

## Electronic Supplementary Information

### Carbon dots isolated from chromatographic fractions for sensing applications

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### Measurement of quantum yield

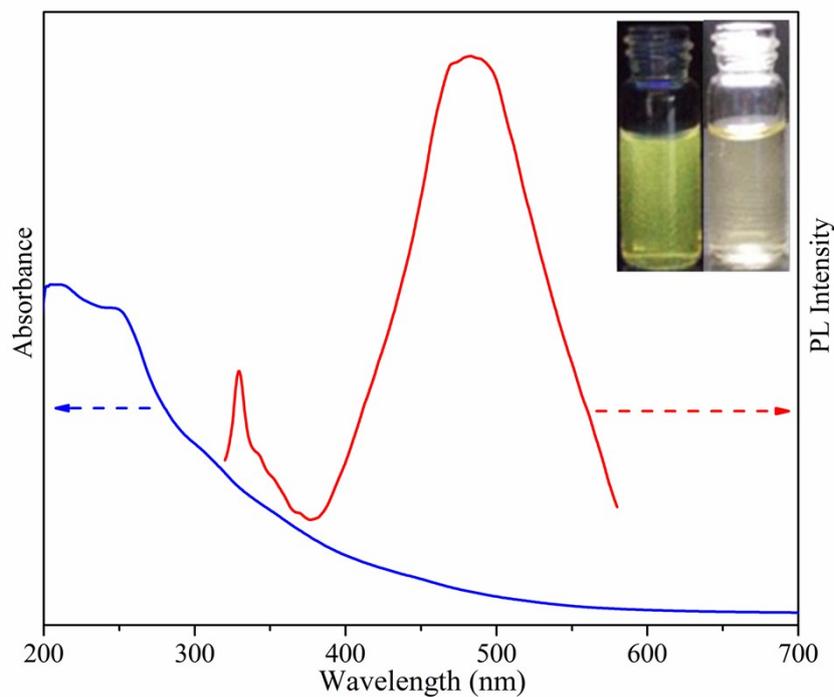
The quantum yield ( $\Phi_S$ ) of the C-dots sample was determined by a comparative method. Quinine sulfate ( $\Phi_R = 0.54$ ) in 0.10 M H<sub>2</sub>SO<sub>4</sub> (refractive index,  $\eta = 1.33$ ) was selected as the reference to determine the  $\Phi_S$  of the C-dots sample in methanol ( $\eta = 1.44$ ) and C-dots HPLC fractions in distilled water ( $\eta = 1.33$ ) at different concentrations. All the absorbances of the solutions at the excitation wavelength ( $\lambda_{ex}$ ) were recorded by a UV-vis absorption spectrophotometer (Varian, Palo Alto, CA, USA). Photoluminescence (PL) spectra of C-dots were measured by a Hitachi F-2500 spectrofluorometer (Tokyo, Japan). The  $\lambda_{ex}$ /integrated PL intensity areas under the PL curve in the wavelength range were 370/390–650 nm for C-dots sample and 350/370–650 nm for C-dots HPLC fractions. Graphs of integrated PL intensity against absorbance were plotted. The  $\Phi_S$  of the C-dots sample was calculated as follows:

