Supporting Information

Acid-assisted hydrothermal synthesis of red fluorescent carbon dots for sensitive detection of Fe(III)

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Figures

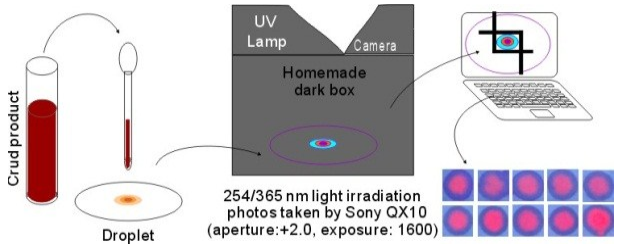
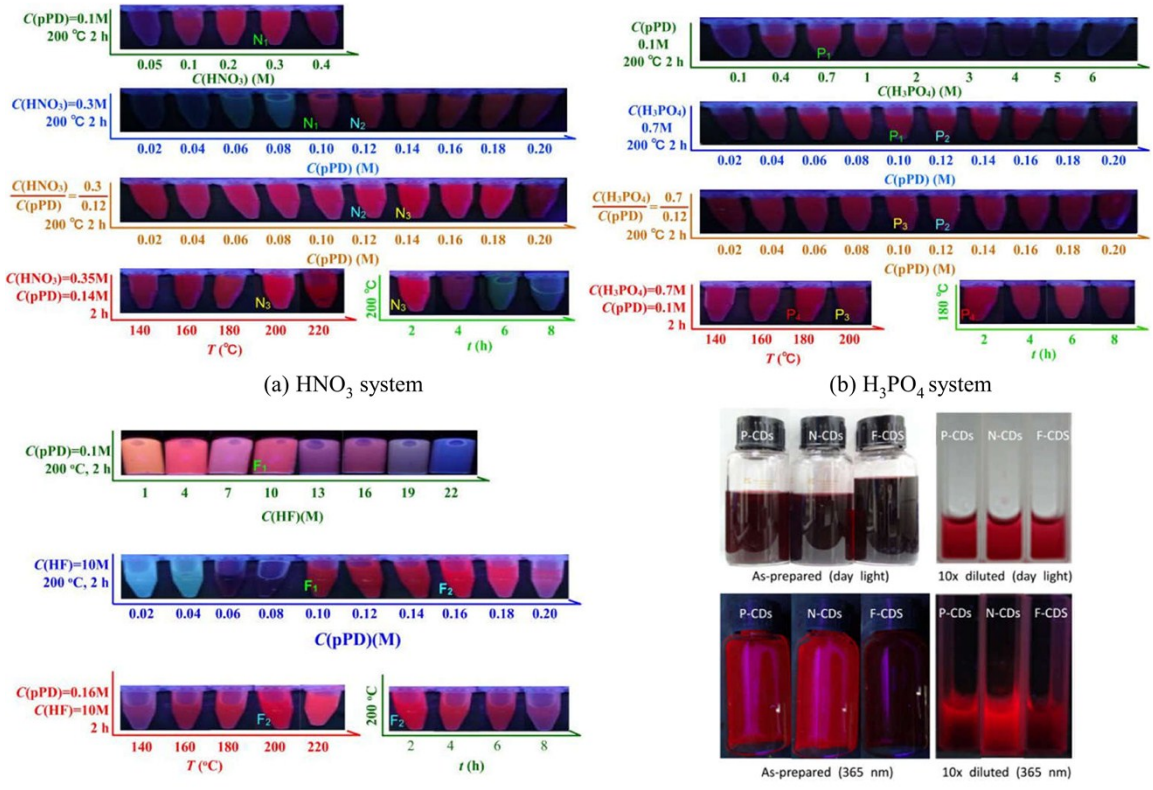


Fig. S1 Paper-test strategy of PL assessment for fluorescence materials. The brightest and the reddest fluorescent C-dots (under 365 nm UV light, in a dark box) were selected via comparing photographs, which were taken by the camera (Sony QX10) with the same parameters (aperture:+2.0, exposure: 1600).



