Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information

Red Fluorescent Carbon Dots Excited by Visible Light: Cell Imaging and the Visual Detection of Ammonia in the PVB Films

Bingyan Han [a,b *], Jingmei Jiang [a,b], Qifang Yan [a,b], Jing Zhao [c], Ze Xin [a,b], Qin Yan [a,b], Gaohong He [a,b]

[a] State Key Laboratory of Fine Chemicals, Dalian University of Technology, Dalian 116023, Liaoning, China.

[b] School of Chemical Engineering, Dalian University of Technology, Panjin 124221, Liaoning, China.

[c] School of Life Science and Medicine, Dalian University of Technology, Panjin 124221, Liaoning, China.

*Corresponding author E-mail: byhan@dlut.edu.cn; Tel: +86427-2631820.

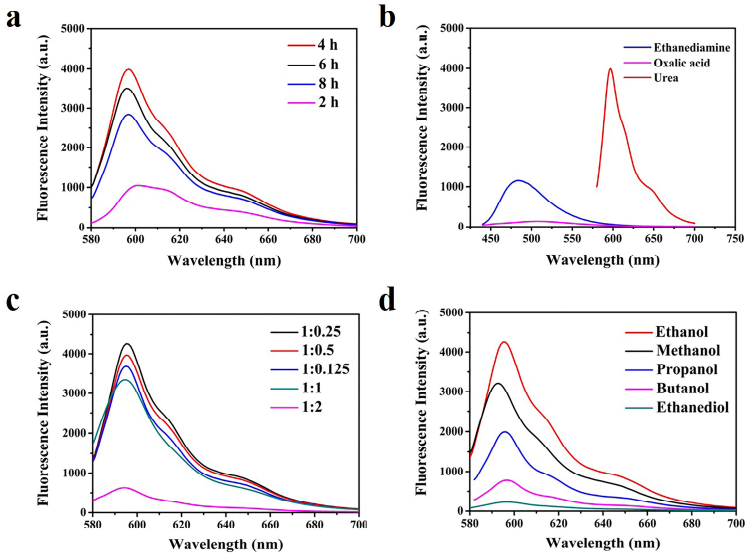

Figure S1. The fluorescence spectra of CDs under different (a) reagent reaction time, (b) the doping reagent, (c) mass ratio (m-dihydroxybenzene: urea) and (d) solvent.

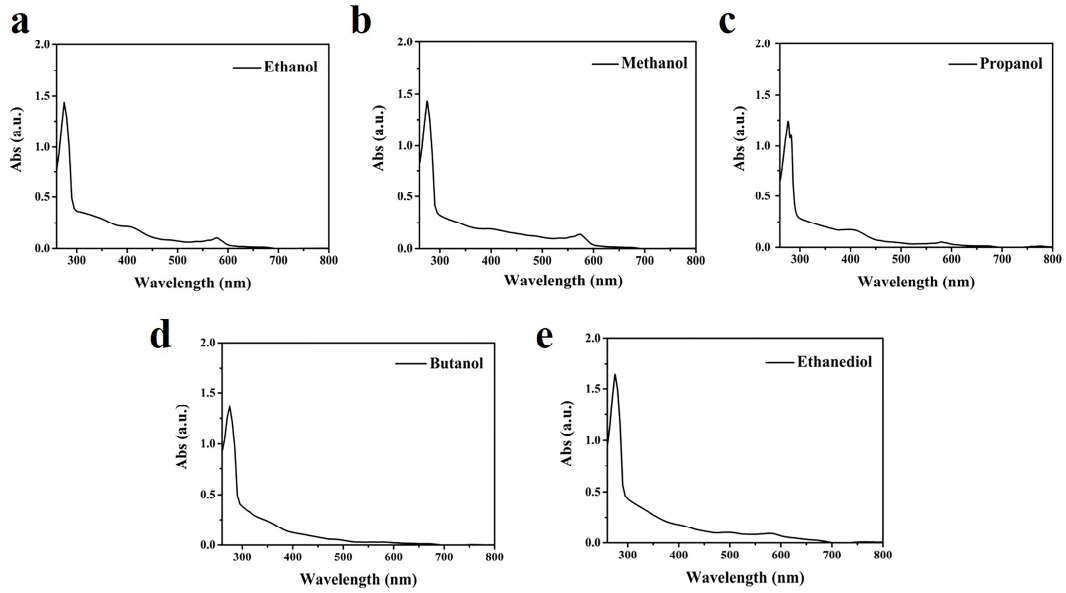

Figure S2. UV-vis spectra of CDs in different solvent (a) ethanol (b) methanol (c) propanol (d) butanol (e) ethanediol.

