Electronic Supplementary Material (ESI) for Journal of Materials Chemistry
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# Supporting Information

## One-Pot Synthesis of N-Doped Carbon Dots with Tunable Luminescence Properties

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**Synthesis of the samples:** In a typical process for synthesis of N-doped CDs with tunable fluorescent emission, 1 mL of $CCl_4$ and 0.5 g of $NaNH_2$ were put into a 50 mL of Teflon-lined stainless autoclave, which was filled with 10 mL of methylbenzene. Then the autoclave was sealed and maintained at 200 $^oC$ for an appropriate period of time. After it was naturally cooled to room temperature, the as-obtained solution was washed with ultrapure water and absolute ethanol for several times and then separated centrifugally. The resultant solid products were obtained through freeze drying.

**Synthesis of C dots:** 2 mL of $CCl_4$ and a piece of Aluminum foil (thickness: 0.25 mm, length: 10 mm, width: 10mm, used after rinsing with diluted hydrochloric acid, distilled water, and ethanol, respectively) were put into a stainless steel autoclave with a Teflon liner of 30 mL capacity. The autoclave was sealed and heated at 220 $^oC$ for 4 h and then cooled in air to room temperature. The remaining Al foil was taken out and the as-obtained solution was washed with ultrapure water and absolute ethanol for several times. Then it was separated centrifugally. The resultant solid products were obtained through freeze drying.

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**Characterizations:** Transmission electron microscopy (TEM) and high-resolution transmission electron (HRTEM) images were taken on a Tecnai G2 F30 S-Twin high-resolution transmission electron microscope (Philips-FEI Inc.), using an accelerating voltage of 300 kV. Atomic force microscope (AFM) images were recorded on a nanoscope IIIa atomic force microscope with tapping mode. The measurements of C, H, and N elements were performed on a PE 2400II CHNS/O elemental analyzer. X-ray photoelectron spectroscopy (XPS) measurements were carried out with a Thermo ESCALAB 250 X-ray photoelectron spectrometer with an exciting source of Al Kα = 1253.6 eV. Infrared spectra were obtained on a Bruker EQUINOX 55 Fourier transform infrared (FTIR) spectrometer ranged from 4000 to 400 $cm^{-1}$. $^{13}C$ nuclear magnetic resonance (NMR) spectrum was measured on a Bruker 500 MHz spectrometer, using $CDCl_3$ as the solvent. Zeta-potential measurement was carried out on a Zetasizer nano ZS90 (Malvern). UV-visible (UV-vis) absorption spectra of the samples were recorded on a Shimadzu UV2501PC spectrophotometer. Powder X-ray diffraction (XRD) was performed on a Bruker D8 Advance X-ray diffractometer using Cu Kα radiation (λ = 0.15418 nm) at a scanning rate of $8^o$/min in the 2θ range from 10 to $70^o$. The photoluminescence (PL) spectra and quantum yields (QY) were measured on a Fluoromax-4 spectrofluorometer (HORIBA Jobin Yvon Inc.) equipped with an integrating sphere. The imaging of peritoneal macrophages of mice was carried out on a conventional inverted fluorescence microscopy, using Hg lamp as light source equipped with UV, red, and green filters.

**Imaging of peritoneal macrophages of mice:** Four C57BL/6 mice with ages of 6-8 weeks were divided into two groups. A group of mice was supplied with 0.8 mL of N-doped CDs saline through intraperitoneal injection. B group was only provided with the same amount of blank saline. Mice were sacrificed by cervical dislocation after two days, and then they were disinfected by 75% of ethanol solution for 5 min. Subsequently, 8 mL of serum-free Dulbecco's Modified Eagle's Medium (DMEM) culture solution was injected into the abdomens of mice. Standing for about five min, then 4 mL of ascitic fluid was extracted through a syringe under aseptic conditions. After separated centrifugally and washed, they were counted under microscopy. The conventional DMEM (including 10% fetal calf serum, penicillin 100U/mL, streptomycin 100 μg/mL) was used to adjust the cells to desired concentration about $10^5$/mL. The cells were cultured in 6-well cell culture plate in $CO_2$ gas incubator at 37 $^oC$ and 5% of $CO_2$. In order to remove a small quantity of non-adherent cells, the DMEM culture solution was changed after 12 h. After another 12 hours' culture, the cells were imaged and observed on a conventional inverted fluorescence microscopy equipped with different filters.