(a) HNO_3 system (b) H_3PO_4 system

(c) HF system (d) as-prepared and 10x diluted solutions

Fig. S2 Experimental optimization for the preparation of C-dots from p-PD and acid systems of HNO_3 (a), H_3PO_4 (b), and HF (c). As-prepared C-dots under day light and 365 nm UV light (d). For the optimization experiments, all the as-prepared C-dots aqueous solutions were 10X diluted and filled in 1.5 mL centrifuge tubes, the photographs were taken under 365 nm UV light.

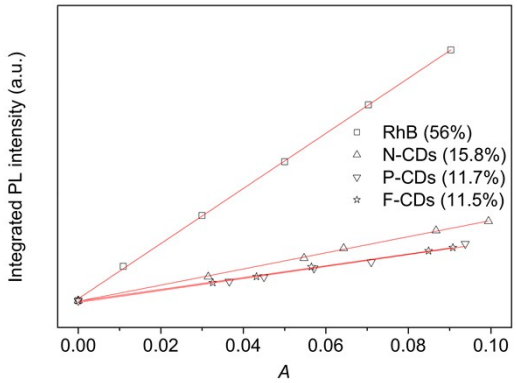


Fig. S3 Quantum yields data and the PL intensity plots as a function of absorbance for the C-dots and RhB excited at 365 nm.

Purification of C-dots

After hydrothemal reaction, autoclaves were cooled down to room temperature naturally and the dark-red crude products were obtained. There are 4 methods available to purify these C-dots and the available purification methods for different acid system were shown in **Tab. S1**.

Tab. S1 Purification methods of C-dots

Methods	N-CDs	P-CDs	F-CDs
dialysis	√	√	√
re-extraction	√	√	√
ethanol-wash	-	√	-
concentration	√	-	-

(i) Dialysis

The as-prepared suspension was filtered through a 0.22 μm filter membrane to remove the precipitation and further dialyzed against ultra-pure water through a dialysis bag (molecular weight cut-off: 3500 Da) for 24 h.

(ii) Re-extraction

The as-prepared suspension was mixed with ethyl acetate with the volume ratio of 1:1 and shaken for 5 min, C-dots can be extracted into ethyl acetate phase. It is noted that a little amount of water can be resolved by ethyl acetate, so the supernatant contains a little water. Extract the supernatant and add hexane into the supernatant with *V*(supernatant):*V*(hexane)=5:1. After being shaken for 5 min and let it stand for 10 min, tiny droplets, which means the condensed C-dots aqueous solution, sank and layered. The purified C-dots were then re-extracted.

(iii) Ethanol-wash

For C-dots (P-CDs) prepared by non-volatile acid, such as H_3PO_4, add ethanol into the crude products with *V*(product):*V*(ethanol)=4:1, shake the suspension for 5 min, use centrifuge at 14000 rpm for 30 min and collect the supernatant. Repeat the process for 3-4 cycles. H_3PO_4 can be removed by excessive p-PD through forming ammonium salt and by adsorption through poly(p-PD). Supernatant, which contains ethanol and water, can be evaporated to form near-dry paste by a rotary evaporator. The near-dry C-dots paste can be further dried at 80 ^oC with a vacuum dryer to make the C-dot powder.

(iv) Concentration

For the C-dots (N-CDs and F-CDs) prepared by volatile acid (HNO_3 and HF), acid-contained crude products can be removed by solvent evaporation. Typically, the crud products were washed (by hexane to remove the unreacted p-PD), centrifuged (at 14000 rpm for 30 min to remove polymer precipitation), and filtered (through a 0.22 μm filter membrane to remove the precipitation). The purified C-dots solutions can be dried to prepare C-dots powders (when necessary) through evaporation by rotary evaporator to near dry state at 80 ^oC and a low vacuum condition and further drying in vacuum drying oven.