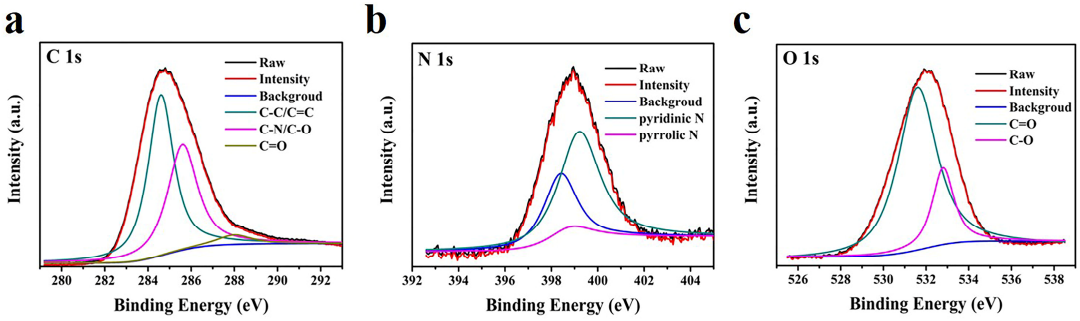

Figure S3. High-resolution XPS spectra of (a) C 1s, (b) N 1s, (c) O 1s of CDs.

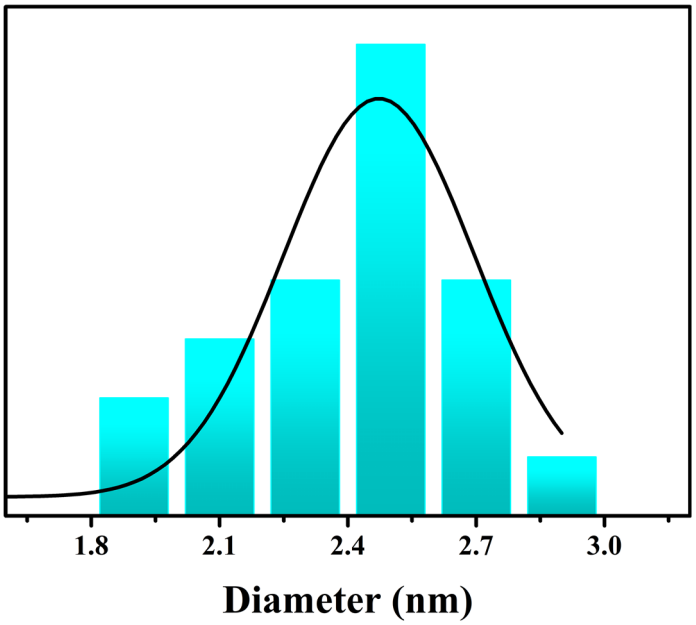

Figure S4. Particle size distribution histogram of CDs.

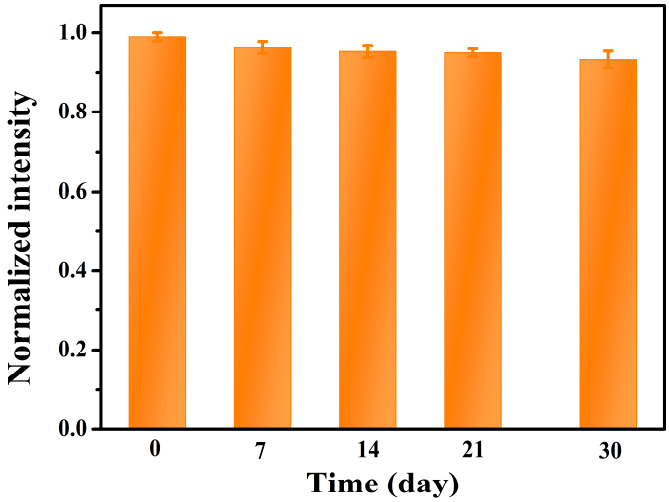

Figure S5. Storage stability of red CDs.