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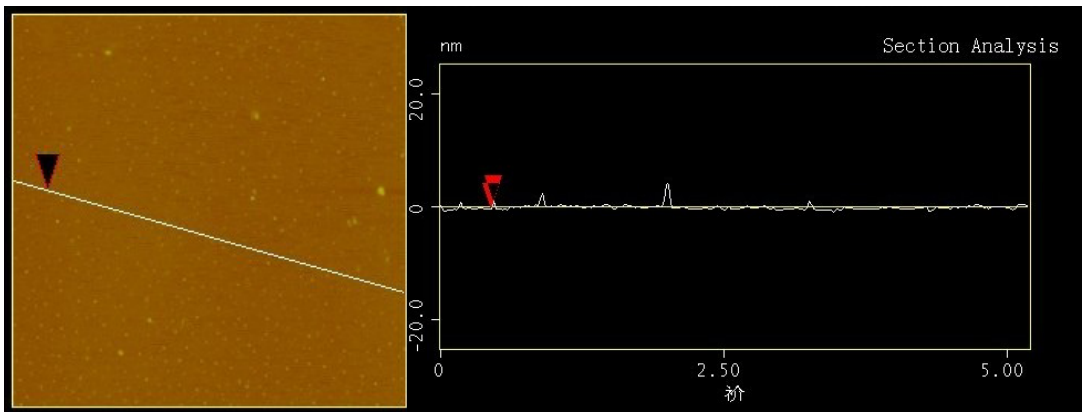


