Supporting Information

High photoluminescent carbon based dots with tunable emission color from orange to green

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Experimental Section:

Chemicals: CA (99.9%), RhB (AR) and (3-[4, 5-dimethylthiazol-2-yl]-3, 5-diphenyltetrazolium bromide (MTT) were obtained from Sigma–Aldrich and used as received. Other reagents were of analytical grade and used as received without further purification. Deionized (DI) water was used throughout the experiment.

Synthesis of CDs and C-CDs: CDs were prepared through thermal treatment of the mixture of citric acid with RhB. In a typical CDs synthesis procedure, 1 g of CA and 0.2 g of RhB (only 1g CA was used for the synthesis of control CDs) were dissolved in 5 mL deionized water then evaporation until dry at 80 °C for 24 h. Subsequently, the resulted purple-red viscous syrup was heated hydrothermally in a Teflon-equipped stainless steel autoclave at 220 °C, 250 °C or 280 °C for 16 h. Then the deep color syrup products were neutralized with dilute ammonia solution. Finally, all the obtained materials were purified by dialyzing against DI water through a dialysis bag (retained molecular weight: 3.5 kDa) for a week to remove the residual organic molecules.

Characterization: TEM and HRTEM images were taken by a Tecnai G2 F20S-TWIN electronic microscope at an operation voltage of 200 kV. AFM images were measured by an atomic force microscopy (Nanoman, Veeco, Santa Barbara, CA) using tapping mode. XRD patterns were obtained from a Rigaku D/max-3C (Japan) using Cu Ka radiation. FTIR spectra were measured on a FT-IR spectrophotometer (Thermo Nicolet 360). UV/Vis spectra were obtained by a UV/Vis spectrophotometer (Lambda 750). All PL spectra were obtained by a spectrophotometer (F 4600). The PL decays were recorded a Fluorescence Steady State and TCSPC Fluorescence Lifetime Spectro-Fluorimeter (FLS920, Edinburgh Instruments, UK). Cell images were carried out by a confocal laser scanning microscopy (LSM 510 META, Carl Zeiss, Germany). Mass spectrometry analysis was measured using an Exactive Plus mass spectrometer.

Cell Viability Assay: The viability and proliferation of cells in the presence of CDs were evaluated using 3-[4,5-dimethylthialzol-2-yl]-2,5-diphenyltetrazolium bromide (MTT) assay. In brief, MCF-7 cells were seeded into 96-well plates at a density of 1×10^4 per well in 200 μL of media and grown overnight. The cells were then incubated with various concentrations of CD (or RhB) sample for 24 h. Following the incubation, cells were incubated in media containing 0.5 mg/mL of MTT for 4 h. Afterwards, the MTT solution was removed and the precipitated violet crystals were dissolved in 200 μL of DMSO. The absorbance was measured at 570 nm using a BioTek microplate reader.

Cell imaging: Cells were seeded at a density of 1×10^4 cells/cm^2 onto poly-L-lysine (0.1 mg/mL) coated coverslips for cell attachment overnight. The cells were then incubated with 200 ug/mL CD sample. After 3 hours, the cells were washed three times with PBS and the PL images were acquired by confocal laser scanning microscopy.

Table S1. Excitation wavelength and PLQY of the three kinds of CDs.

Luminophor	RhB	CDs_{220}	CDs_{250}	CDs_{280}
Ex (nm)	552	554	520	500
PLQY (%)	31.0 (known)	24.2	24.5	21.2

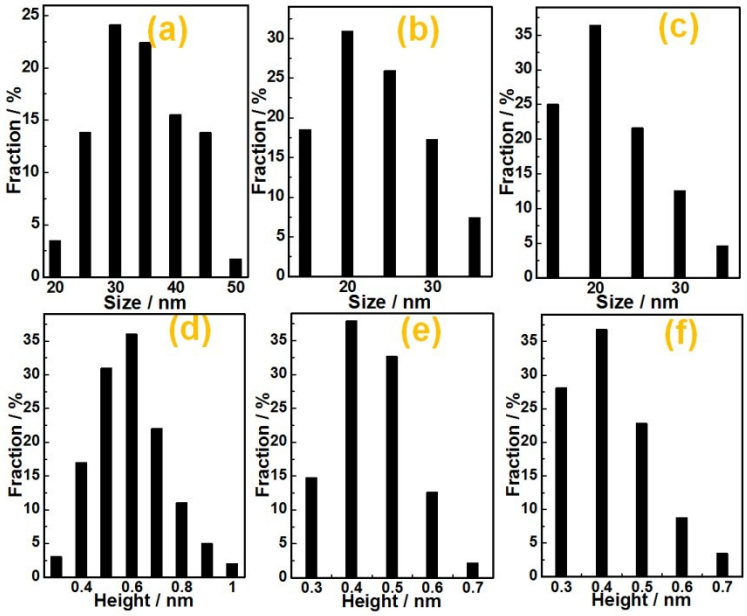

Figure S1. Lateral size distribution of (a) CDs_{220}, (b) CDs_{250} and (c) CDs_{280}; height distribution of (d) CDs_{220}, (e) CDs_{250} and (f) CDs_{280}.