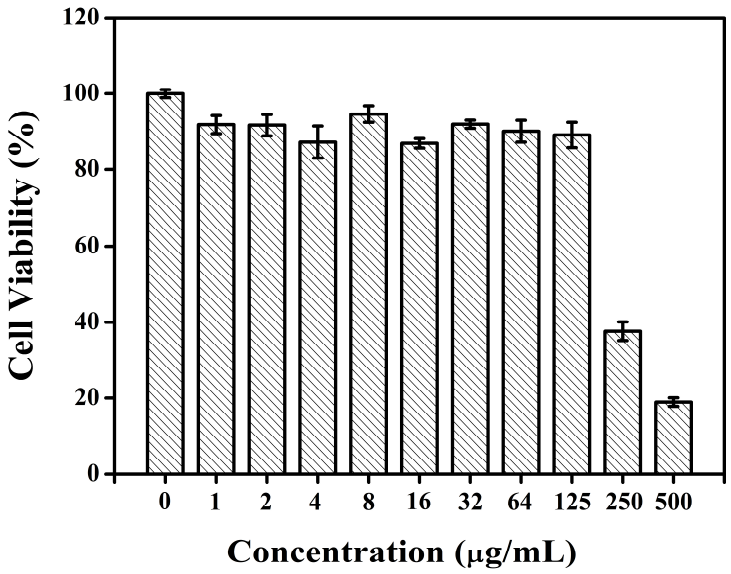

Figure S6. Cell viability of Hela cells treated with various concentrations of CDs (from 0 to 500 mg·mL^{-1})

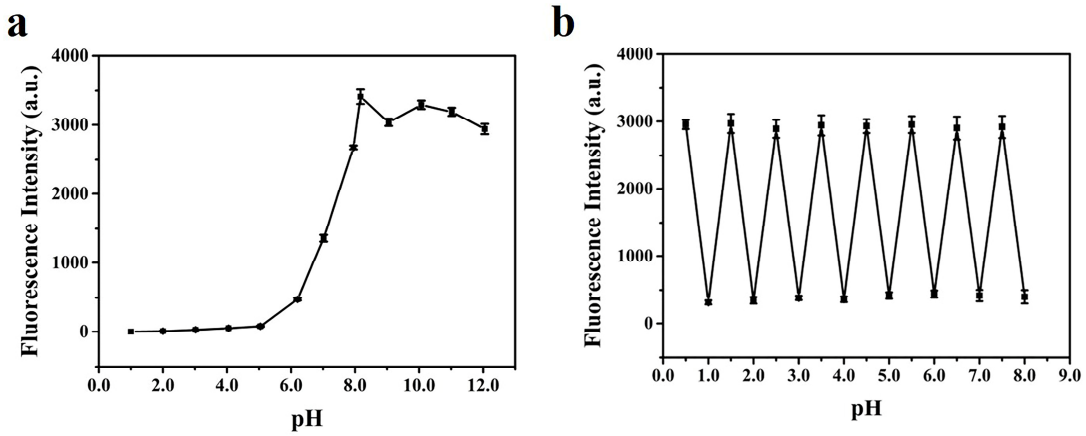

Figure S7. (a) The fluorescence intensity of CDs dispersed at different pH values, (b) Reversible response of fluorescence intensity of carbon dots at pH between 6.0 to 8.0.