**Figure S1**. AFM analysis of sample 1.

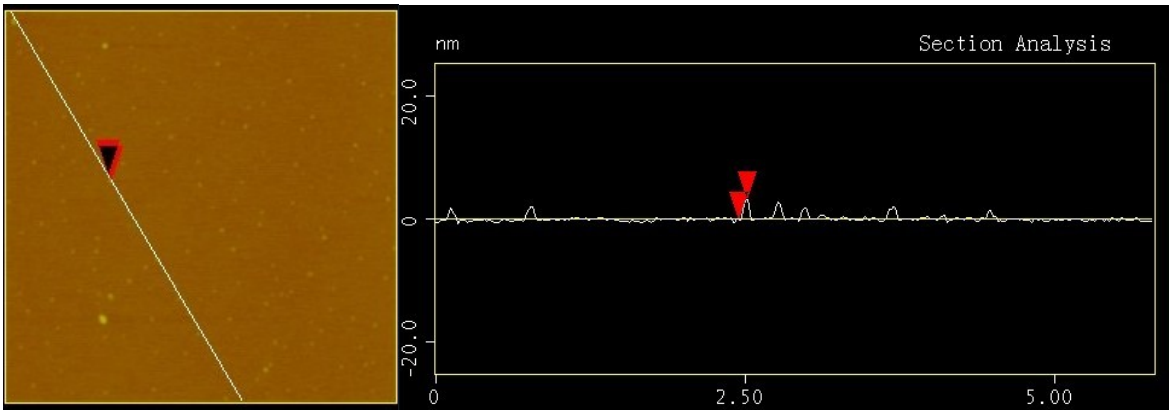


**Figure S2**. AFM analysis of sample 2.

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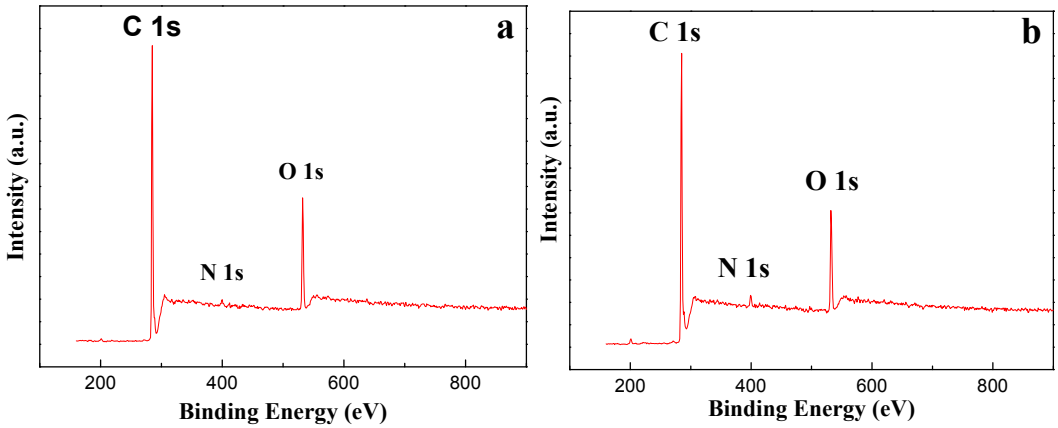


**Figure S3.** XPS survey of sample 1 (a) and 2 (b).

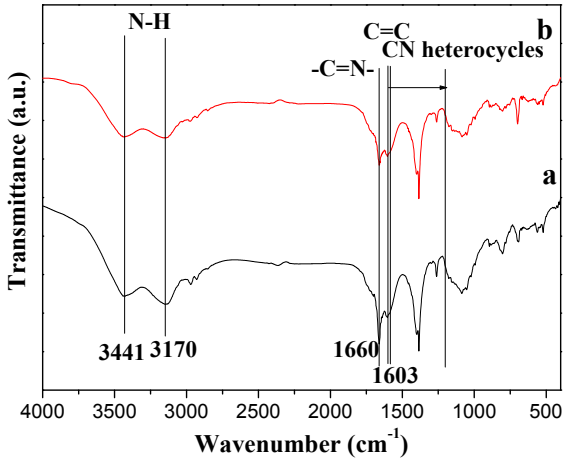


**Figure S4**. FTIR spectra of sample 1 (a) and 2 (b).

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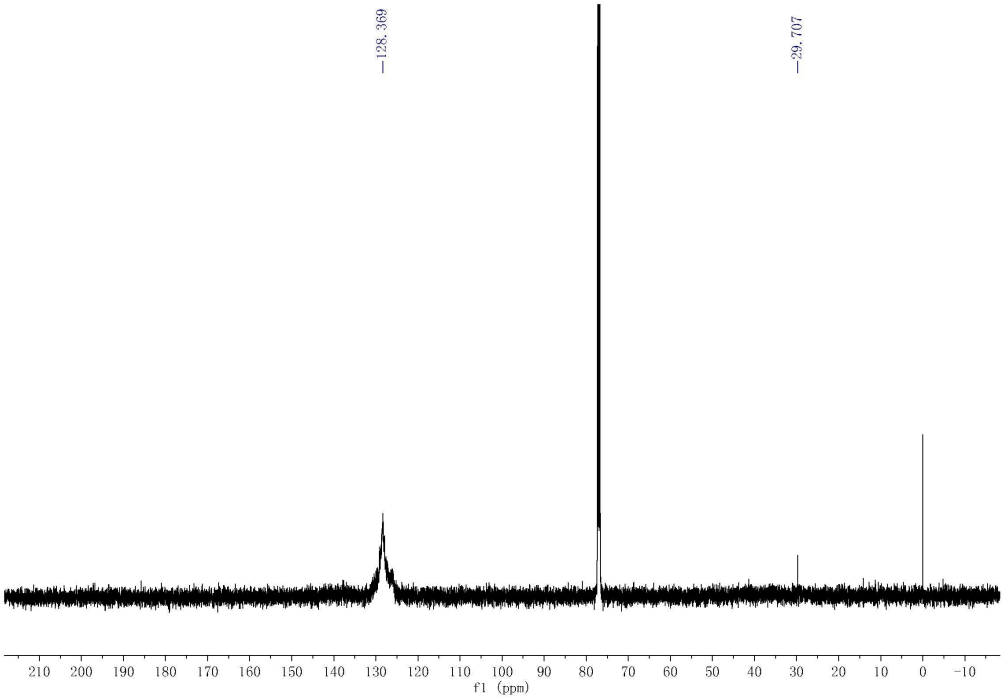


