Supporting Information

Full-Colour Carbon Dots : Integration of Multiple Emission Centres in Single Particles

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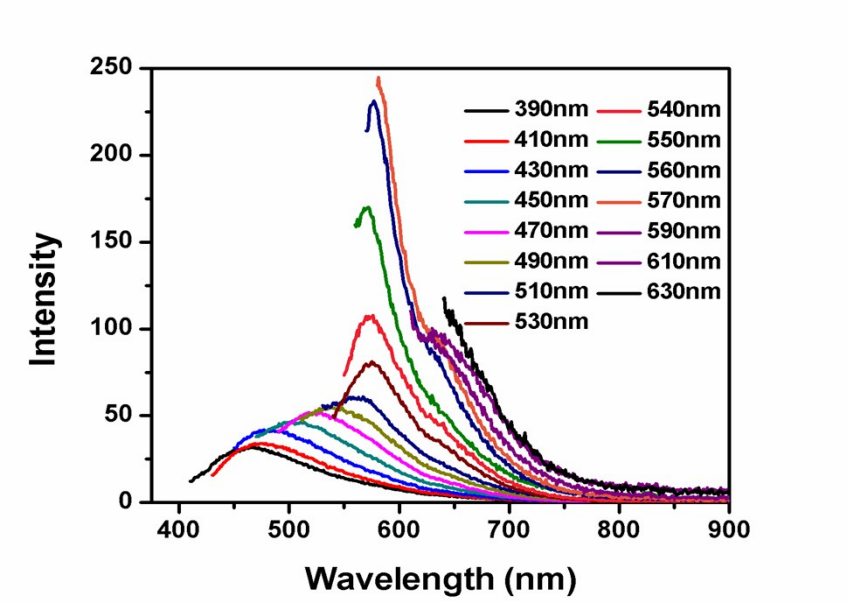

Figure S 1. Fluorescence spectra of F-C dots isolated in PVA film under different excitation wavelengths. The concentration of C dots is 0.02 % in PVA thin film, 20 times higher than the single particle imaging, the fluorescence spectra of C dots-PVA film also shows multi-colour emission of F-C dots that is very similar to the solution phase emissions, indicating that F-C dots can be well dispersed in PVA.

