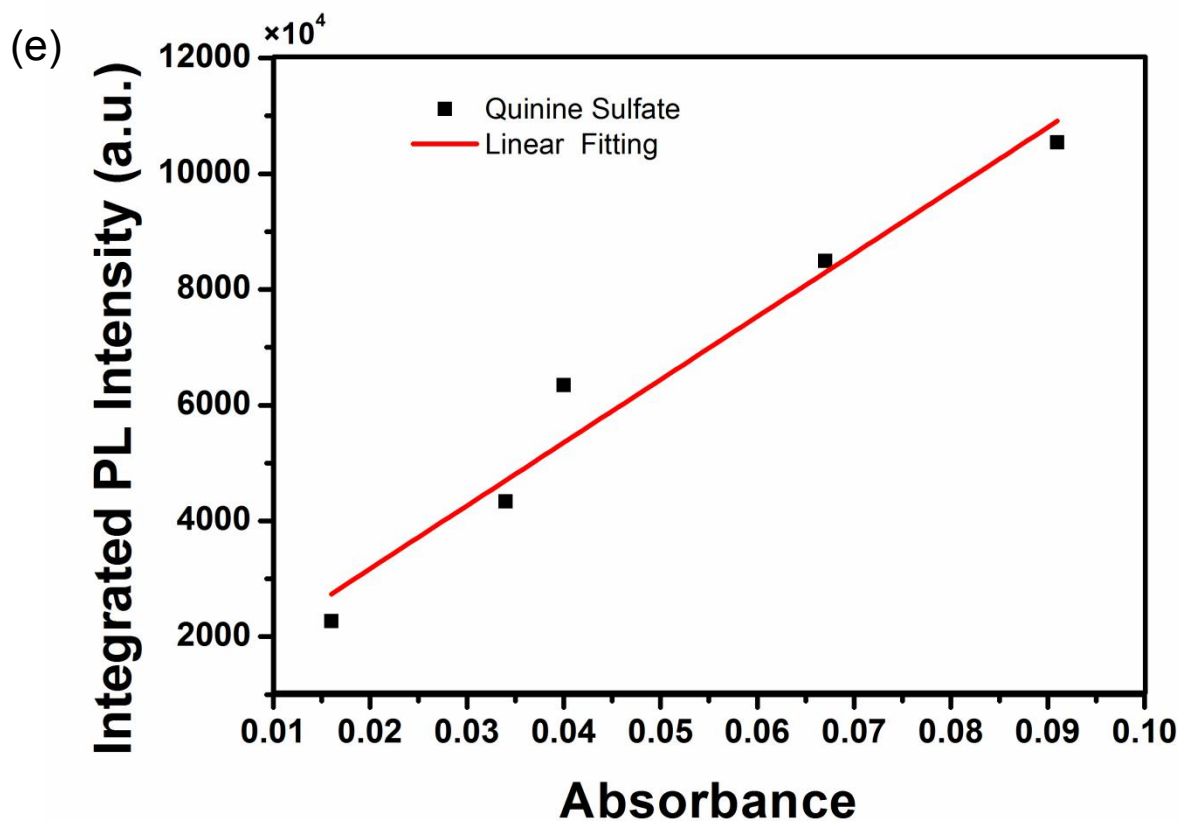


Benzyl alcohol-CDs					
Abs	0.096	0.049	0.04	0.034	0.023
Integrated PL	945562	609428	481736	453626	394438
Slope	7.67×10^6				
QY	0.39 %				



Xylene-CDs

Abs	0.108	0.061	0.054	0.025	0.014
Integrated PL	1200206	747965	595171	522112	358388
Slope	8.54×10^6				
QY	0.43 %				



Quinine Sulfate					
Abs	0.016	0.034	0.04	0.067	0.091
Integrated PL	22687777	43412639	63508730	84919367	105400219
Slope			1.09×10^9		
QY			55 %		

Figure S2 Plots of integrated PL intensity of Benzene-CDs(a), Styrene-CDs(b), Benzyl alcohol-CDs(c), Xylene-CDs(d) and quinine sulfate(e) (referenced dye) as a function of optical absorbance at 365 nm and relevant data.