**Figure S5**. $^{13}C$ NMR spectrum of sample 2 in $CDCl_3$.

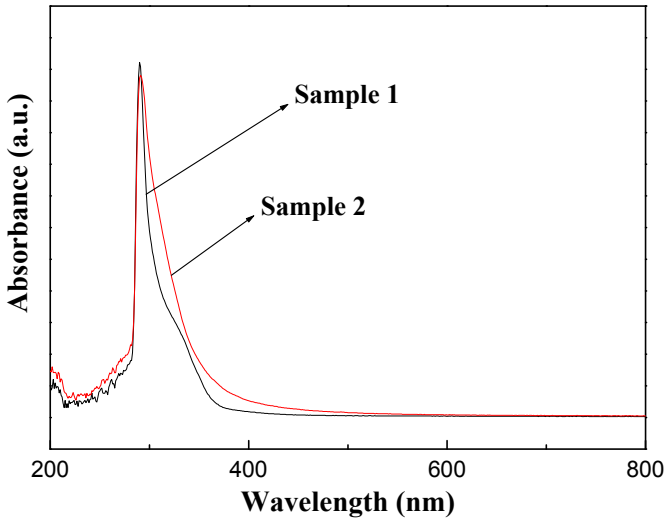


**Figure S6**. UV-vis absorption spectra of sample 1 and 2.

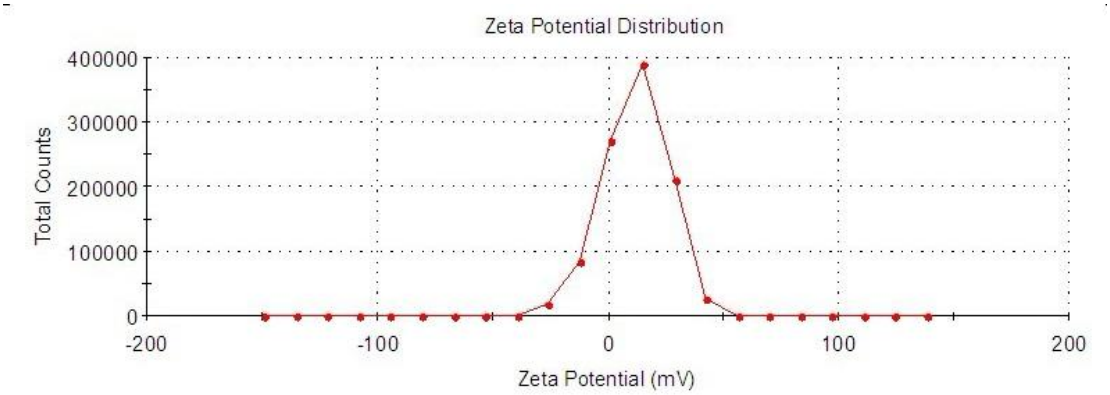


**Figure S7**. Zeta potential of sample 2 measured in near neutral water.

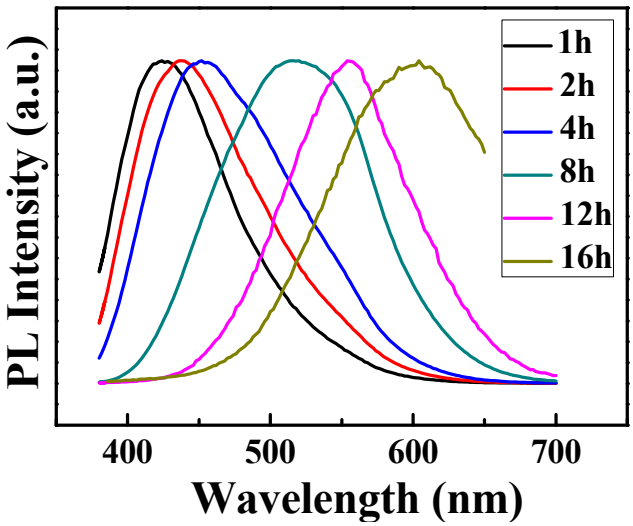


**Figure S8**. The normalized PL emission spectra of the samples respectively obtained at 200 $^{o}$C for 1, 2, 4, 8, 12, and 16 h excited at wavelength of 365 nm.