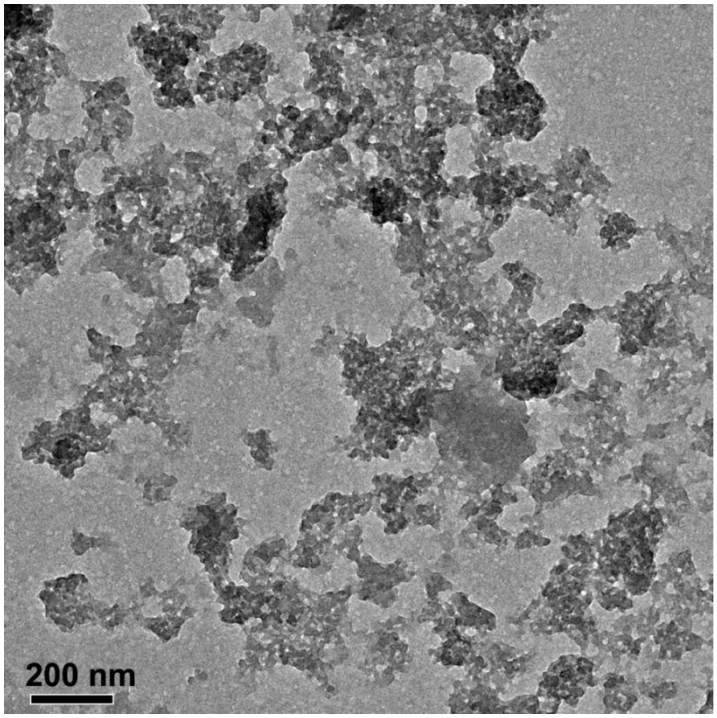

Figure S2. TEM of CDs synthesized at 300 °C using 1 g of CA and 0.2 g of RhB as the precursor.