$$\Phi_S = \Phi_R (Grad_S / Grad_R) (\eta^2_S / \eta^2_R)$$

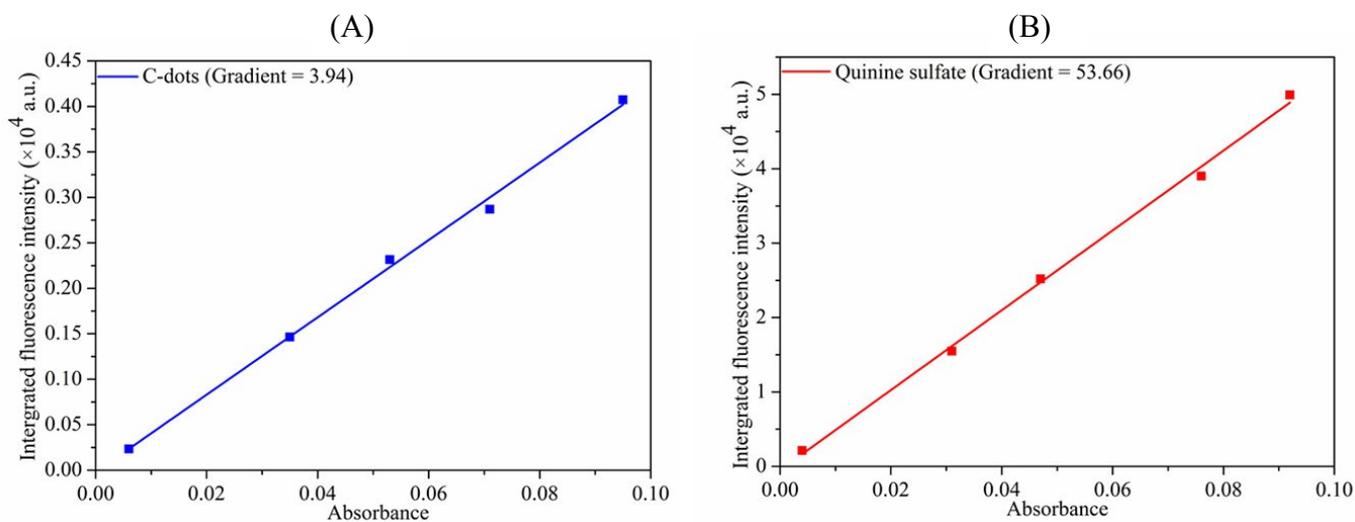
where the subscripts *S* and *R* refer to the sample C-dots and reference, respectively. *Grad* is the gradient from the plot of integrated PL intensity against absorbance, and  $\eta$  is the refractive index of the solvent. In order to minimise the self-absorption effect, the absorbance in the 10-mm path-length fluorescence cuvette was kept under 0.10 at the  $\lambda_{ex}$ .<sup>1,2</sup>

### References

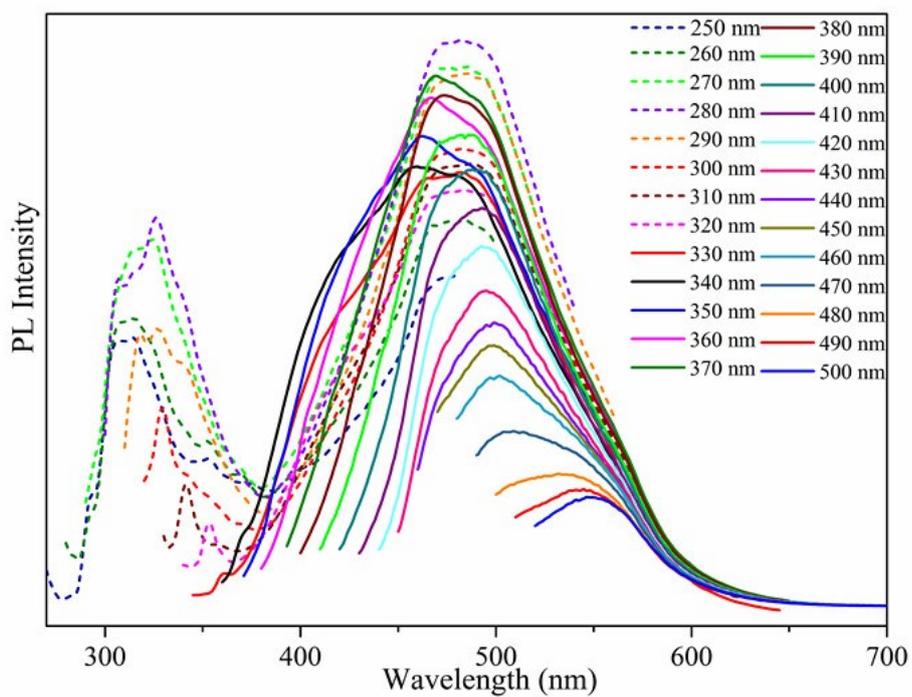
- 1 Y. Yang, J. Cui, M. Zheng, C. Hu, S. Tan, Y. Xiao, Q. Yang and Y. Liu, *Chem. Commun.*, 2012, **48**, 380.
- 2 X. Zhai, P. Zhang, C. Liu, T. Bai, W. Li, L. Da and W. Liu, *Chem. Commun.*, 2012, **48**, 7955.



