Electronic Supporting Information

Materials

Glycerol, glycol, glucose, sucrose, NaCl, Na_2SO_4, NaH_2PO_4, Na_2HPO_4, $CaCl_2$, $AlCl_3$, $CuSO_4$, NaOH and H_2SO_4 were obtained from Beijing Chemicals Inc. (Beijing, China). All these chemicals were of analytical reagent grade and were used without further purification.

Preparation of carbon dots

70% glycerol, 70% glycol, 20% glucose or 20%sucrose was mixed with different concentration of inorganic salts. The solution was then put into a domestic microwave oven (750 W) and heated for different time periods. Finally the color-changed solutions were purified and diluted with water.

Instruments

UV-Visible absorption spectra were recorded on a Jasco V-550 spectrometer. Fluorescence spectra were measured on a Jasco FP6500 spectrofluorometer and appropriate blank spectrum was subtracted. FT-IR characterization was carried out on a BRUKE Vertex 70 FTIR spectrometer (2 cm^{-1}). Fluorescence lifetime was measured with a Lecroy Wave Runner 6100 digital oscilloscope (1 GHz) using a 355 nm laser (Continuum Sunlite OPO with pulse width = 4 ns) as an excitation source. Atomic-force microscopy (AFM) measurements were performed using Nanoscope V multimode atomic force microscope (Veeco Instruments, USA) and tapping mode was used to acquire the images under ambient conditions.

Quantum yield measurement

The quantum yield of carbon dots was calculated by comparing the integrated fluorescence intensities (excited at 360 nm) and the absorbance values at 360 nm of carbon dots with quantum yield standard. Quinine sulfate in 0.1 M H_2SO_4 (literature quantum yield: 58%) was chose as the reference. Quantum yield can be calculated using:

$$Q = Q_R(\frac{Grad}{Grad_R})(\frac{n^2}{n_R^2})$$

where *Grad* is the gradient obtained from the plot of the integrated fluorescence intensity vs. absorbance and *n* is the refractive index The subscript *R* refers to the reference fluorophore of known quantum yield. In order to minimize re-absorption effects absorbencies in the 1 cm fluorescence cuvette were kept under 0.05 at the excitation wavelength.

Cell Labeling Assay

The 293T cells were cultured in Iscove's modified Dulbecco's medium supplemented with 10% fetal calf serum in culture discs at 37 °C incubator with 5% CO_2. Carbon dots were administered into the cell culture. After an incubation of 24 h, cells were washed two times with 1×PBS BUFFER and the fluorescence images were captured using an Olympus BX-51 optical system microscope (Tokyo, Japan) with an Olympus EVOLT E-500 digital camera.

E. coli DH5α cells were grown in LB liquid medium at 37 ^{o}C overnight and

subsequently washed twice with 1×PBS buffer. The cell concentration was adjusted to optical density at 600 nm around 0.5 and carbon dots were administered to PBS cell suspension. The mixture was kept at 37 ^{o}C, 200 rpm for 24 h. A drop of this suspension was placed in a glass slide for imaging experiment and the images were recorded with an Olympus BX-51 optical system microscope (Tokyo, Japan).