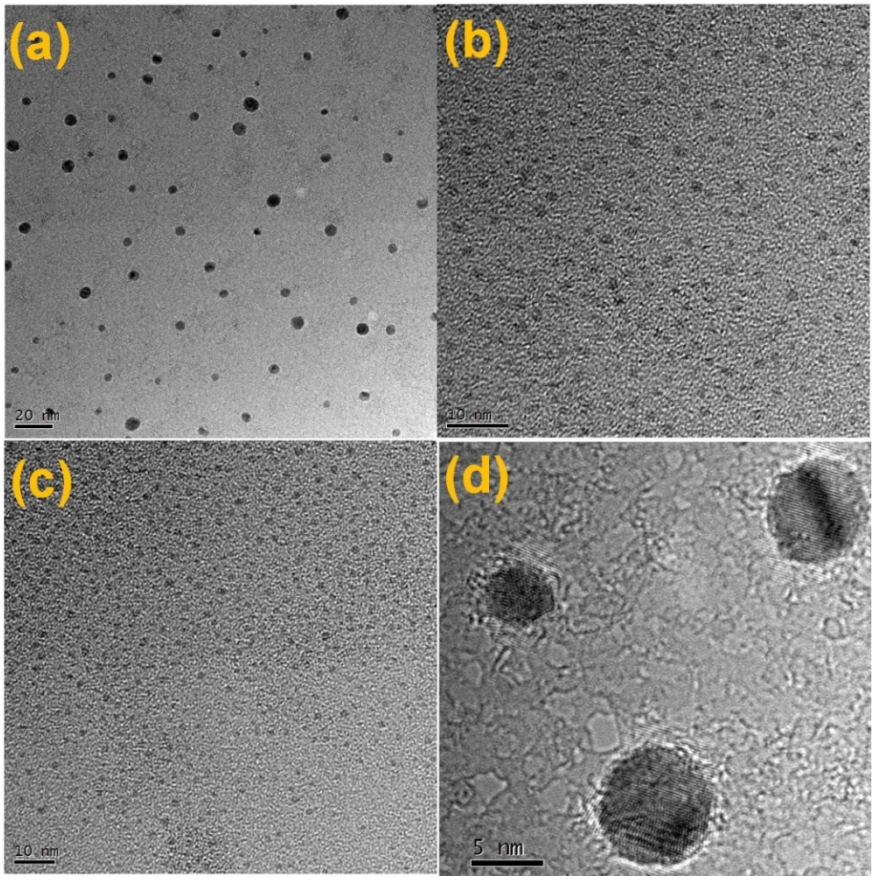

Figure S3. TEM images of (a) C-CDs$_{220}$, (b) C-CDs$_{250}$ and (c) C-CDs$_{280}$ and HRTEM image of (d) C-CDs$_{220}$.

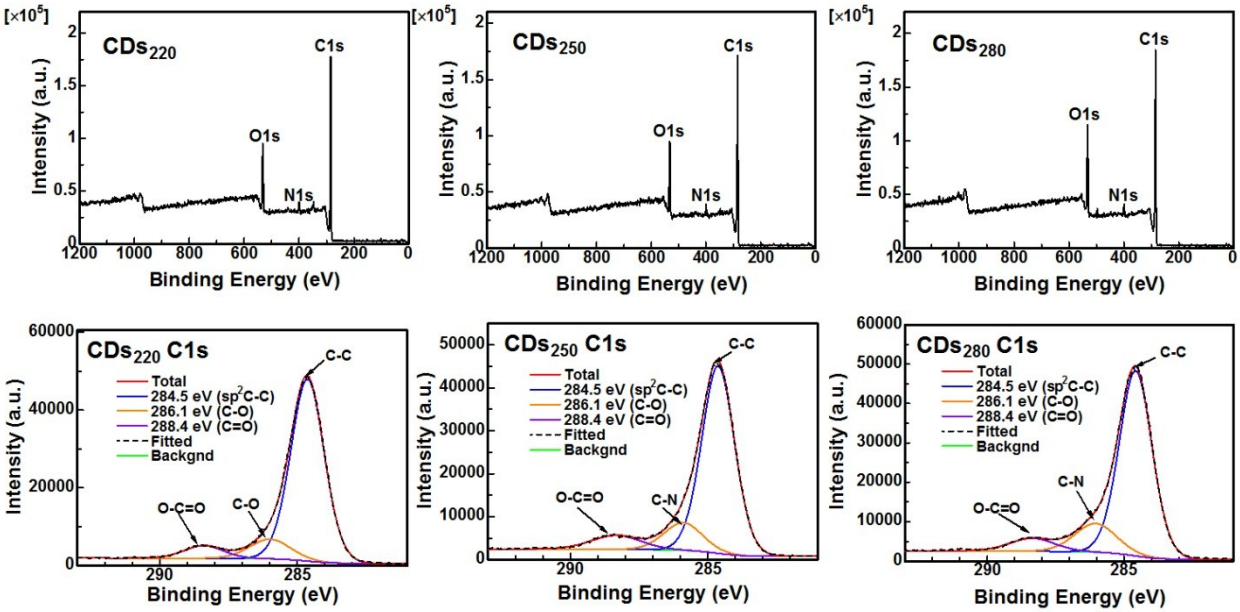

Figure S4. XPS and high resolution XPS C1s spectra of the three kinds of CDs.