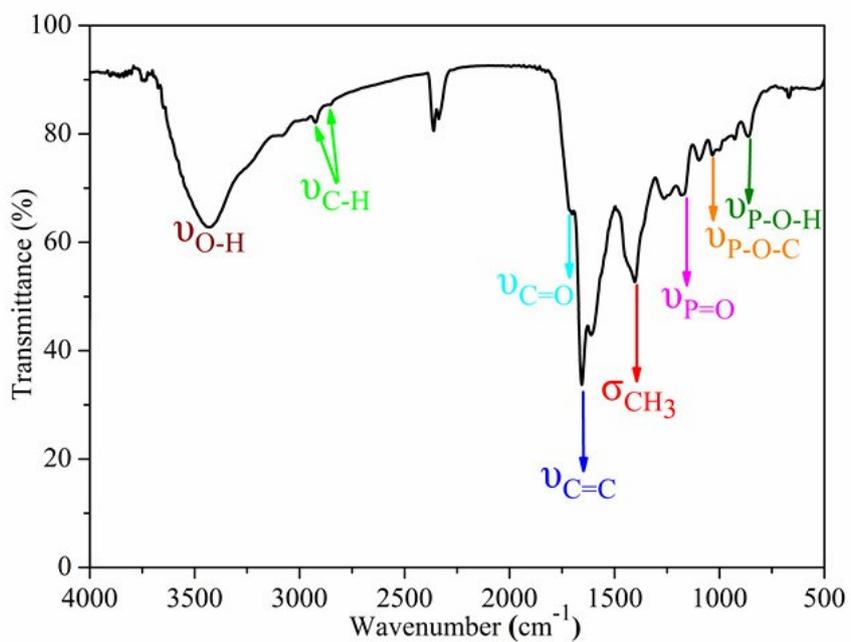
**Fig. S1.** UV-vis absorption (blue line) and PL spectra (red line,  $\lambda_{ex}$  300 nm) of the C-dots in methanol solution. Inset: the photographic images of the C-dots solution under daylight (right) and UV irradiation (365 nm, left).