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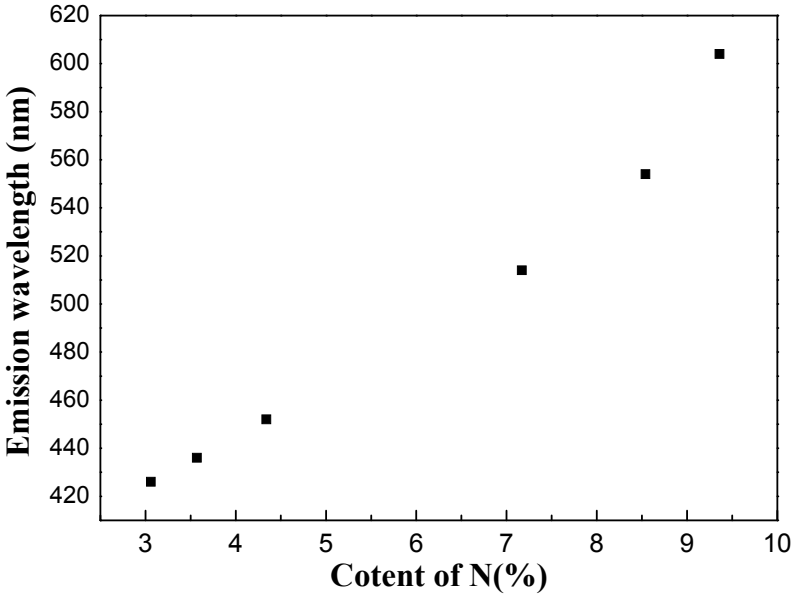


**Figure S9**. Content of N-emission wavelength curve of the samples respectively obtained at 200 $^{o}$C for 1, 2, 4, 8, 12, and 16 h excited at wavelength of 365 nm.

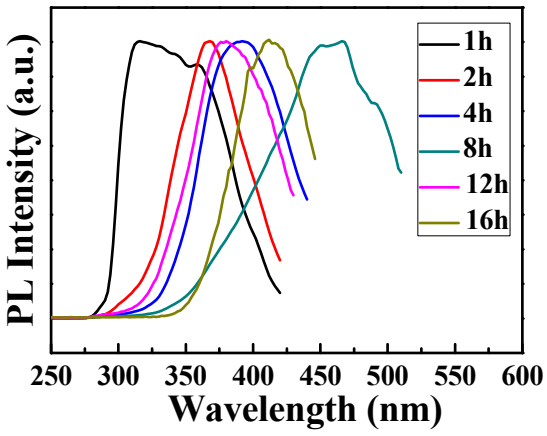


**Figure S10**. The normalized PL excitation spectra of the samples respectively obtained at 200 $^{o}$C for 1, 2, 4, 8, and 12 h monitored at corresponding maximum emission wavelength.