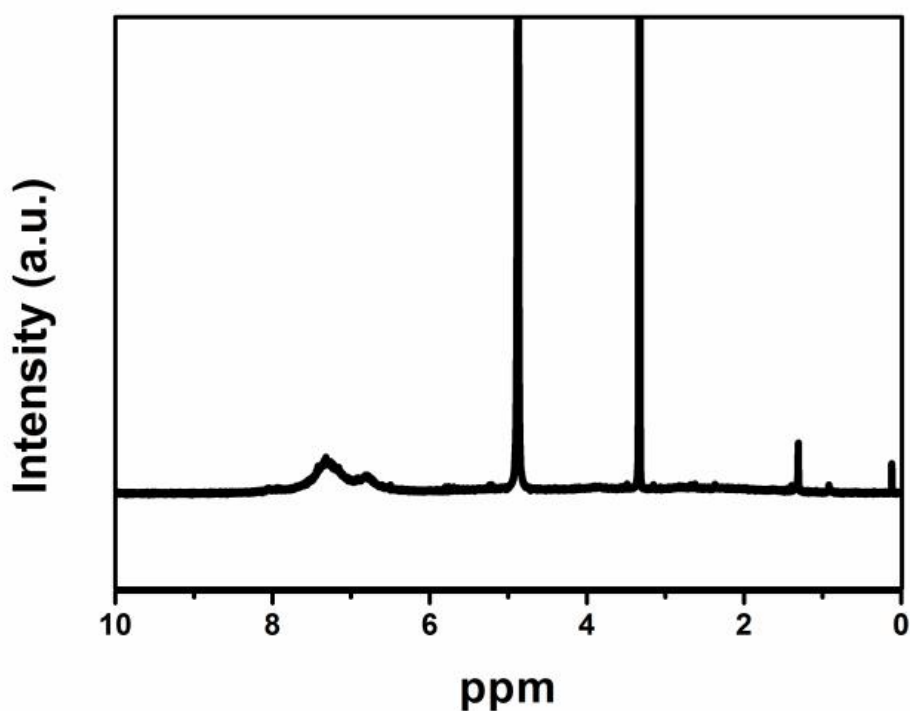


Figure S3 ¹H NMR spectrum of CDs in methanol-d₄. The intense peak at 3.34 and 4.87 ppm corresponds to the methanol-d₄ solvent residue and H₂O. The signal at 0.8-2.0 ppm could be attributed to contaminants. The sample is prepared by styrene at concentration of 400 mM H₂O₂ and 20 mM CuSO₄.

Table S1 Photoluminescent life time τ of CDs samples(1,2,4,6,8) prepared by various oxidants concentration (100 mM, 200 mM, 400 mM, 600 mM, 800 mM H₂O₂, respectively). χ^2 is the reduced Chi-Square value for each τ avg. PL peak excited at 368 nm.

Sample	τ_1 [ns]	B1(%)	τ_2 [ns]	B2(%)	τ_{avg} [ns]	χ^2
1	2.22	100	--	--	2.22	1.08
2	2.25	100	--	--	2.25	1.02
4	2.43	100	--	--	2.43	1.07
6	3.48	27.6	0.769	72.4	2.50	1.00
8	2.86	29.1	0.415	70.9	2.23	1.00