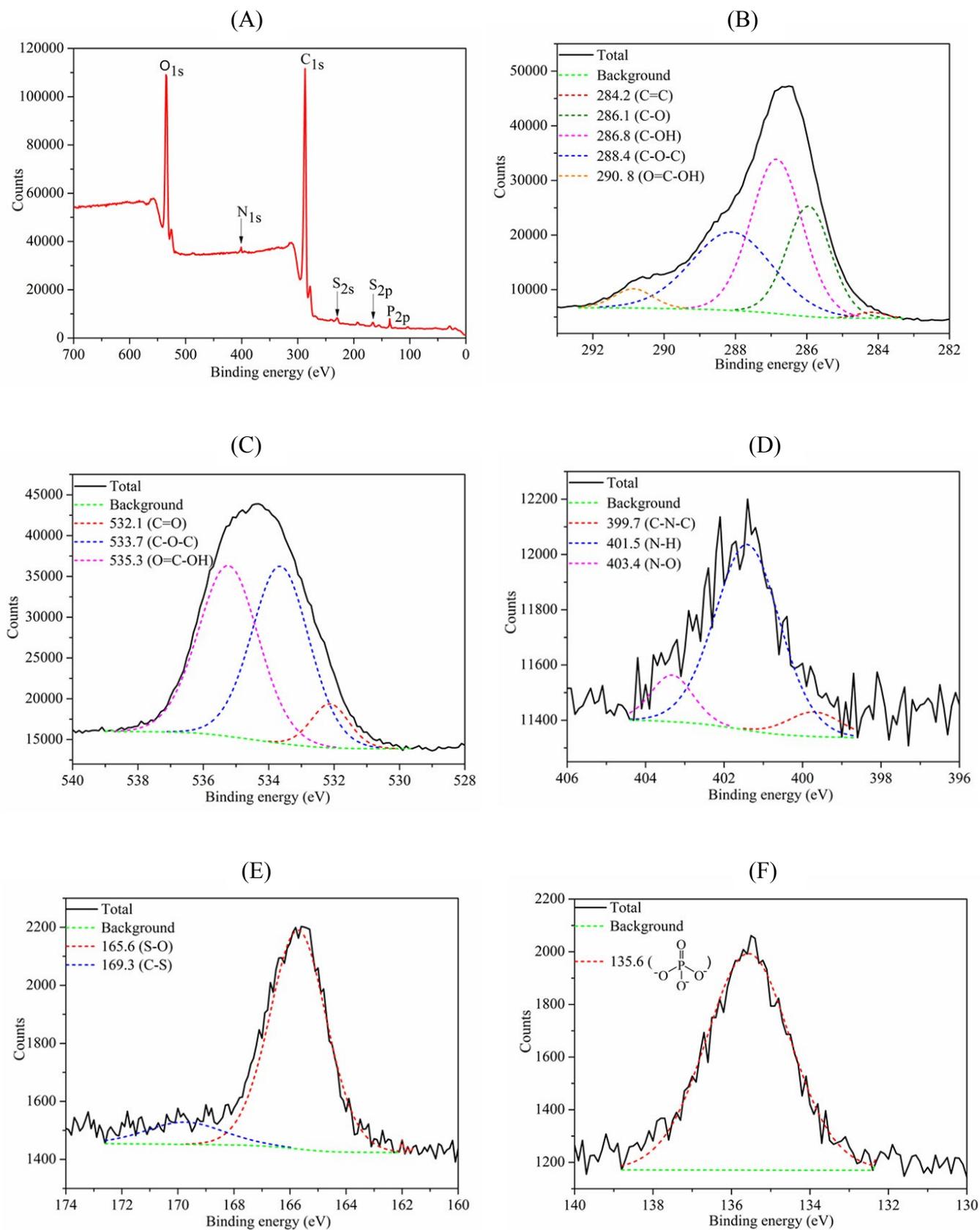
**Fig. S2.** Plots of integrated PL intensity against absorbance of (A) C-dots and (B) quinine sulfate.