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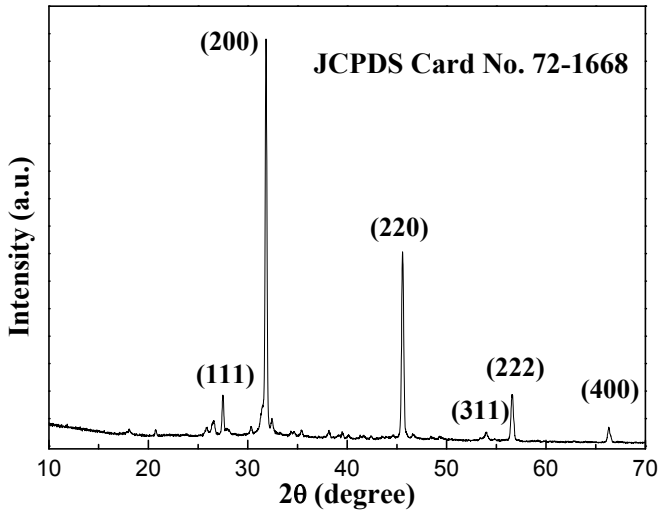


**Figure S11**. XRD pattern of the products obtained without washing.

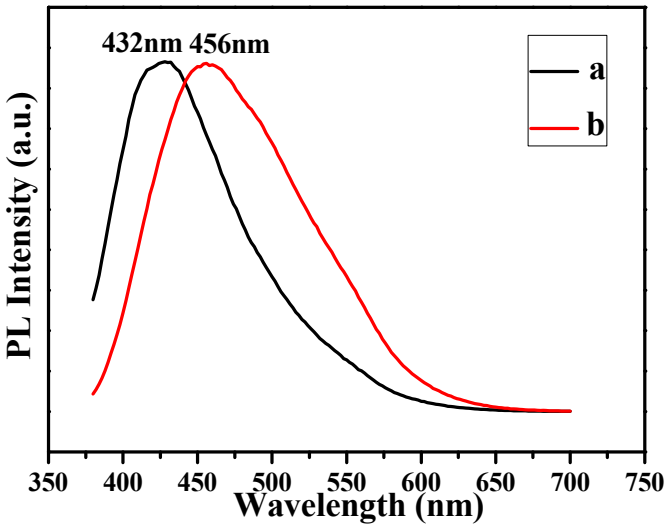


**Figure S12**. PL emission spectra of the samples synthesized at different reaction conditions: (a) 1 h, 1 g of $NaNH_2$, (b) 4 h, 0.5 g of $NaNH_2$.

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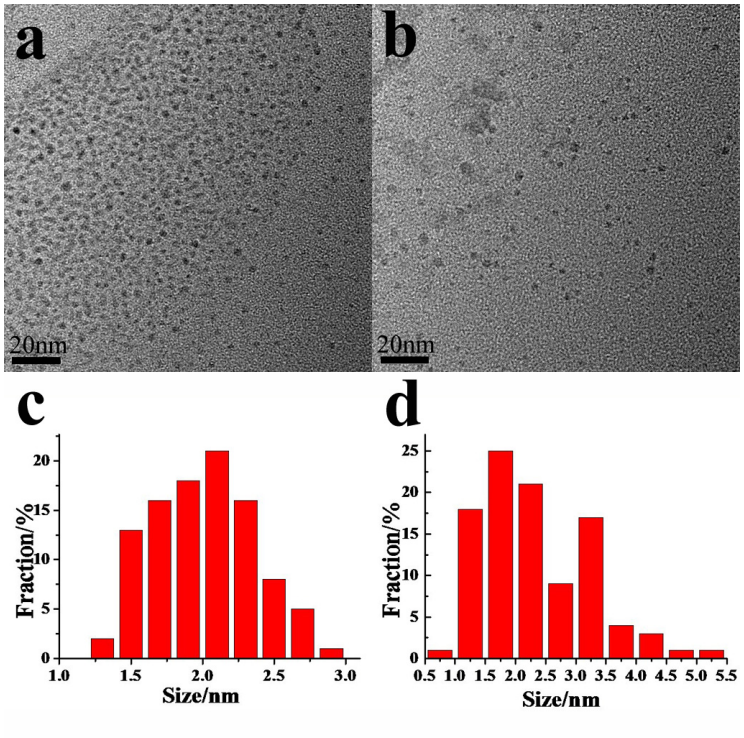


**Figure S13**. TEM images and corresponding particles size distribution of the samples obtained at different reaction conditions: (a, c) 1 h, 1 g of $NaNH_2$, (b, d) 4 h, 0.5 g of $NaNH_2$.