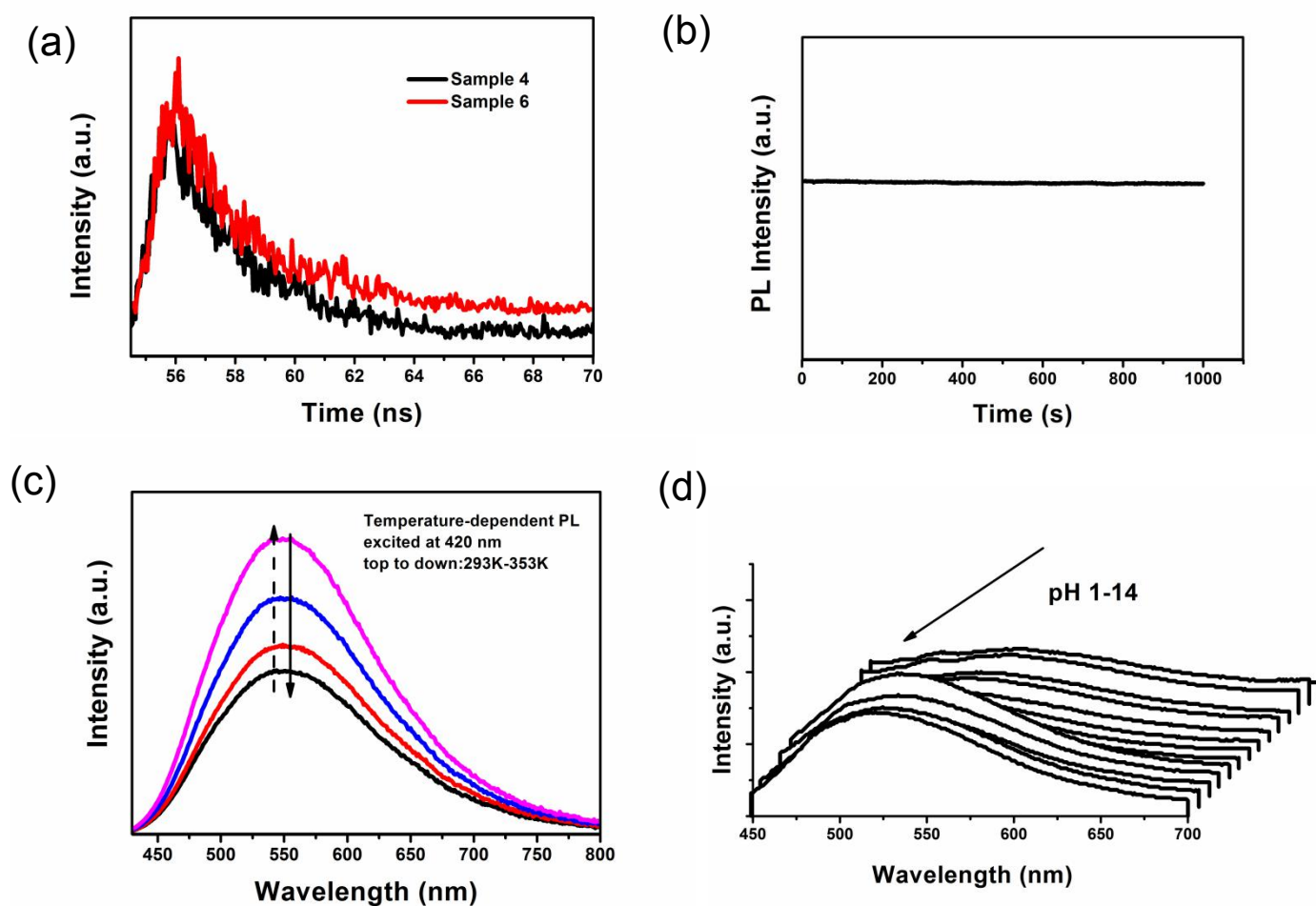


Figure S4 Photoluminescence properties of CDs. a) Life time spectra at 368 nm excitation. b) Time-based PL spectra. c) Temperature-dependent PL spectrum of CDs-4 from 293-353K at 420 nm excitation. d) pH-dependent PL spectra of CDs-4.