**Fig. S3.** PL spectra of C-dots at different  $\lambda_{ex}$  250–500 nm.



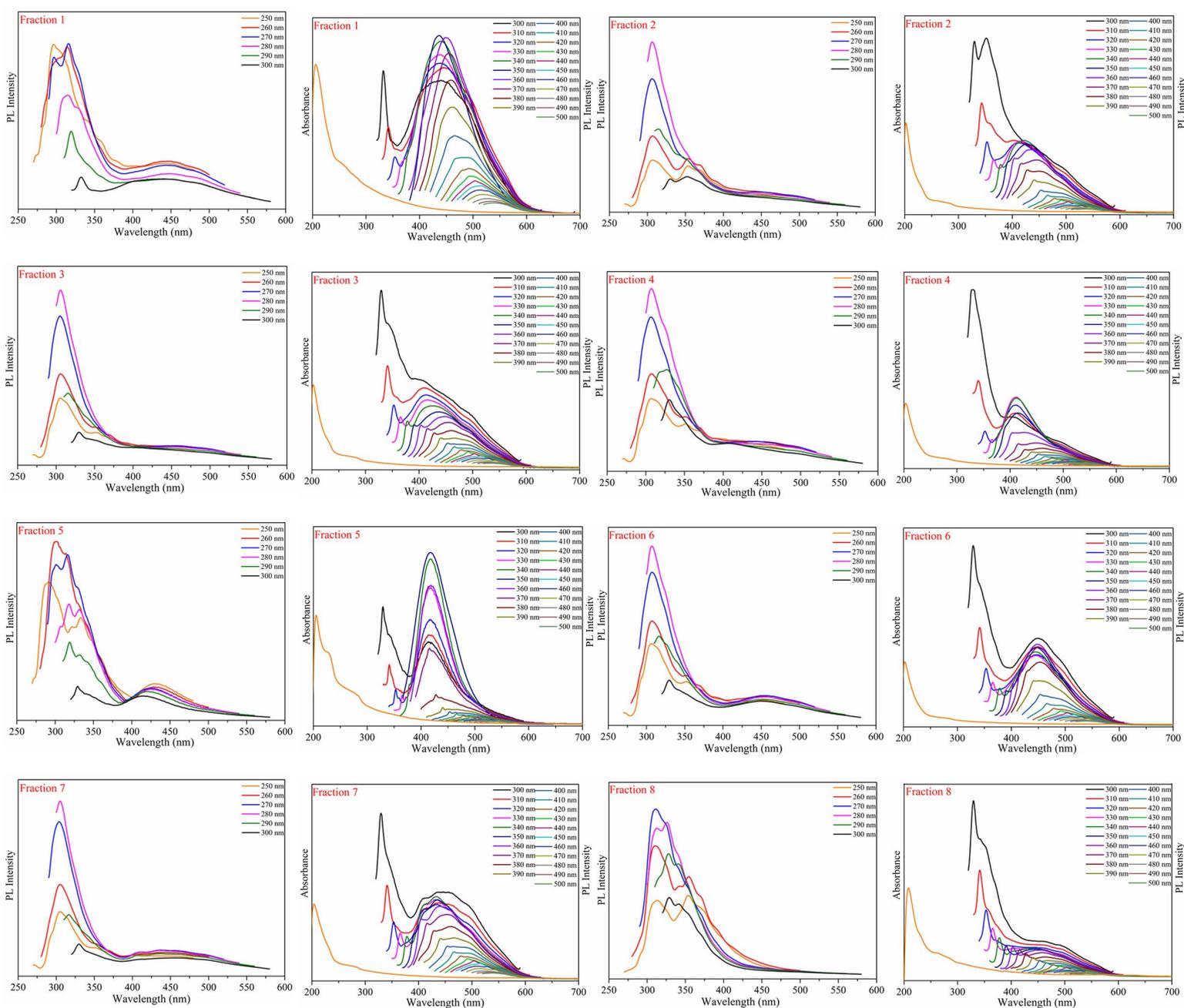
**Fig. S4.** IR spectrum of C-dots.