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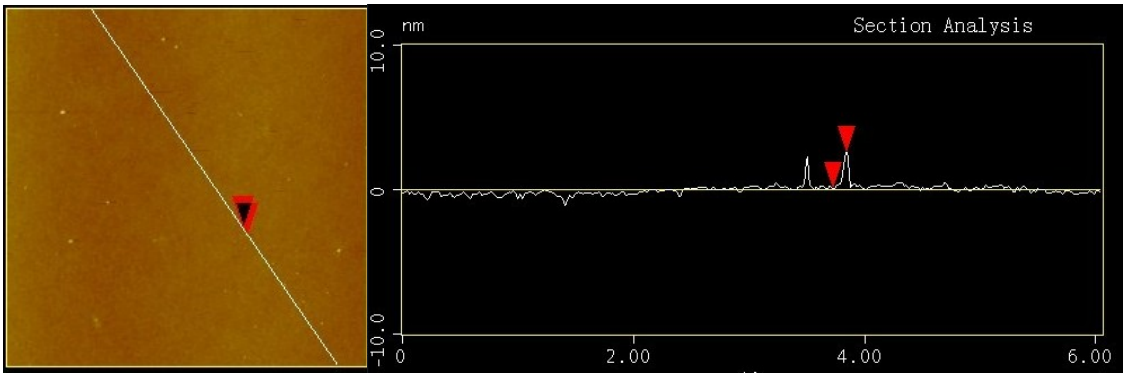