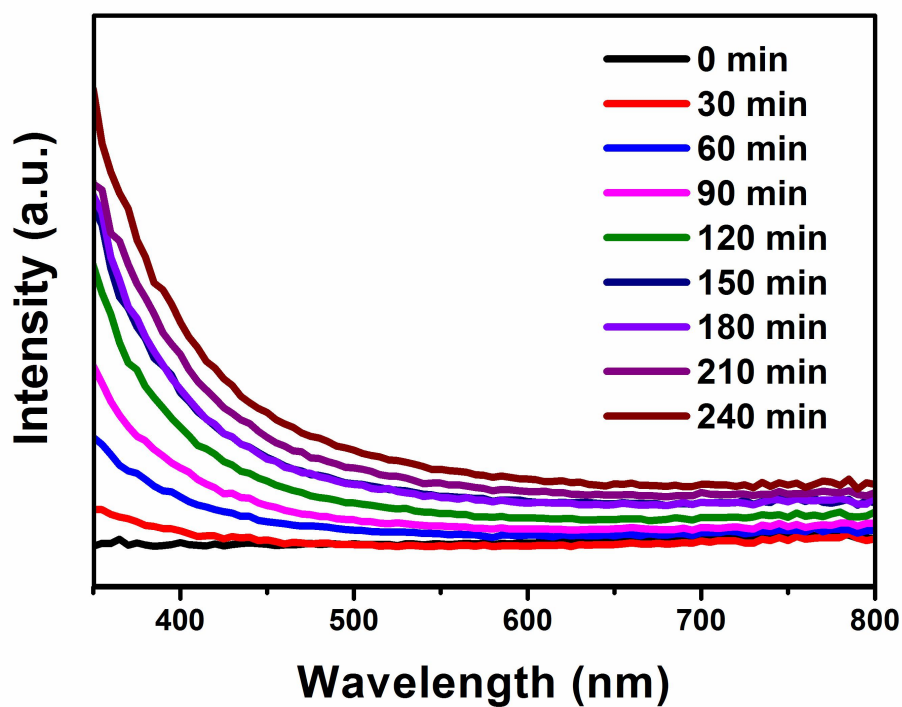


Figure S5 UV/Vis and PL emission spectra of CDs versus various reaction time (a) and (d), concentration of CuSO_4 (b) and (e); concentration of H_2O_2 (c) and (f). Emission wavelength: PL peak excited at 420 nm.

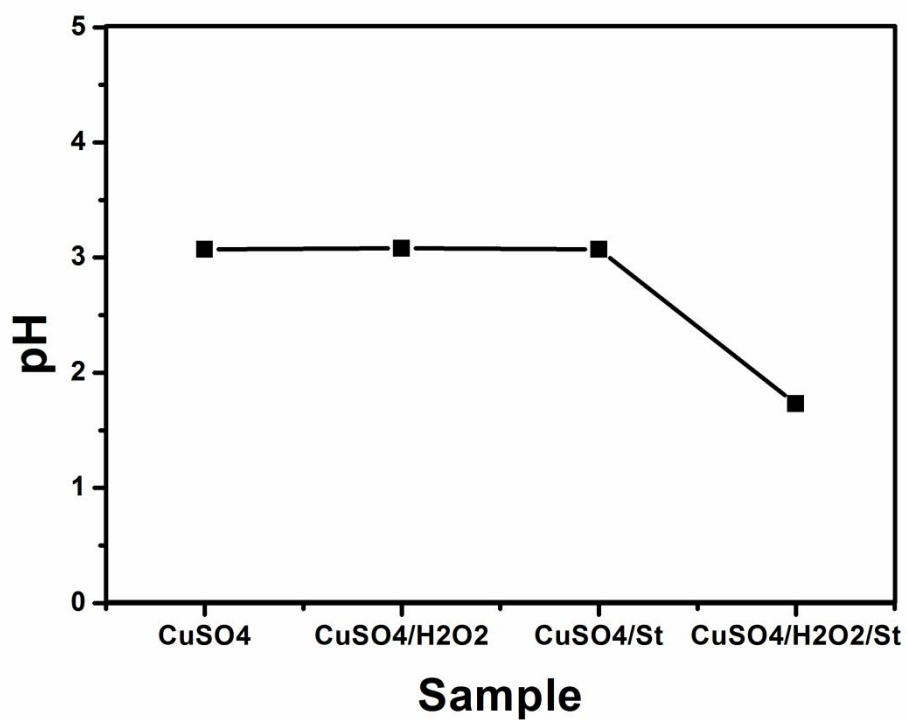


Figure S6 PH variation of different systems.