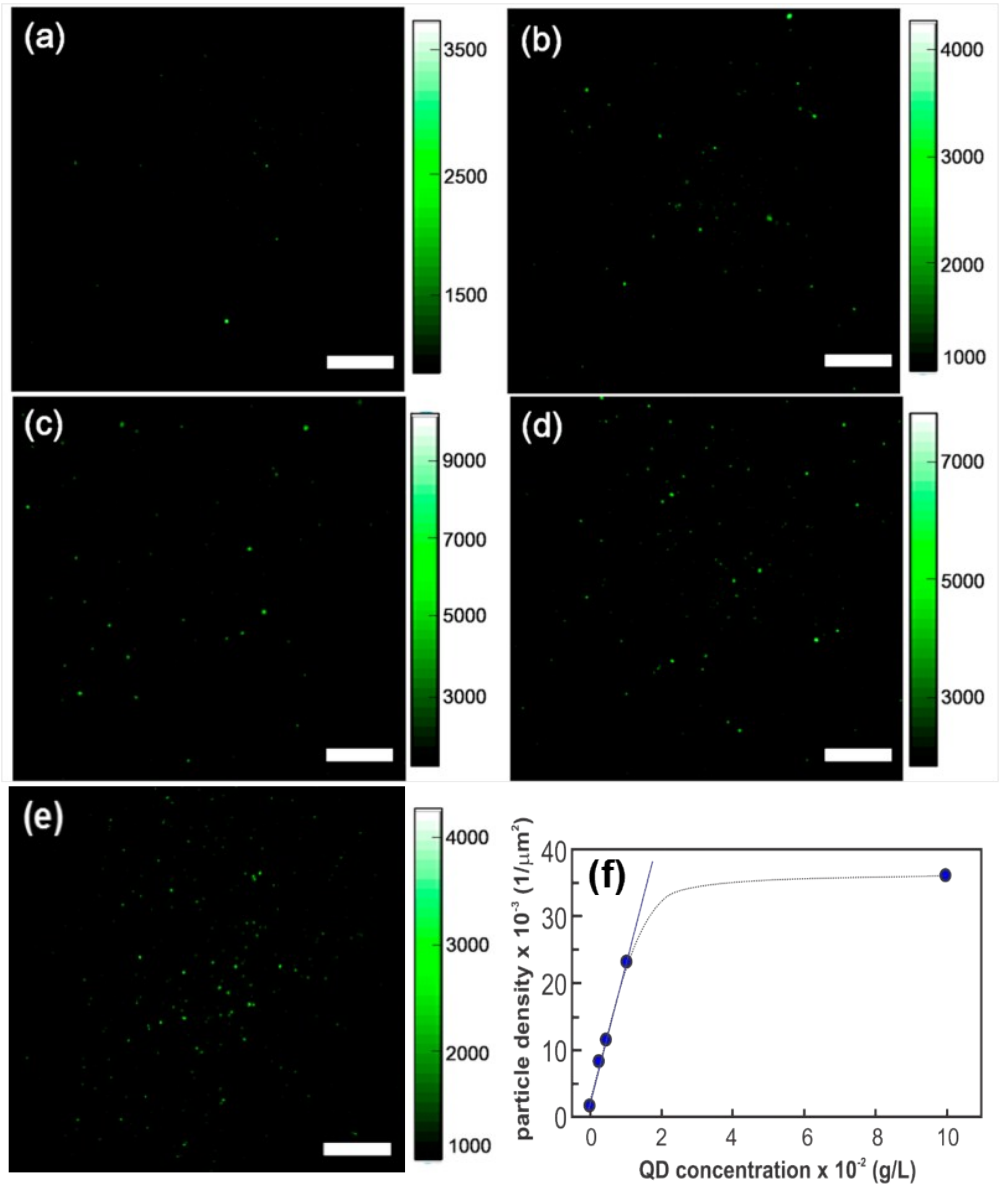

Figure S 2. Single particle emission from F-C dots with different weight percentages in PVA spin-coated film: (a) 0.00005 %; (b) 0.00025 %; (c) 0.0005 %; (d) 0.001 % and (e) 0.01 %. Scale bar=10 μm. (f) Dependence of the measured number of emitting spots in the wide-field single particle imaging as a function of the initial concentration of the deposited solution of F-C dots in PVA. By counting the particles in images of 33685 μm^{-2}, the areal density of the F-C particles (a. 1.78×10^{-3}, b. 8.16×10^{-3}, c. 11.73×10^{-3} and d. 23.16×10^{-3} particle μm^{-2}) in images varies approximately linearly with concentrations of F-C dots in the PVA films respectively. This result suggests that the spots in the images are identified as single particles. Then PVA film with F-C dots of 0.001 % is chosen for the follow-up experiments.

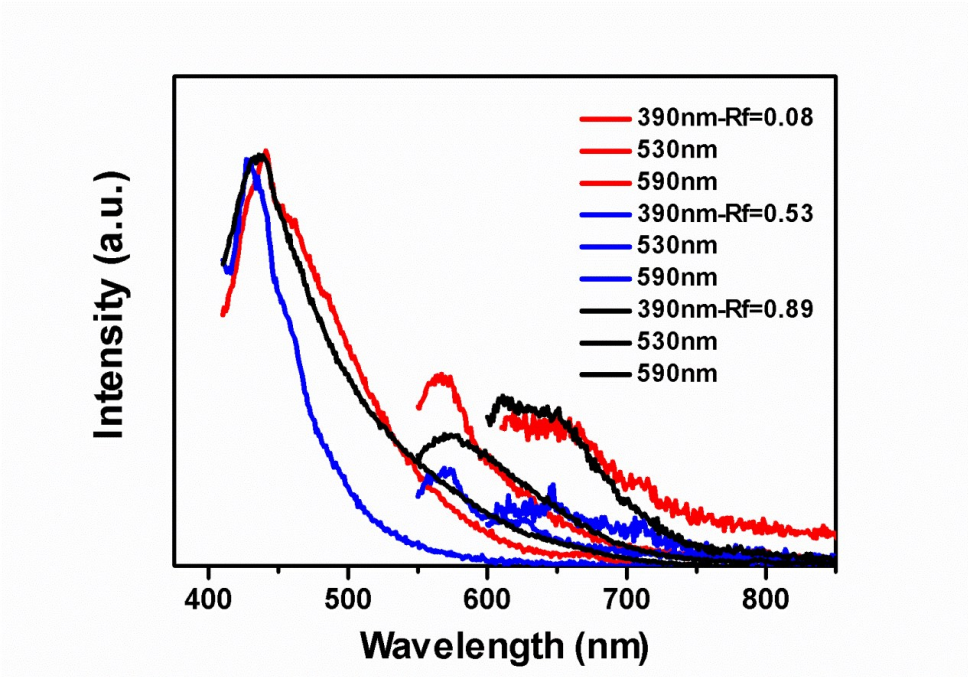

Figure S 3. Fluorescence spectra of F-C dots separated by TLC method (developer: petroleum ether: ethyl acetate = 100:15, v/v) at different excitation wavelengths. The emission intensities at 390 nm excitation are normalized to see the relative emission intensity at different colour regions. Cellulose fibers on filter paper may be dispersed partially in solution and give rise to the non-zero emission intensities at the beginning of the spectra by light scattering.