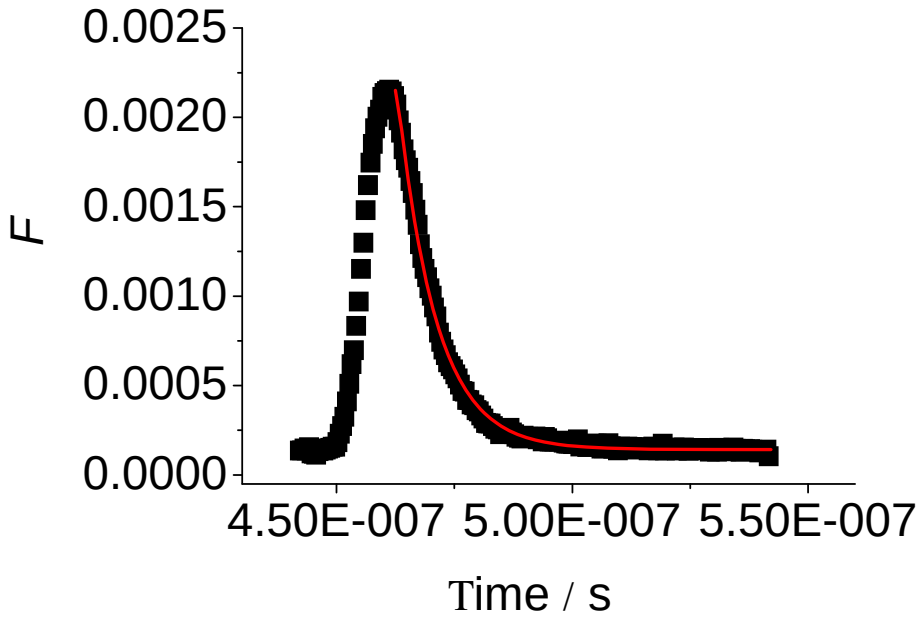

Figure S1. Photoluminescence decay curve of carbon dots in water. A single exponential fit gives a lifetime of 8.00 ± 0.07 ns. Luminescence lifetime was measured with a Lecroy Wave Runner 6100 digital oscilloscope (1 GHz) using a 355 nm laser (Continuum Sunlite OPO with pulse width = 4 ns) as an excitation source.

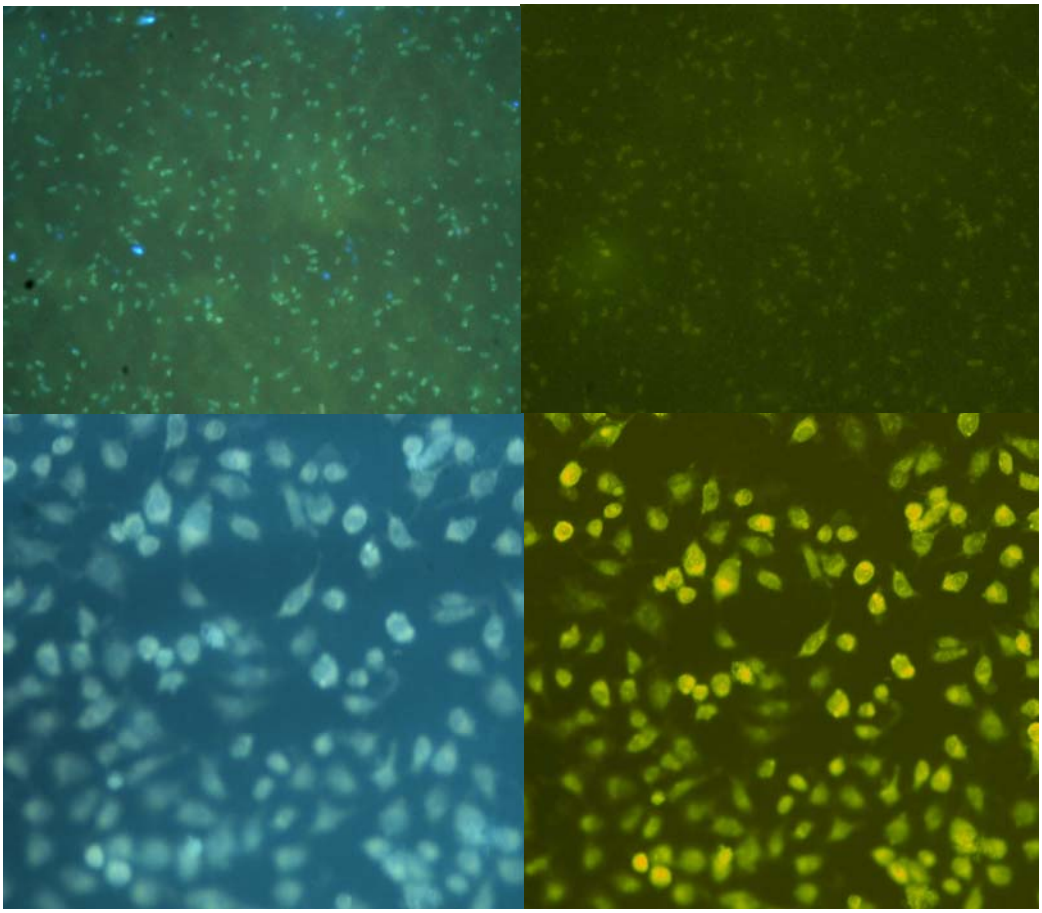

Figure S2. Photoluminescence images of *E. coli* DH5α cells (upper panel) and 293T cells (lower panel) labeled with the carbon dots. Left panel: excitation by UV light (330-385 nm); Right panel: excitation by blue light (450-480 nm).