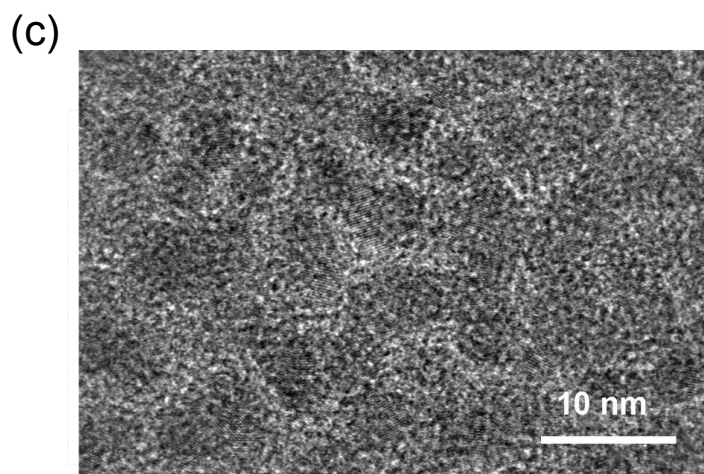
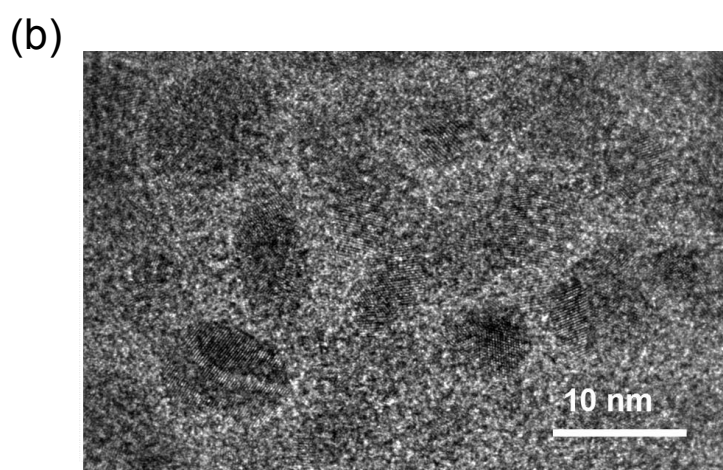
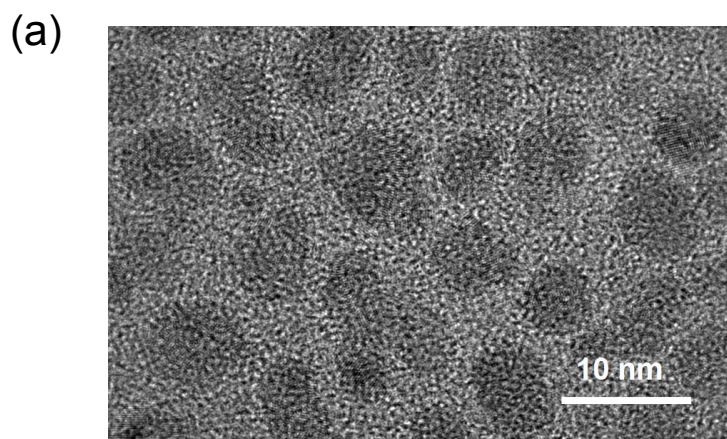


Figure S7 HRTEM of carbon dots by some water soluble molecules in catalytic-oxidation system: (a) citric acid-CDs; (b) ascorbic acid-CDs; (c) ethylene glycol-CDs.

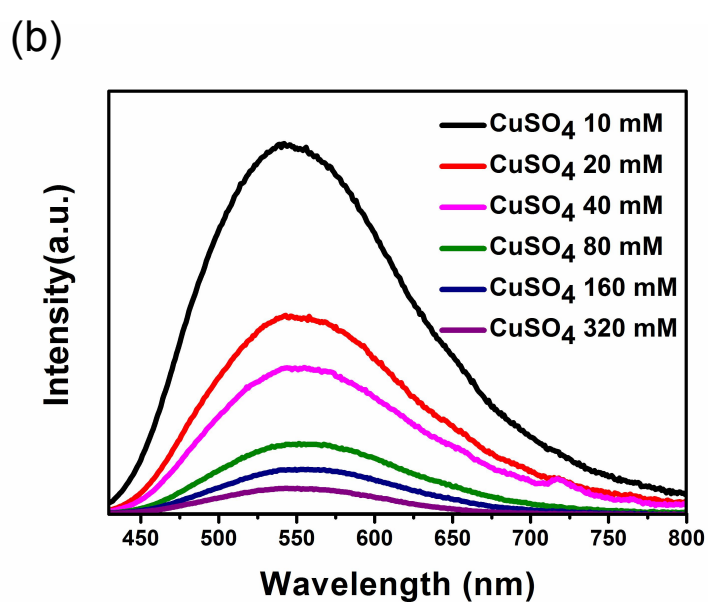
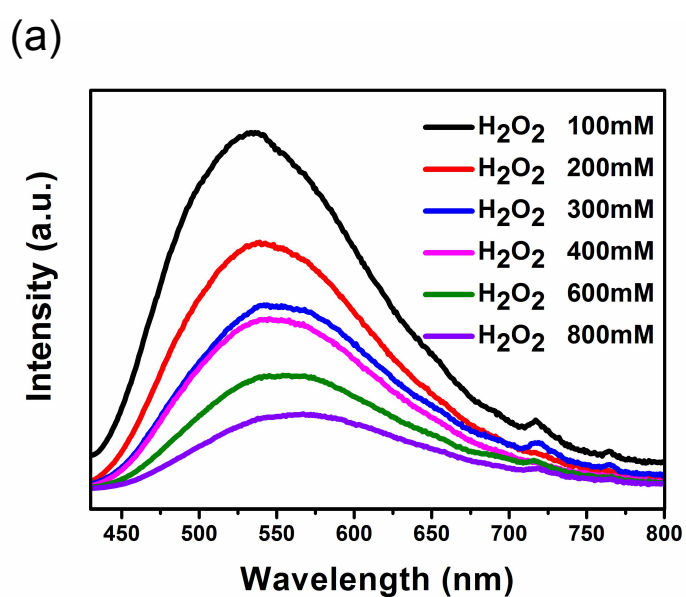