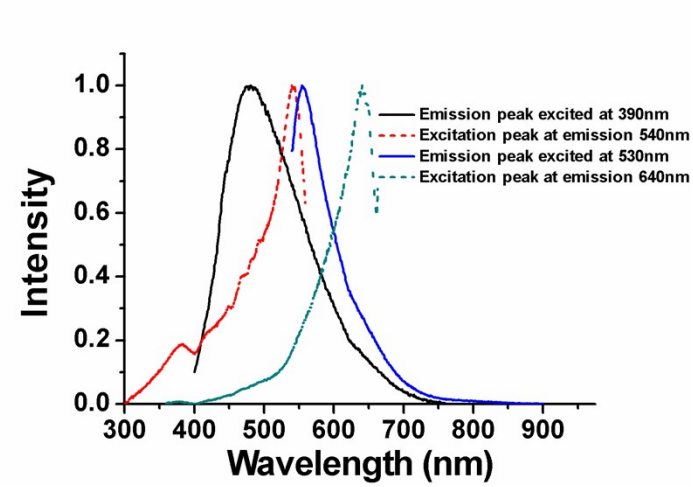

Figure S 4. Fluorescence spectra (solid line) excited at 390 nm and 530 nm and excitation spectra (dash line) at emission peaks of 540 nm and 640 nm of F-C dots.

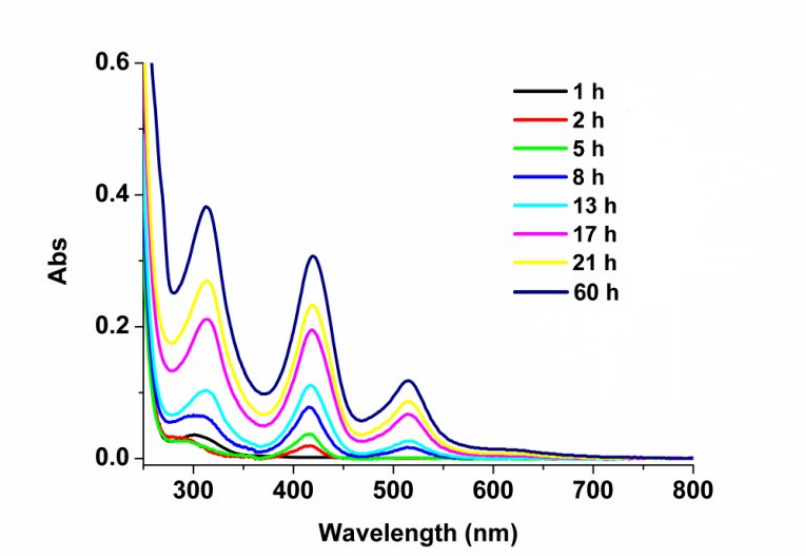

Figure S 5. UV-vis absorption spectra of the reaction solution ($CHCl_3$: diethylamine =10:1, v/v) under air atmosphere for different reflux time periods. The strong absorption peaks are from the byproducts, the absorption of C dots is buried in these spectra.