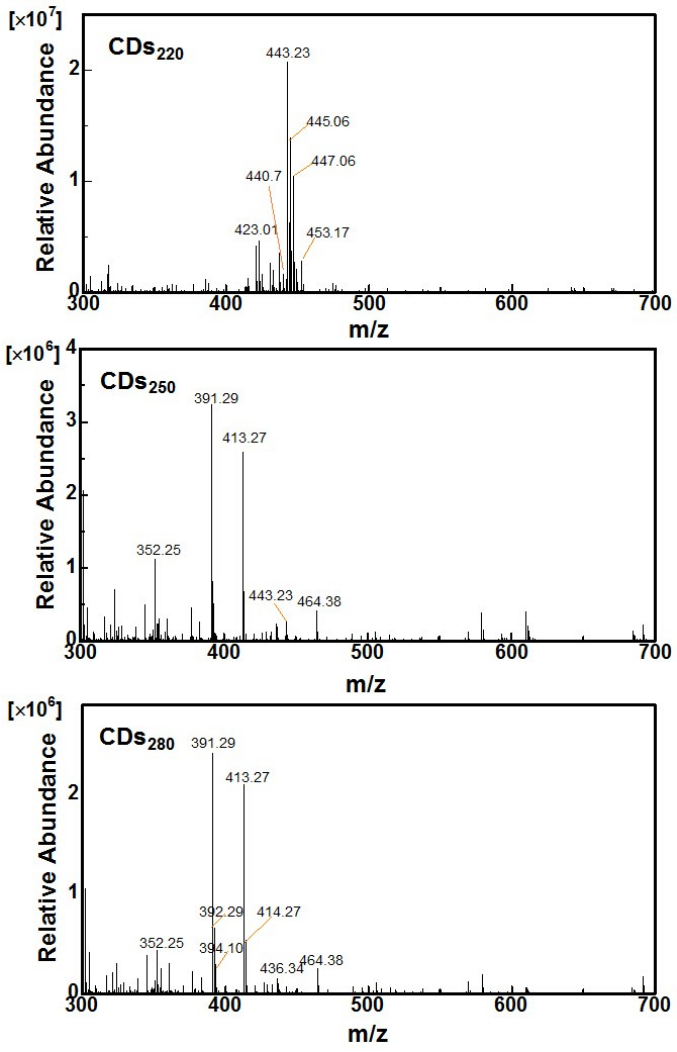

Figure S5. MS spectra of the three kinds of CDs.

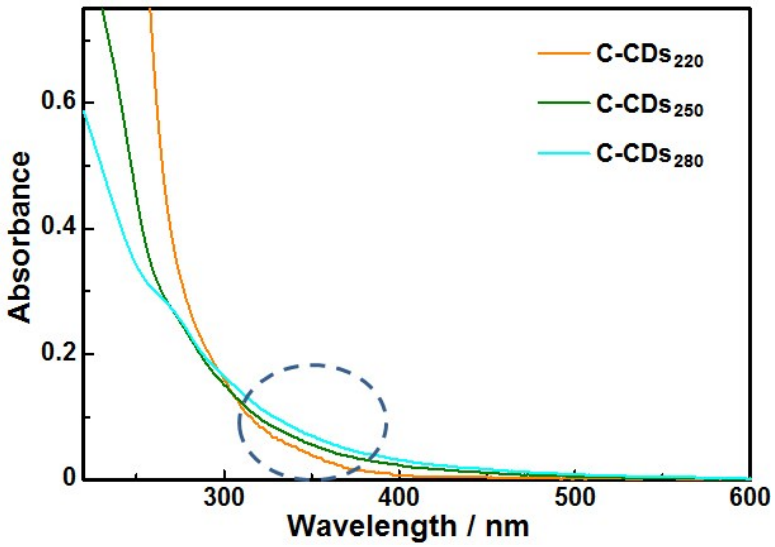

Figure S6. UV-vis spectra of (a) C-CDs$_{220}$, (b) C-CDs$_{250}$ and (c) C-CDs$_{280}$.

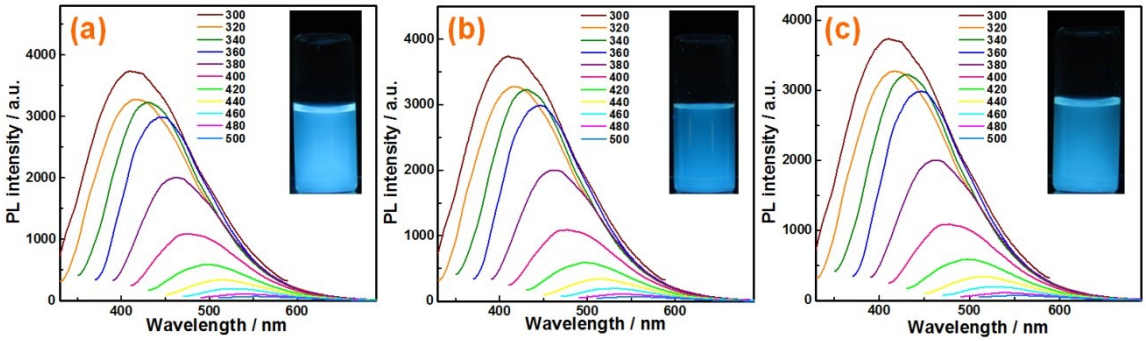

Figure S7. PL spectra of (a) C-CDs$_{220}$, (b) C-CDs$_{250}$ and (c) C-CDs$_{280}$. Insets are the photographs of the corresponding CDs under illumination 365 nm UV light.