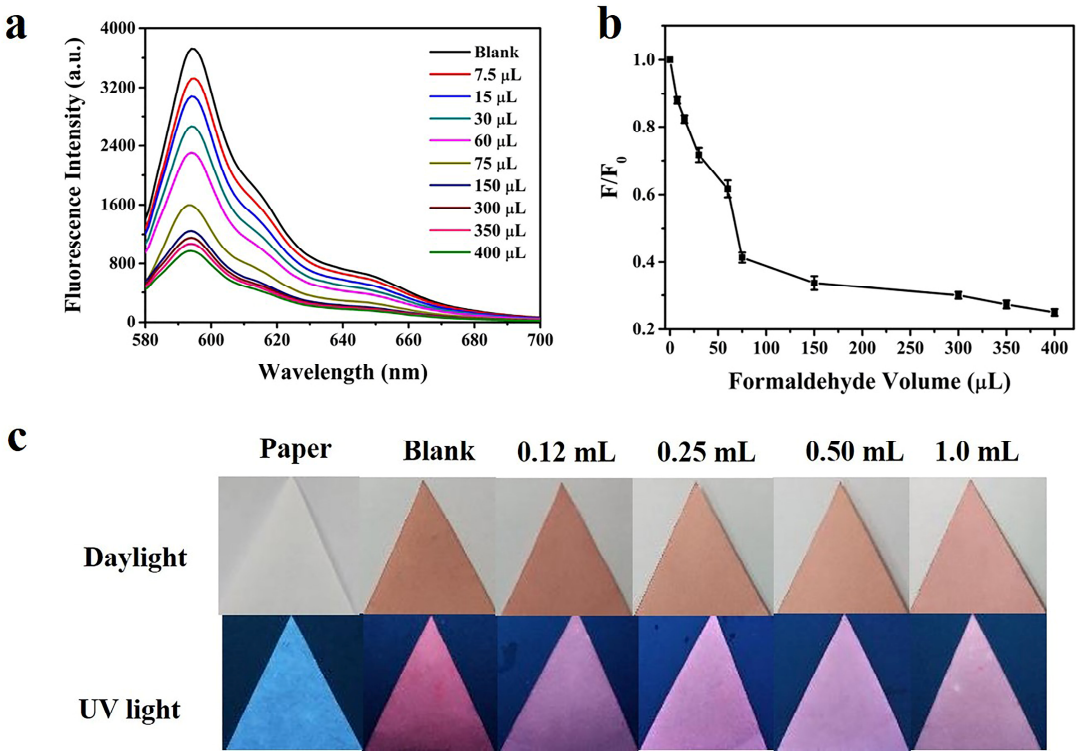

Figure S8. (a) The fluorescence spectra of CDs in the presence of various concentration of formaldehyde gas by adding different volumes of formaldehyde, (b) The relationship between F/F_0 versus different of formaldehyde gas, Where F_0 and F are the fluorescence intensities of CDs at 598 nm in the absence and the presence of ammonia and formaldehyde gas, (c) The photographs of the paper that soaked in a CDs solutions with the volume of formaldehyde from 0.12 mL to 1.0 mL that dropped on filter paper in 2.0 L beaker.