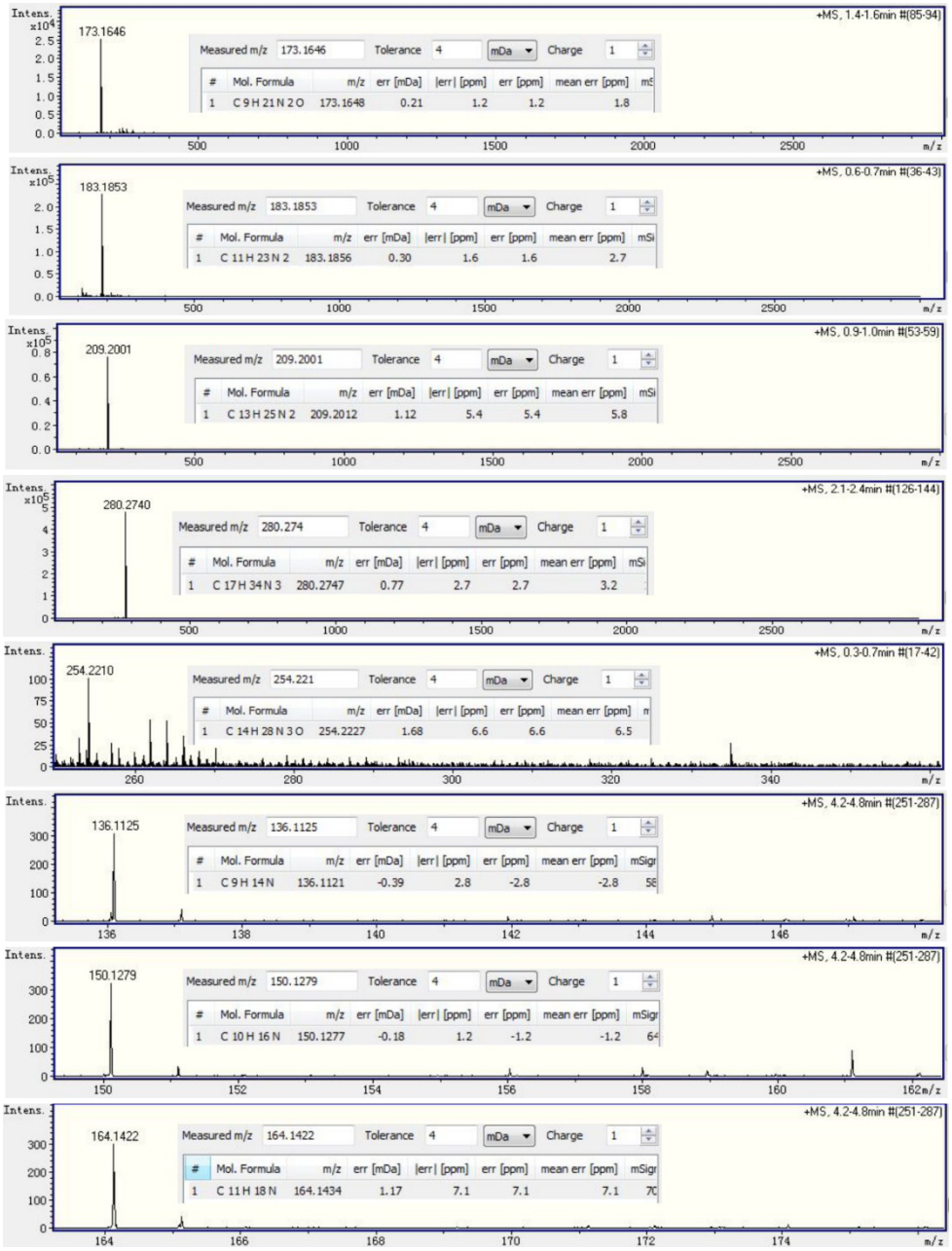

Figure S 6. Mass spectra of small molecular by-products generated during the reaction of $CHCl_3$ and diethylamine.

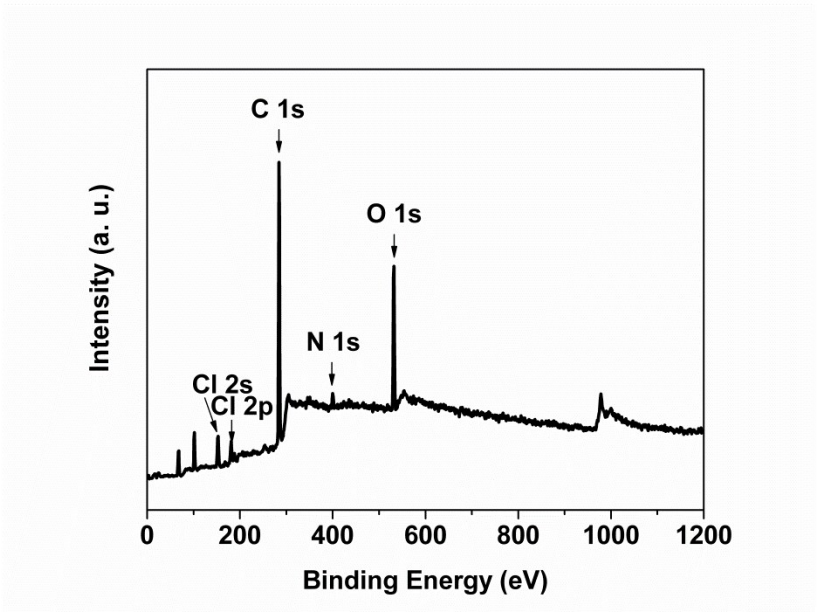

Figure S 7. XPS data of the dialysate.