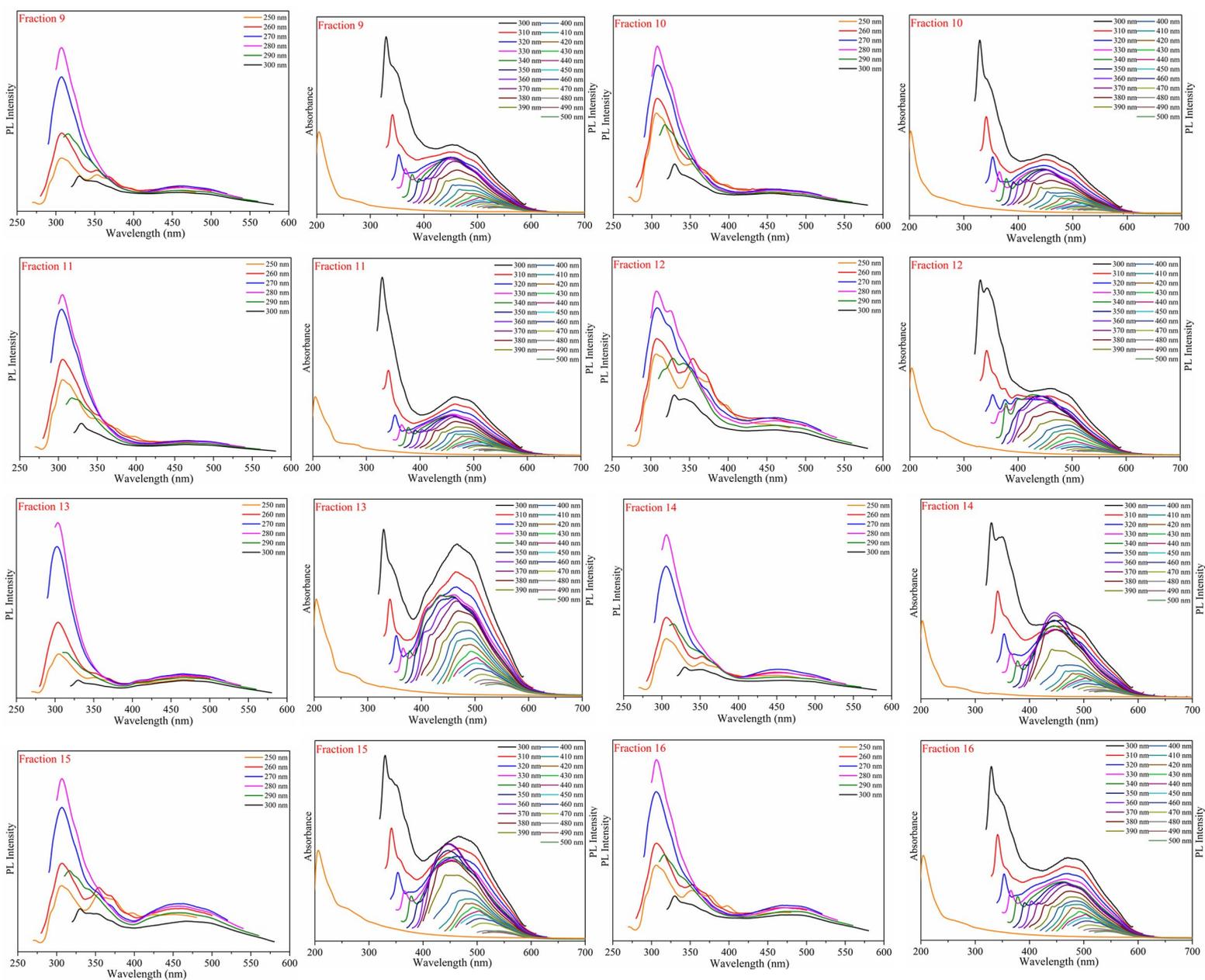


**Fig. S5.** (A) XPS survey scan, (B) C<sub>1s</sub>, (C) O<sub>1s</sub>, (D) N<sub>1s</sub>, (E) S<sub>2p</sub> and (F) P<sub>2p</sub> XPS spectra of C-dots.