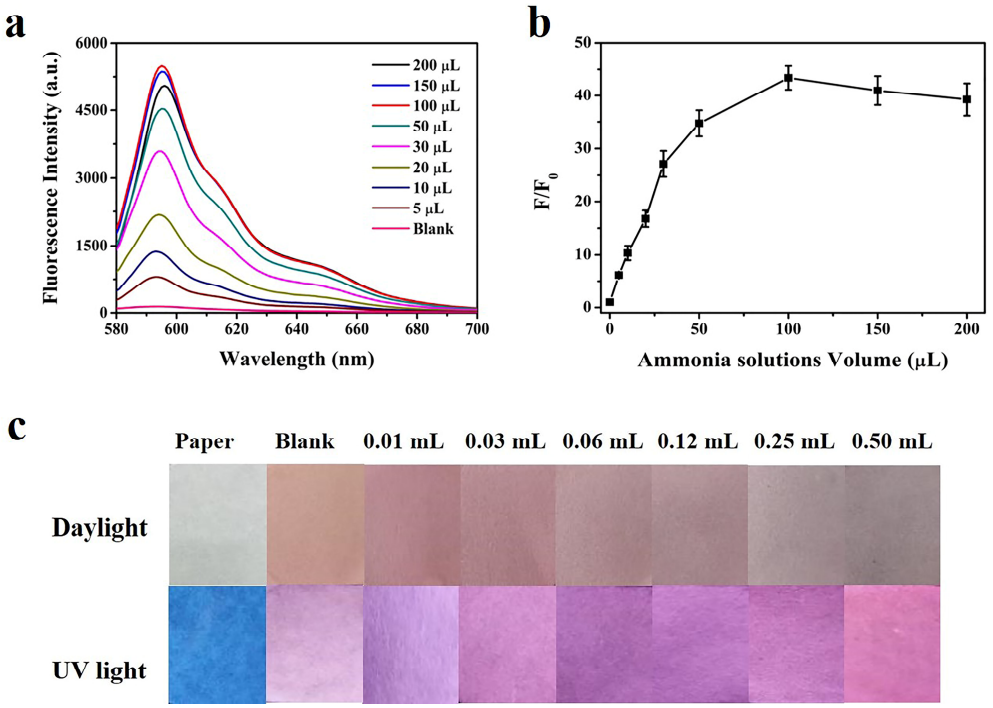

Figure S9. (a) The fluorescence spectra of NF-CDs in the presence of various concentration of ammonia by adding different volumes of ammonia solutions, (b) The relationship between F/F_0 versus different of ammonia, Where F_0 and F are the fluorescence intensities of CDs at 598 nm in the absence and the presence of ammonia gas, (c) The photographs of the paper that soaked in NF-CDs solutions with the volume of ammonia solutions from 0.01 mL to 0.5 mL.

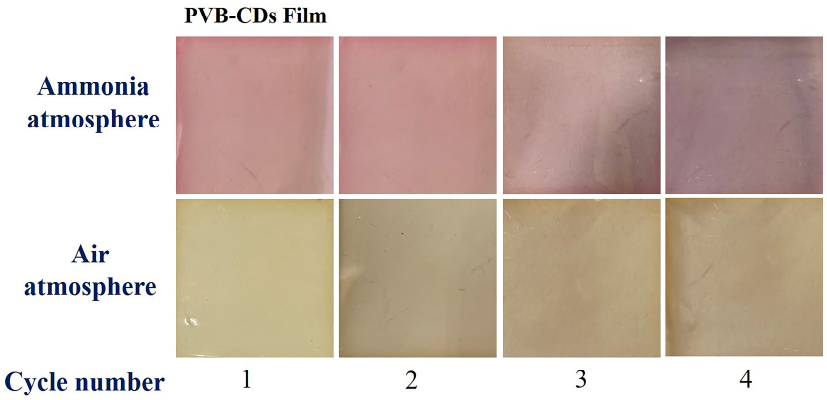

Figure S10. The reversible of PVB-CDs films with ammonia atmosphere and air atmosphere.

Table S1. Comparison of sensing performance of sensing material based Formaldehyde and present work

Sensing material or methods	LOD	Linear range	Ref.
Liquid crystal	30 mM	0-50 mM	[38]
6-hydroxy naphthalene	60 μM	0-3 mM	[39]
enzymatic selfpowered biosensor	3 μM	0.01-0.35 mM	[40]
BODIPY-Substituted Hydrazine	0.18 μM	0-100 μM	[41]
CDs	44 μM	0-1 M	This work

Table S2. The pH changes of the NF-CDs in the absence and presence of different concentrations of ammonia solutions

Ammonia solutions concentration	pH before adding Ammonia solutions	pH after adding Ammonia solutions
Blank	4.0	4.3
1 μM		4.6
10 μM		5.3
100 μM		6.3
1 mM		8.9
10 mM		9.9
100 mM		10.9

Table S3. The pH changes of the CDs in the absence and presence of different concentrations of Formaldehyde

Formaldehyde concentration	pH before adding Formaldehyde	pH after adding Formaldehyde
Blank		8.0
1 mM		8.0
10 mM		7.3
20 mM		7.1
40 mM	8.0	6.8
60 mM		6.6
80 mM		6.4
100 mM		6.1
1 M		6.0