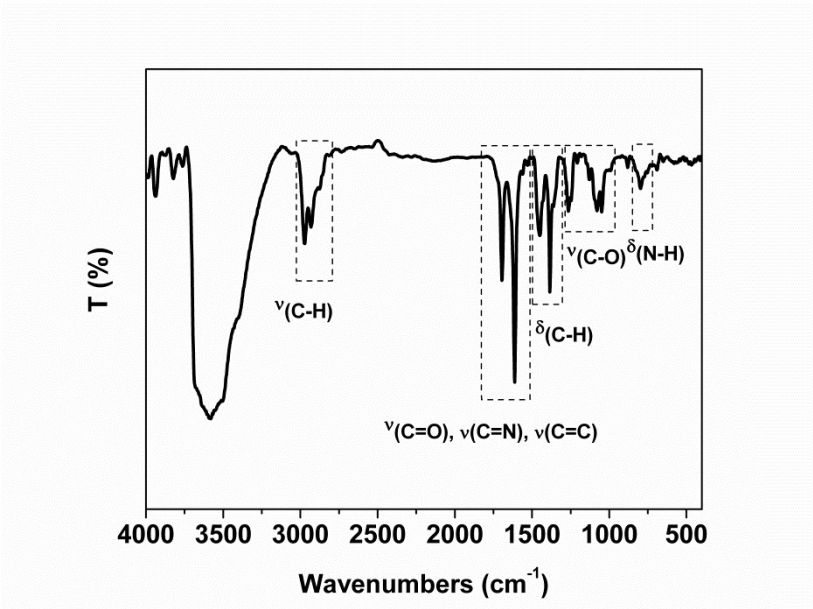

Figure S 8. FT-IR spectrum of the dialysate.

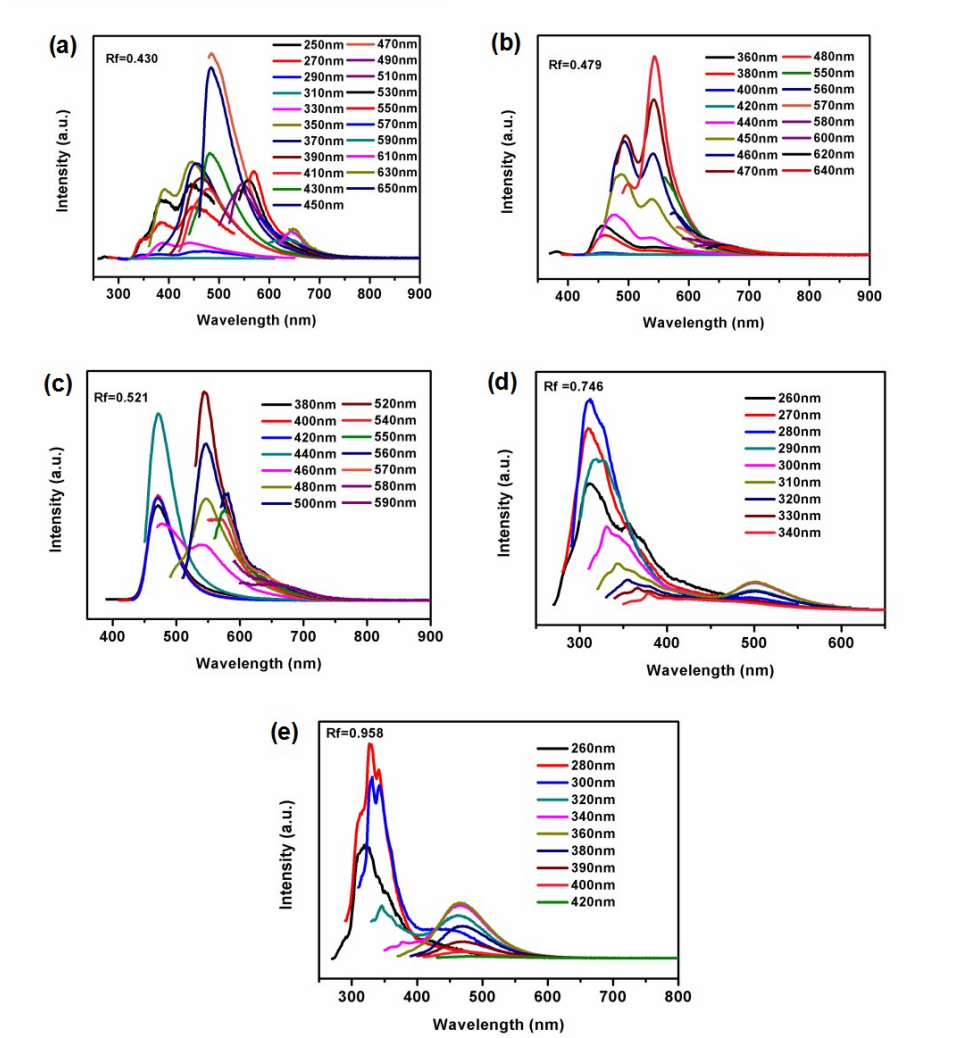

Figure S 9. (a-e) Fluorescence spectra of dialysates with different Rf values separated by TLC method.

