

## Supporting Information

### Synthesis of Colour-Tunable Tannic Acid-Based Carbon Dots for Multicolour/White Light-Emitting Diodes

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## Materials

Tannic acid (99.0%), ethanol (99.7%), *o*-phthalaldehyde (98.0%), *m*-phthalaldehyde (98.0%), *p*-phthalaldehyde (98.0%), potassium carbonate are provided by Shanghai Titan Science Co., Ltd. Unless otherwise stated, all reagents are used as is and no further purification is required.

## Methods

Transmission electron microscopy (TEM) images was carried out using a FEI Tecani G2 F20 operating at an acceleration voltage of 200 kV. UV-vis spectra were recorded with a Shimadzu UV-2600 spectrometer. Fluorescence measurements were collected using a Shimadzu fluorescence spectrophotometer RF-6000. QYs of the obtained three CDs were determined by a relative method. The Fourier transform infrared (FT-IR) spectra were obtained in transmission mode on a Thermal Scientific Nicolet iS5 spectrometer (Waltham, MA, USA) with the KBr pellet technique, and 8 scans at a resolution of 1 cm<sup>-1</sup> were accumulated to obtain one spectrum. X-ray photoelectron spectroscopy (XPS) was investigated by using K-Alpha spectrometer with a mono X-Ray source Al K $\alpha$  excitation (1486.6 eV). Binding energy calibration was based on C1s at 284.7 eV. Use HORIBA Scientific LabRAM HR Evolutio for Raman analysis. A 290 nm (<1 ns) and a 485 nm (<200 ps) nano-LED light source were used to excite the samples. CIE chromaticity coordinate was measured by KONICA MINOLTA CS-150 colorimeter. QYs of the obtained three CDs were determined by a relative method. Specially, quinine sulfate (QY = 55% in 0.1 M H<sub>2</sub>SO<sub>4</sub>) was selected as the reference for the blue emission, rhodamine 6G (QY = 95% in ethanol) for the green emission, and rhodamine B (QY = 56% in ethanol) for the red emission.

## Synthesis of R-CDs, G-CDs and B-CDs

*o*-Phthalaldehyde or *p*-phthalaldehyde (0.30 g), tannic acid (0.70 g), and potassium carbonate (0.10 g) were dissolved in 10 mL ethanol and then transferred to a polytetrafluoroethylene lined autoclave. The red or green fluorescent suspension were obtained when it was heated in 180 °C oven for 5 hours and naturally cooled to room temperature. In addition, using only tannic acid as the raw material, blue fluorescent suspension was obtained by the same method. The crude products were purified by silica gel column chromatography and the eluent was a mixture of dichloromethane and ethanol. The process was repeated three times to remove excess impurities and unreacted precursors, and finally three purified products of R-CDs, G-CDs and B-CDs were obtained.

## Preparation of CDs-LEDs

1.0 mg CDs were mixed with 4.0 mL epoxy resin thoroughly, and then the mixture was drop-casted on the chip for the red LED. The mixture is horizontal and smooth on the surface of the chip without bubble doping. The chip was placed in an oven at 80 °C for 3 hours. Finally, for fabricating the LED device, the UV chip (emission wavelength at 365 nm) was fixed on a LED base.