Figure S8 PL emission spectra of CDs versus various concentration of CuSO_4 (a); concentration of H_2O_2 (b). Emission wavelength: PL peak excited at 420 nm.

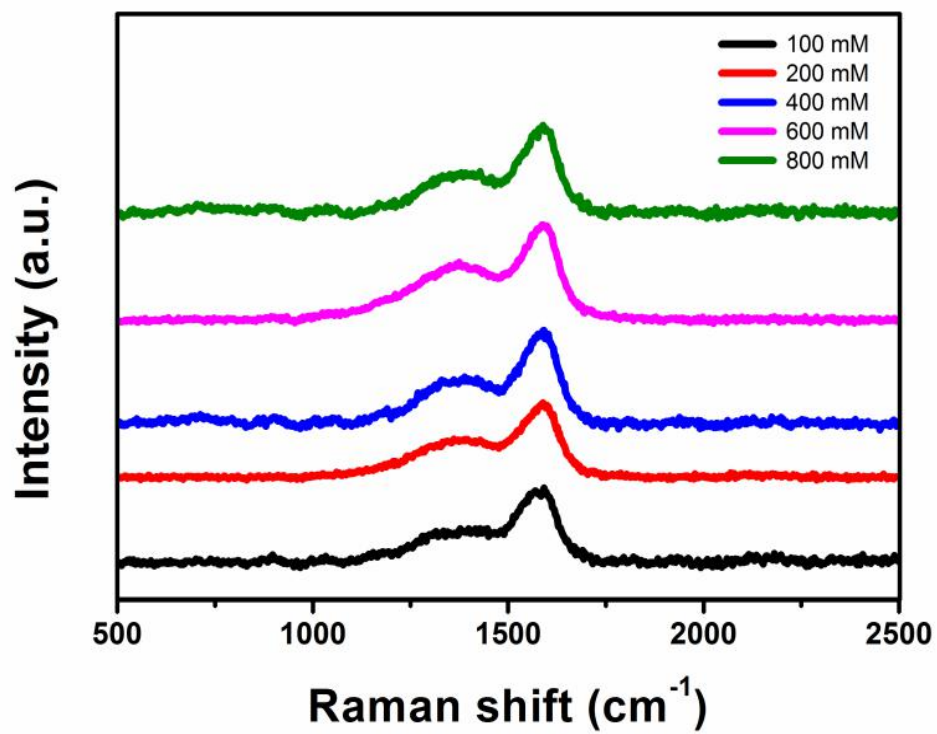


Figure S9 Raman spectra of CDs versus various concentration of H₂O₂.