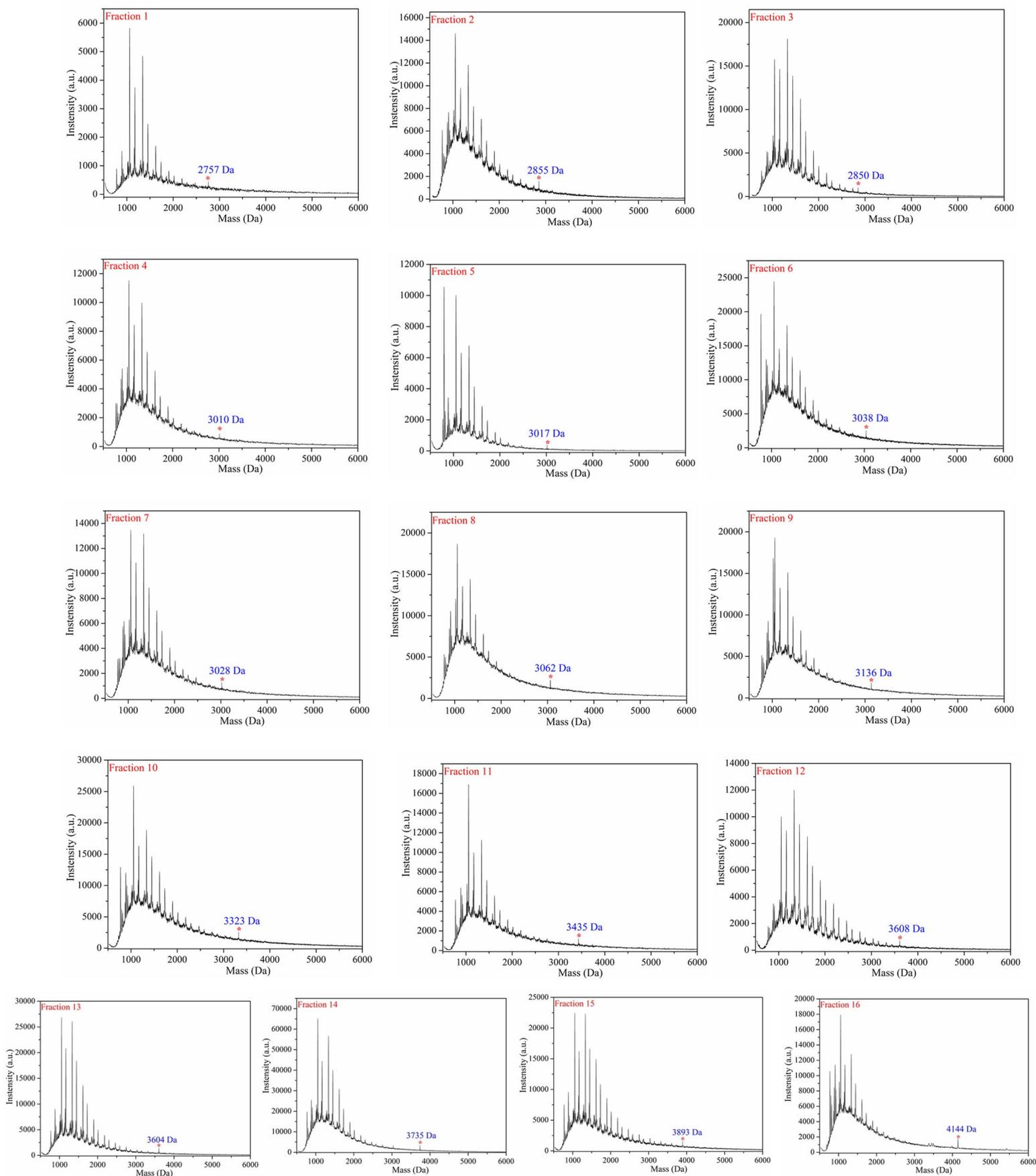
**Table S1.** Elemental analysis of the C-dots samples synthesised with different mole ratios of NAC/HAc (0.00–0.025) in the initial reagents.