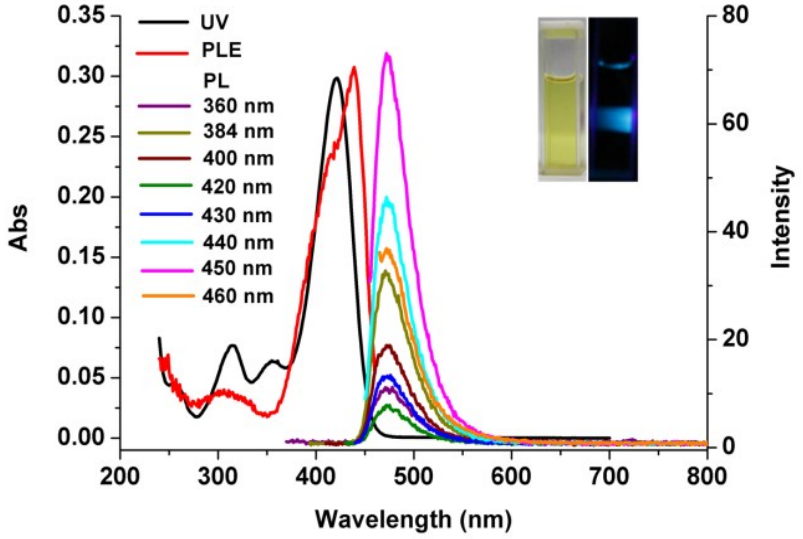

Figure S 10. UV-vis absorption spectrum, emission spectra and excitation spectrum of main by-product of component A with R_f value of 0.6 (developer: dichloromethane: methanol = 10:1, v/v). Inset: photos of component A under white light and 420 nm excitation.

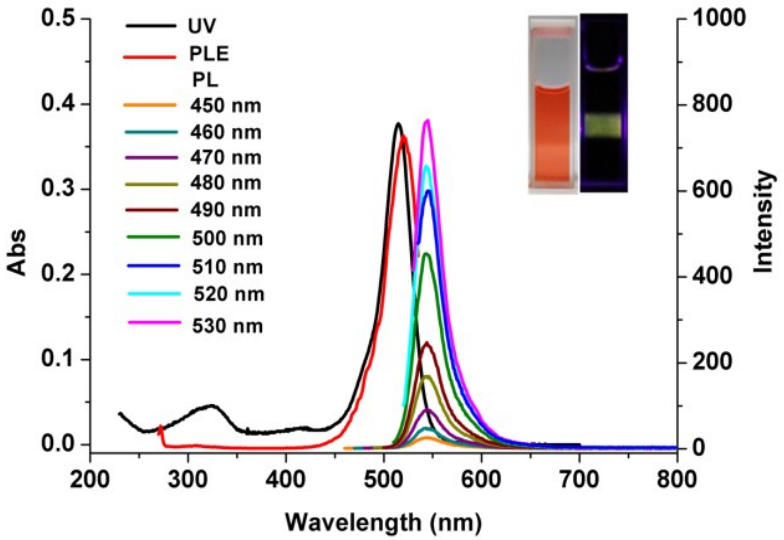

Figure S 11. UV-vis absorption spectrum, emission spectra and excitation spectrum of main by-product of component B with Rf value of 0.57 (developer: dichloromethane: methanol = 10:1, v/v). Inset: photos of component B under white light and 515 nm excitation.

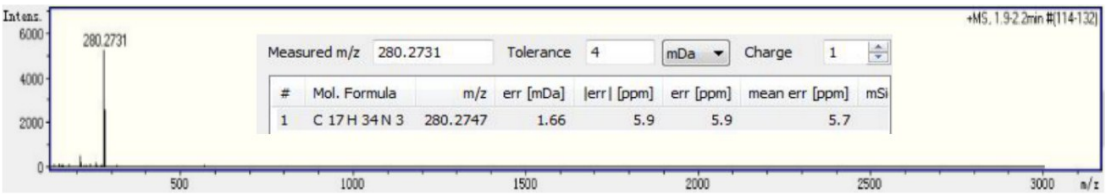

Figure S 12. HRMS spectrum of component A.