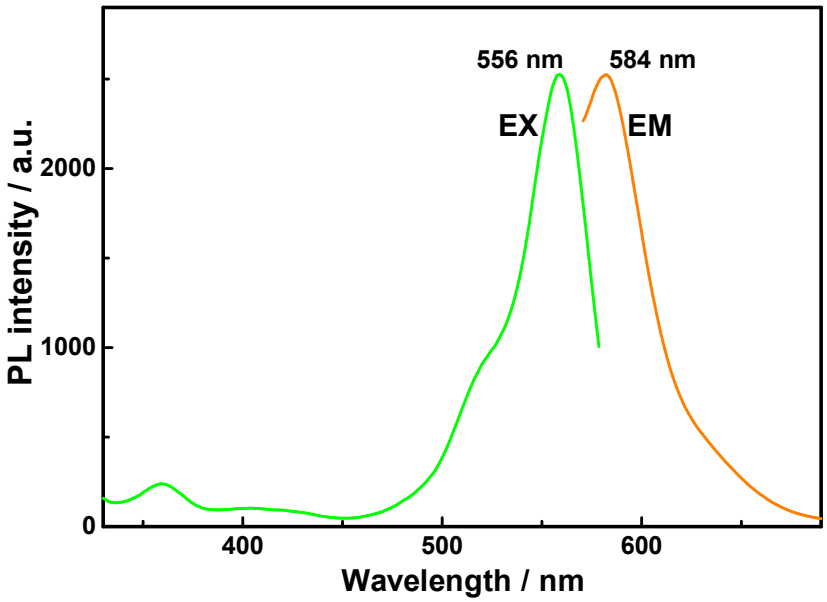

Figure S8. PL spectra of RhB in aqueous solution.

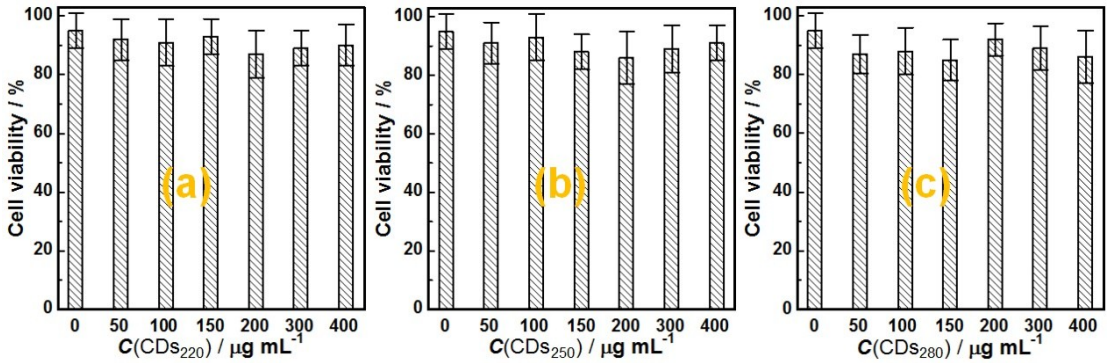

Figure S9. Cell viability assay with human breast cancer cell different concentration of CDs_{220} (a), CDs_{250} (b) and CDs_{280} (c).

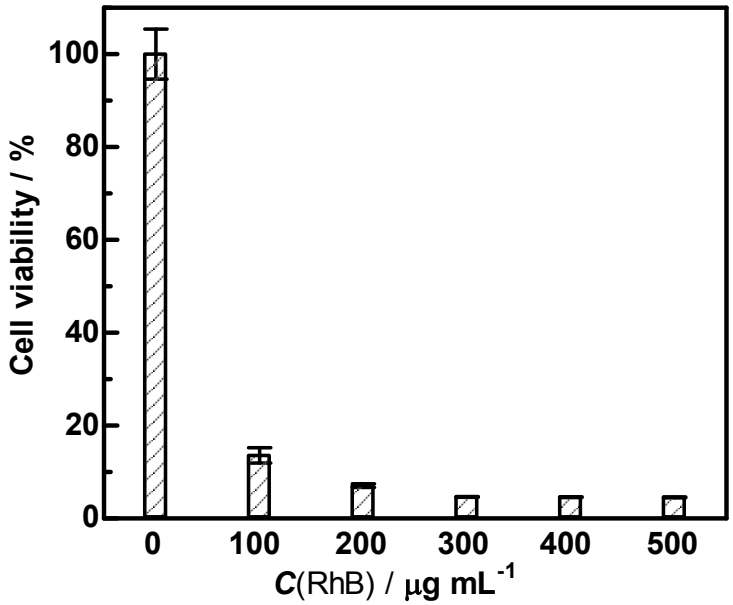

Figure S10. Cell viability assay with human breast cancer cell different concentration of RhB.