Sample prepared from mole ratio of NAC/HAc	Element Content (%)					
	C	H	P	O (calculated)	N	S
0.00	61.14	3.94	2.81	32.11	–	–
0.0050	60.53	4.05	2.69	31.64	0.29	0.80
0.0070	60.36	4.09	2.57	31.47	0.35	1.16
0.010	60.24	4.14	2.41	31.40	0.44	1.37
0.015	60.09	4.19	2.29	31.29	0.53	1.61
0.025	59.84	4.25	2.15	31.18	0.64	1.94

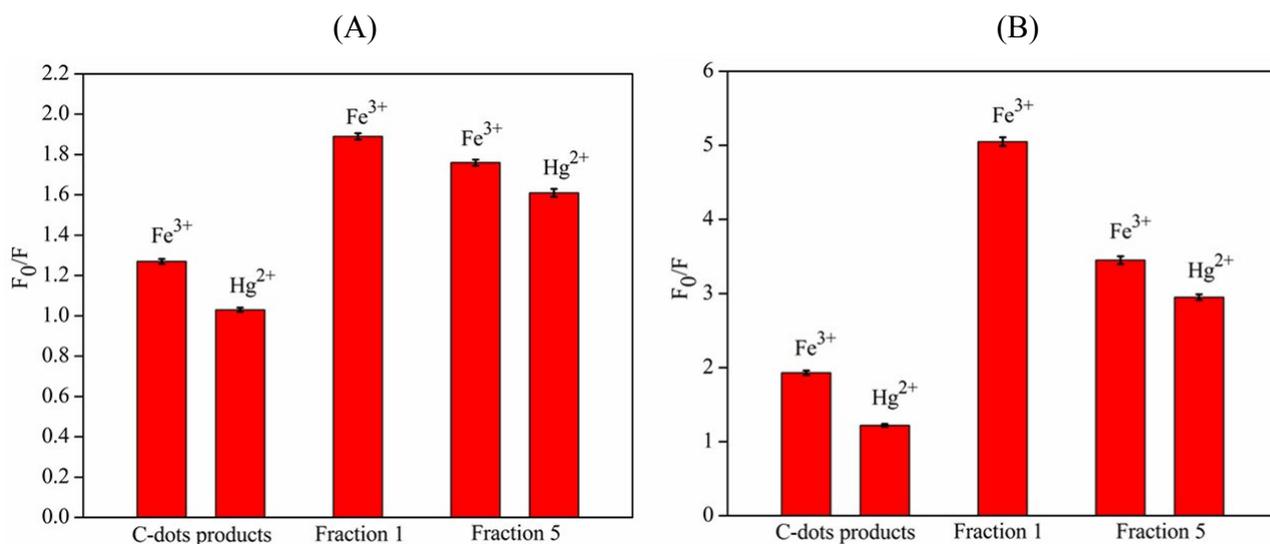




**Fig. S6.** UV-vis absorption and PL spectra at different  $\lambda_{ex}$  of fractions 1–16.



**Fig. S7.** MALDI-TOF mass spectra of fractions 1–16.



**Fig. S8.** (A) PL intensity changes of the as-synthesised C-dots products and fractions 1 and 5 in the presence of  $4.0 \mu\text{M Fe}^{3+}$  and  $1.0 \mu\text{M Hg}^{2+}$ . (B) PL intensity changes of the as-synthesised C-dots products and fractions 1 and 5 in the presence of  $60 \mu\text{M Fe}^{3+}$  and  $20 \mu\text{M Hg}^{2+}$ .  $F_0$  and  $F$  are the PL intensities of the as-synthesised C-dots products at  $\lambda_{ex}/\lambda_{em}$  of 370/480 nm, fraction 1 at  $\lambda_{ex}/\lambda_{em}$  of 350/436 nm and fraction 5 at  $\lambda_{ex}/\lambda_{em}$  of 350/420 nm in the absence and presence of  $\text{Fe}^{3+}$  and  $\text{Hg}^{2+}$ , respectively. Each data point is the average of three measurements. The error bars indicate the standard deviation of the measurements.