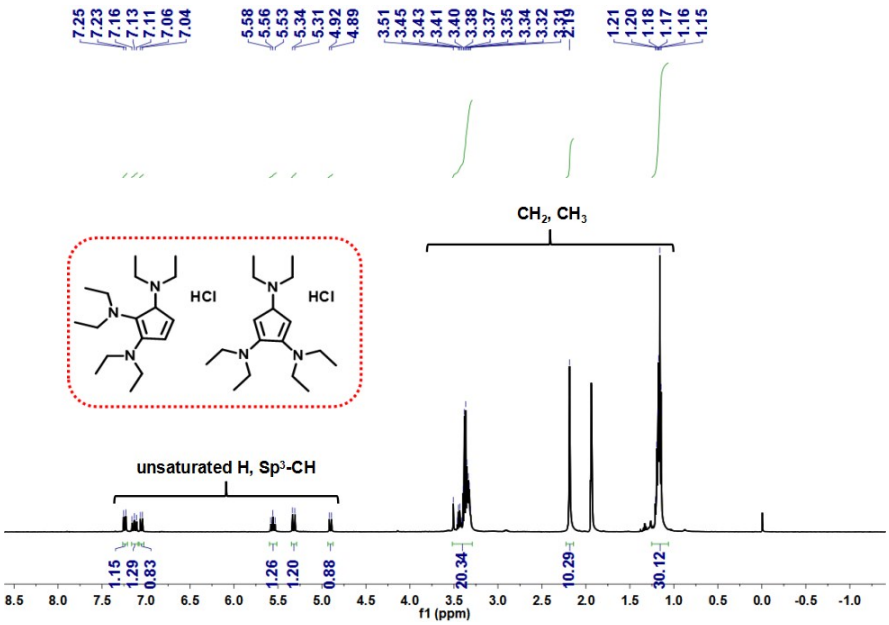

Figure S 13. 500M ^{1}HNMR spectrum of component A in CD_3CN.

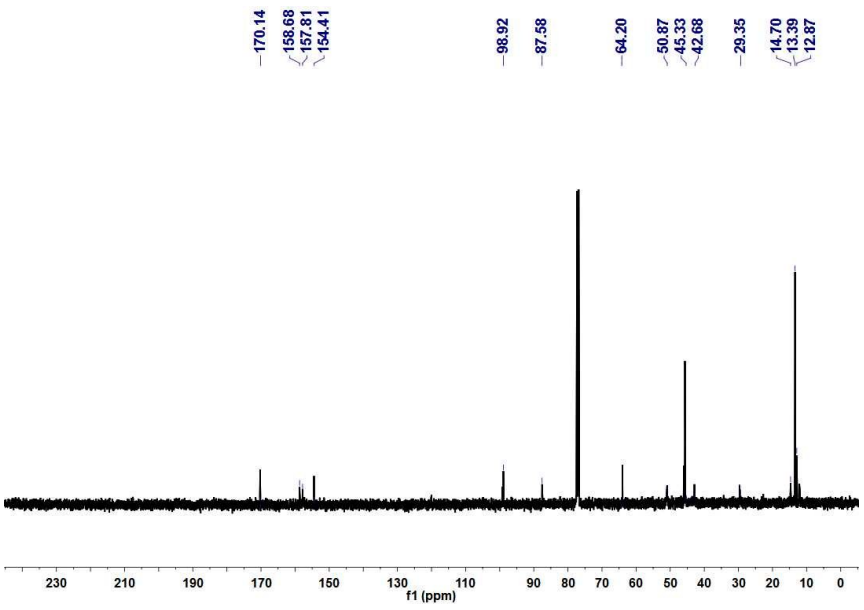

Figure S 14. 500M ^{13}CNMR spectrum of component A in $CDCl_3$.