**Figure S14**. AFM analysis of the as-synthesized C.

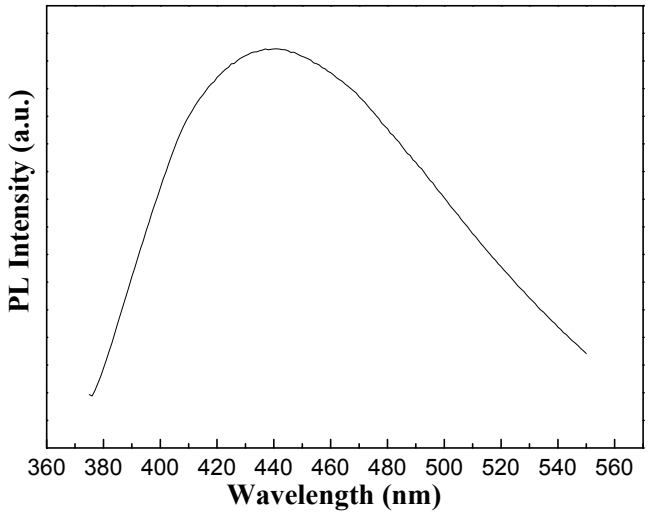


**Figure S15**. PL emission spectra of C dots under excitation of 365 nm wavelength.

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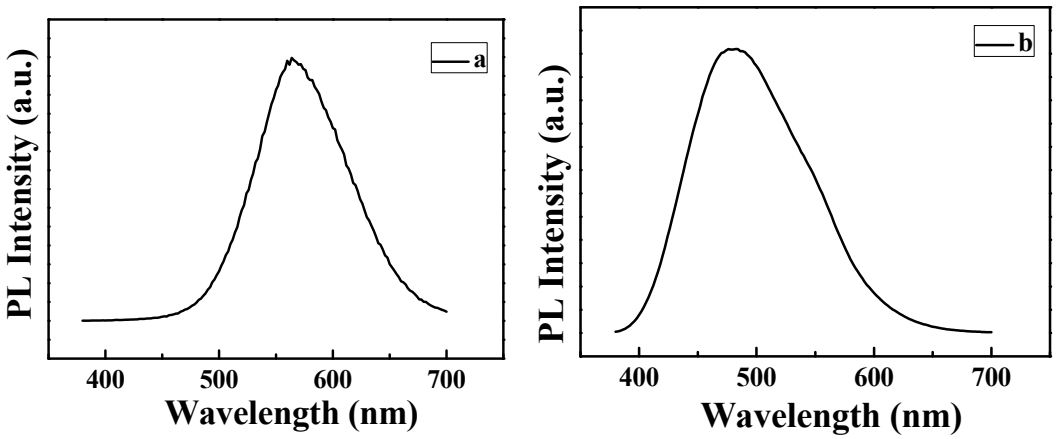


**Figure S16**. PL emission spectra of the samples excited at 365 nm: (a) B-doped carbon dots and (b) S-doped carbon dots.

**Figure S17**. Optical photographs of the samples (from left to right, S-doped carbon dots and B-doped carbon dots) illuminated under daylight (top) and UV light (365 nm, bottom).

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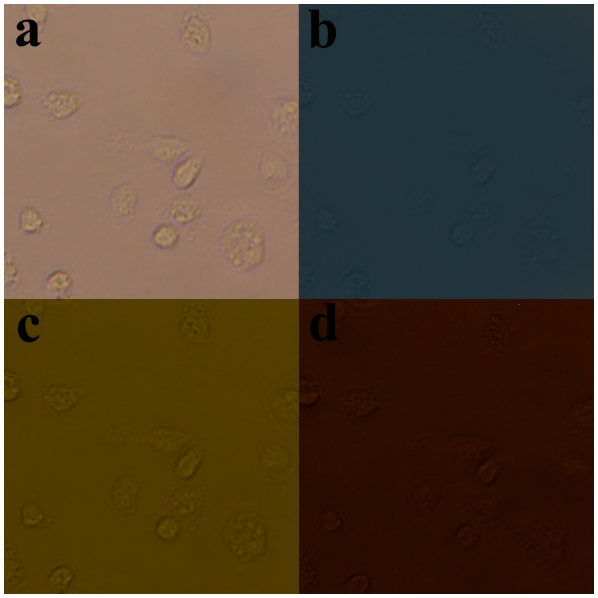


**Figure S18.** The peritoneal macrophages of mice treated without N-doped CDs were imaged under bright field (a), UV light (b), blue light (c), and green light excitation (d), respectively.

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***Table* 1.** The C, H, N content of the samples synthesized at different reaction conditions

| Sample | $CCl_4$ (mL) | $NaNH_2$ (g) | Reaction Time (h) | C (wt %) | H (wt %) | N (wt %) | Quantum Yield[a] | Quantum Yield[b] |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0.5 | 1 | 81.83 | 6.94 | 3.06 | 3.50% | 3.50% |
| 2 | 1 | 0.5 | 8 | 86.84 | 5.05 | 7.17 | 13.40% | 22.4% |
| 3 | 1 | 0.5 | 2 | 82.08 | 6.51 | 3.57 | 9.40% | 10.9% |
| 4 | 1 | 0.5 | 4 | 86.46 | 6.01 | 4.34 | 13.20% | 13.8% |
| 5 | 1 | 0.5 | 12 | 87.12 | 3.18 | 8.54 | 10.30% | 11.7% |
| 6 | 1 | 0.5 | 16 | 87.36 | 2.16 | 9.36 | 11.30% | 12.7% |
| 7 | 1 | 1 | 1 | 88.14 | 5.84 | 3.41 | 3.70% | 3.70% |

[a] Quantum yields of all the samples measured at the same excitation wavelength of 365 nm. [b] Quantum yields of all the samples measured under the strongest emission conditions, which were excited at 365, 380, 375, 379, 408, 412, and 365 nm, respectively.