## Supporting Figures

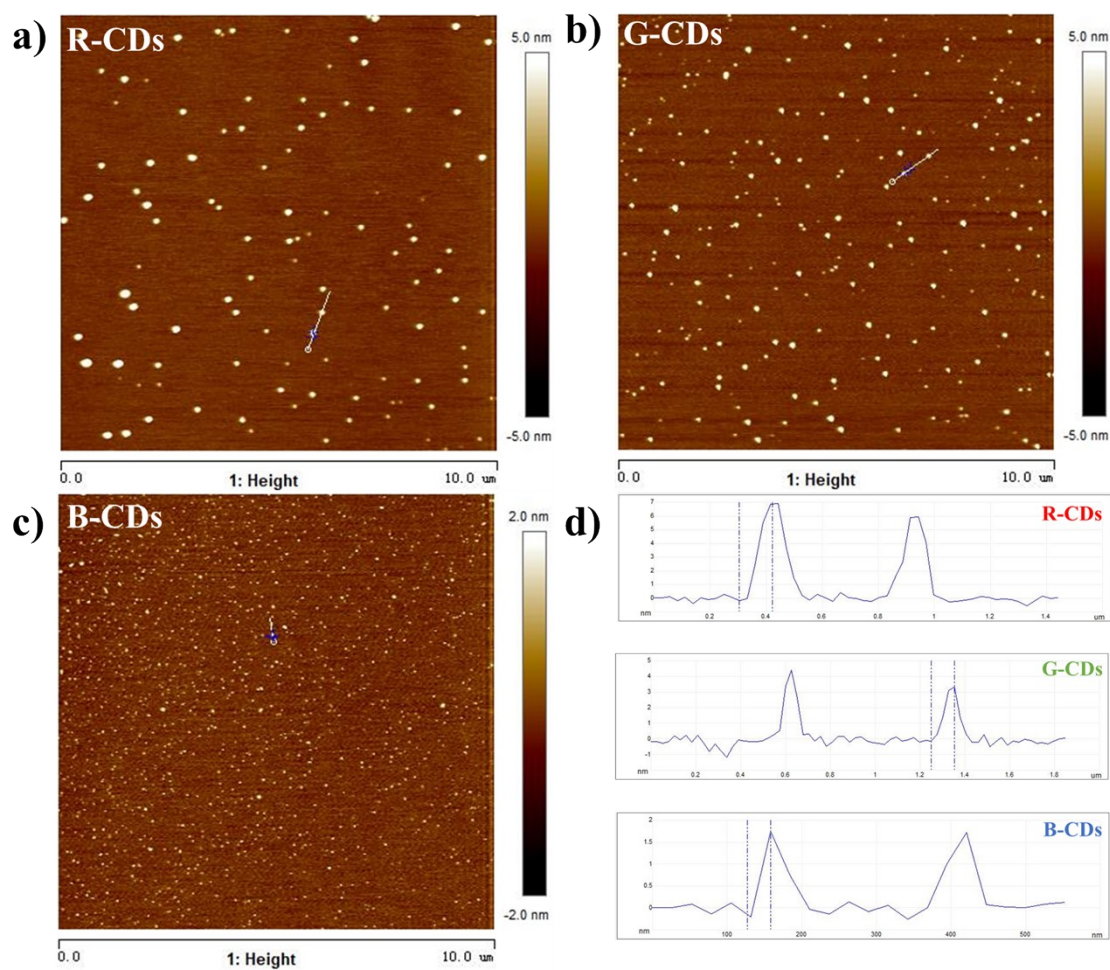


Fig. S1 AFM height images of a) R-CDs, b) G-CDs and c) B-CDs. d) Cross-sectional analysis of these carbon dots along the white lines.

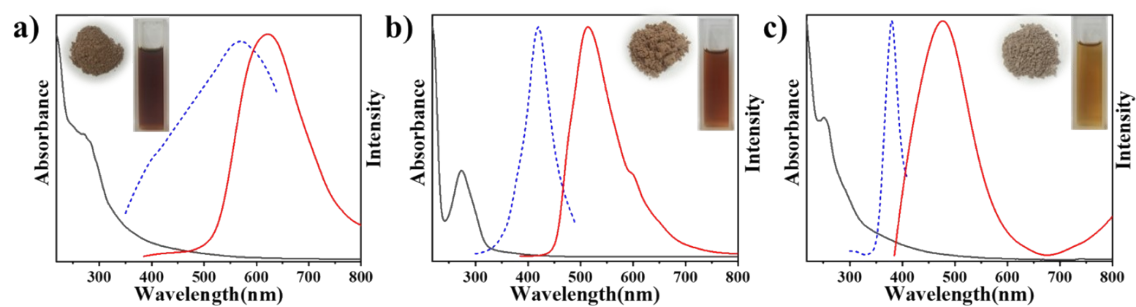


Fig. S2 UV-vis spectra (black solid line), PL excitation spectra (blue dotted line), and PL emission spectra (red solid line,  $\lambda_{\text{ex}} = 365 \text{ nm}$ ) of a) R-CDs, b) G-CDs, and c) B-CDs. The illustrations show their powders and ethanol solution.