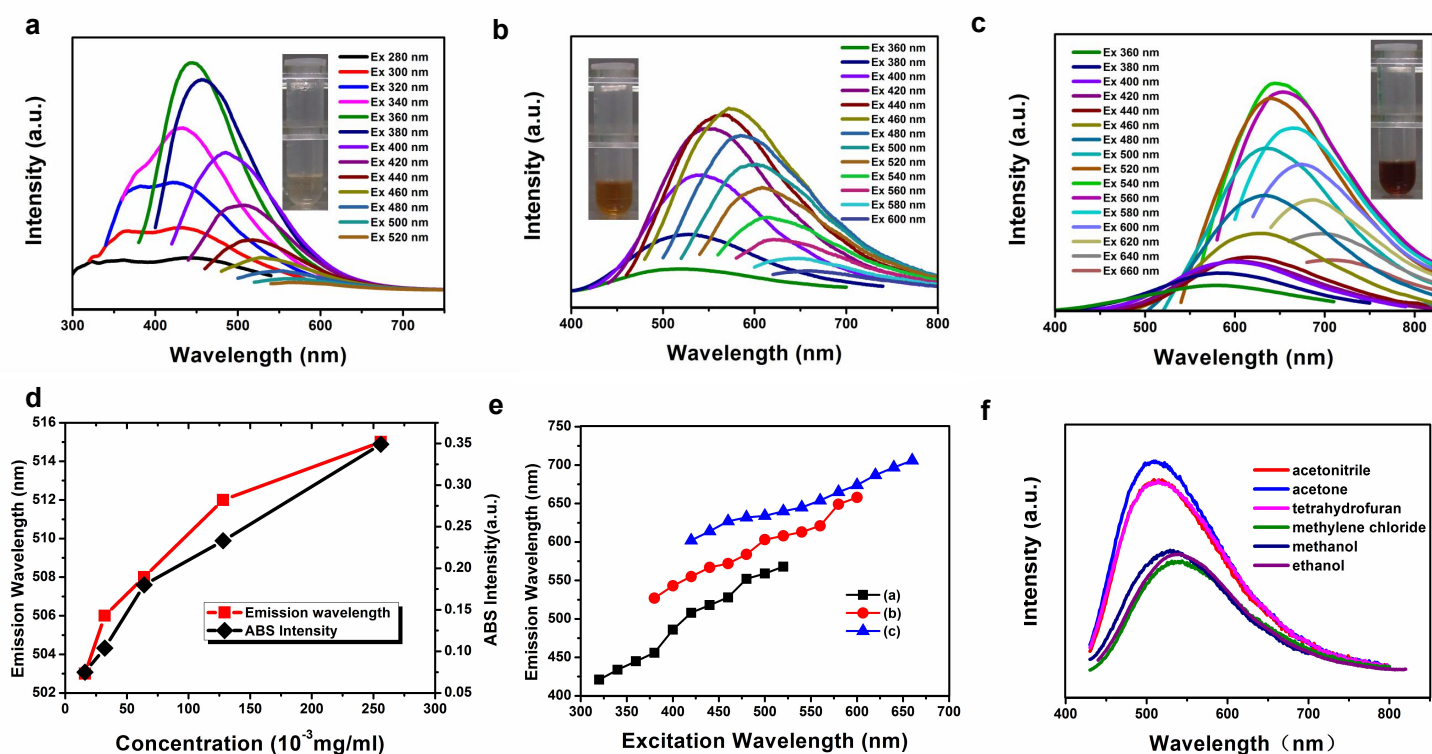
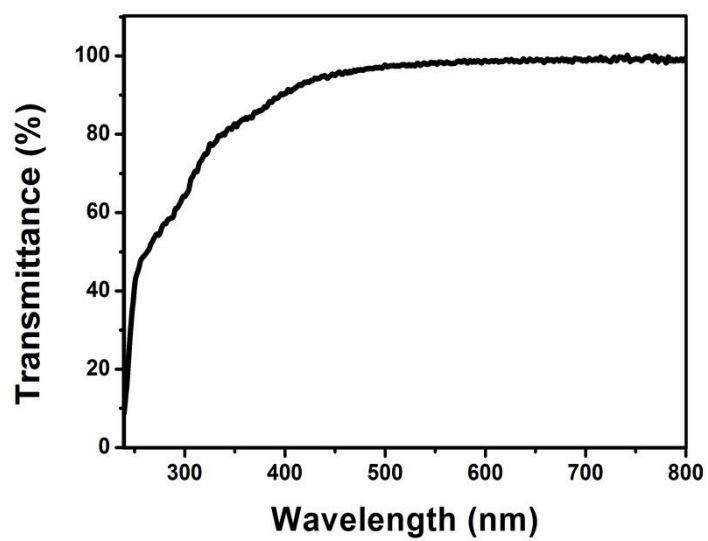


Figure S10 PL emission spectra of CDs versus various concentration in ethanol solution. (a) 0.064 mg/ml, (b) 0.256 mg/ml, (c) 1.024 mg/ml, (d) PL emission wavelength maxima (Ex=420 nm) and absorption intensity versus different concentration of carbon dots in ethanol solution, (e) PL emission wavelength maxima versus excitation wavelength of the samples at concentration(a),(b),(c). (f) PL emission spectra of CDs dispersed in different polar solvents.

(a)



(b)



Figure S11 Large area coatings (1.33% CDs) 30 ml on the 50 * 32 cm PET films under UV light. (a) The transmittance curves of the coating films. (b) The fluorescence microscopy images (green, yellow, red) were obtained through band-pass filters of different wavelengths: 500 nm, 550 nm, and 600 nm.