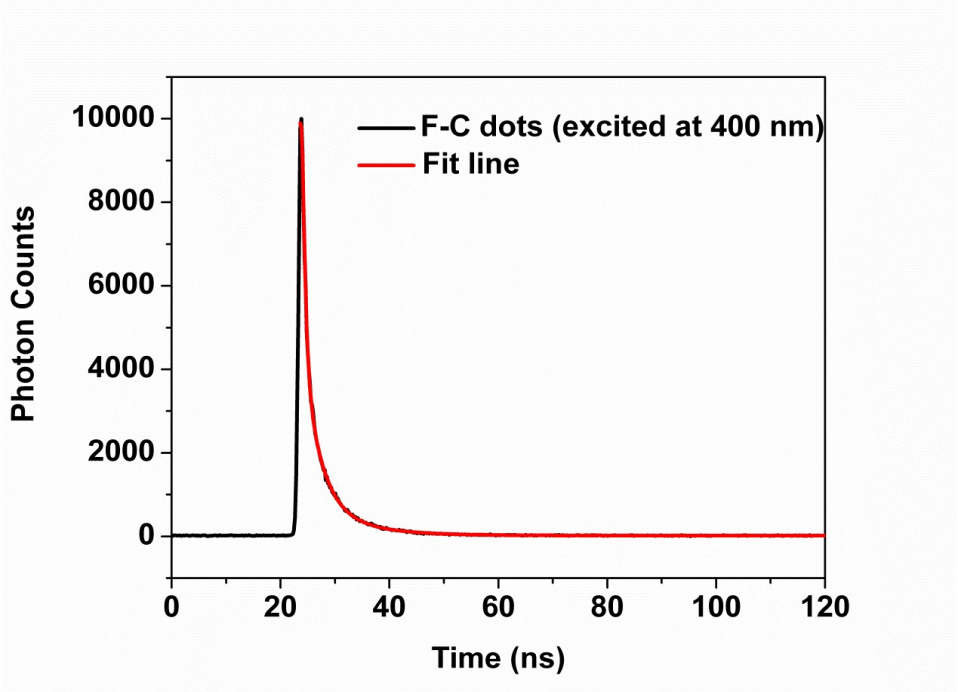

Figure S 15. Fluorescence decay profiles of F-C dots at 400 nm excitation.

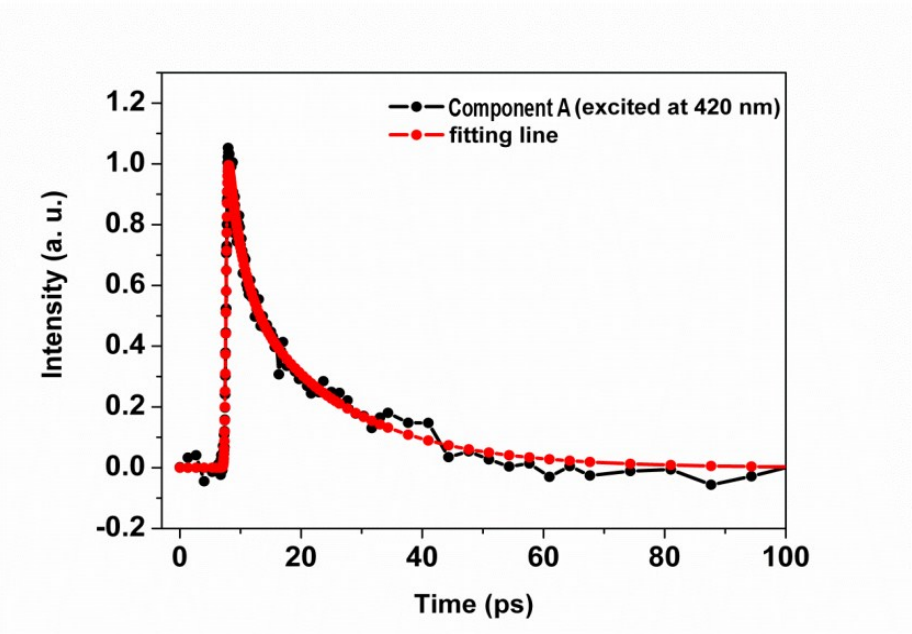

Figure S 16. Fluorescence decay profiles of component A at 420 nm excitation.

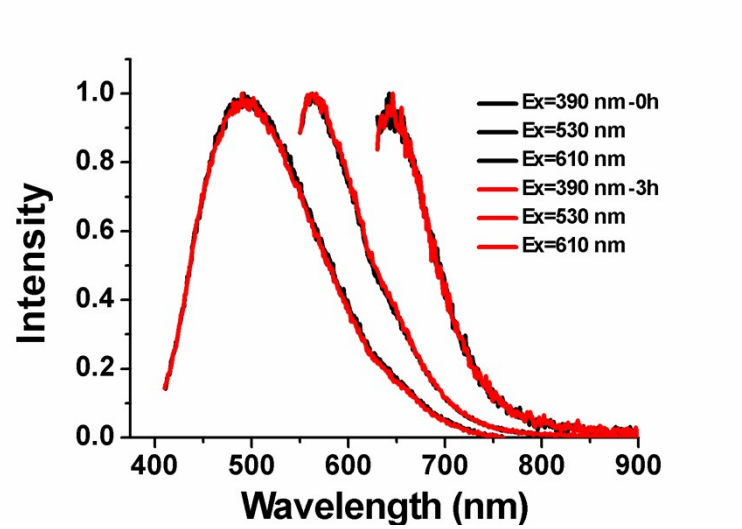

Figure S 17. Photostability of F-C dots in ethanol soltion after three hours' continuous UV excitation (12 W).