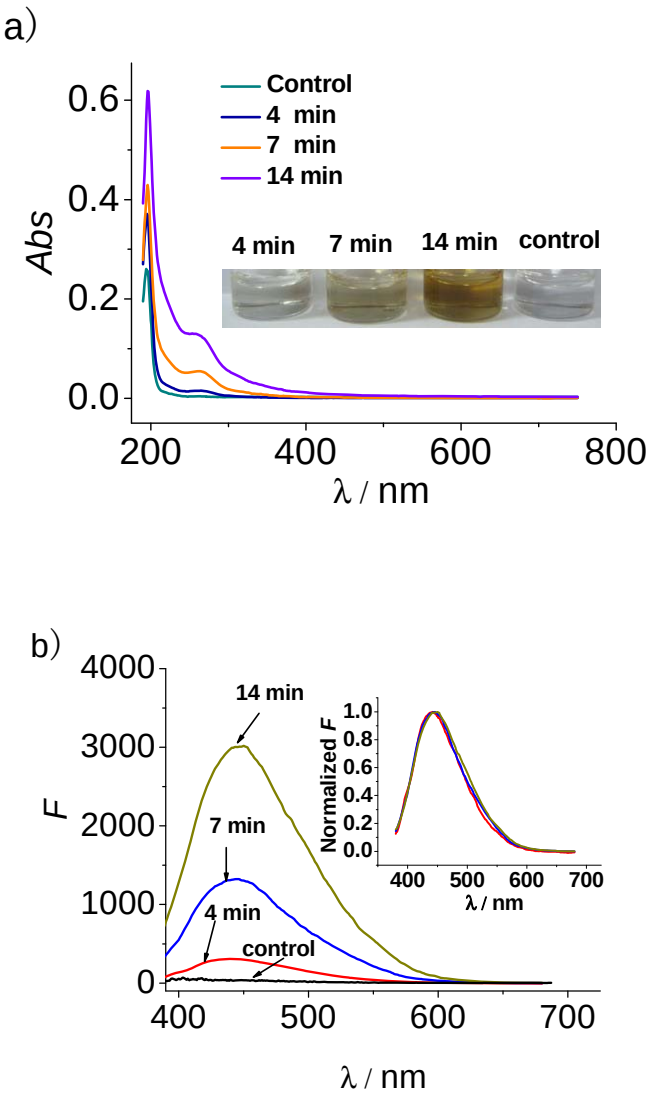

Figure S3. Absorption spectra (a) and photoluminescence emission spectra excited at 360 nm (b) of carbon dots synthesized by 70% glycerol in the presence of 7.1 mM phosphate with different times of microwave pyrolysis. The samples are diluted 100 fold with water and recorded on a spectrometer or fluorescence spectrometer. Control refers to the resulting product of 70% glycerol after 20 min microwave treatment in the absence of phosphate. The insets show the photograph of the as prepared carbon dots (a) and the normalized fluorescence emission spectra of carbon dots when excited at 360 nm (b).

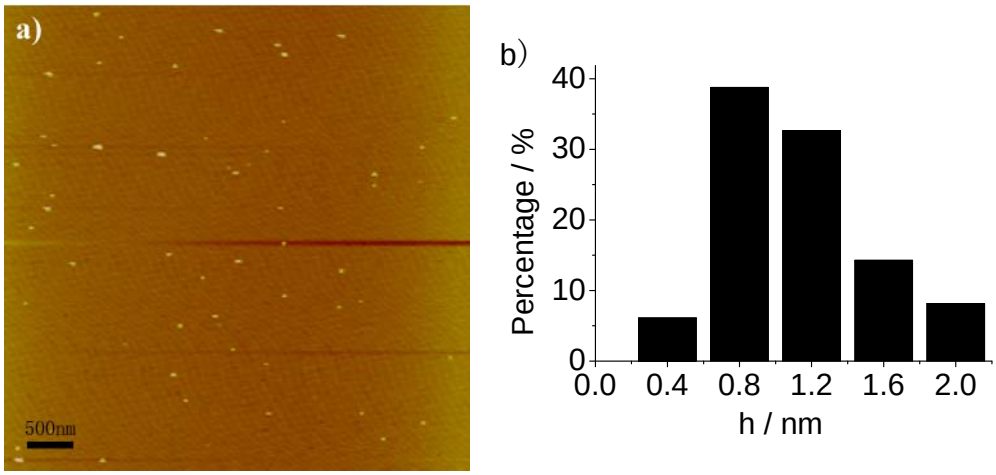

***Figure* S4** AFM characterization of carbon dots synthesized by 70% glycerol in the presence of 7.1 mM phosphate with 7 min. (a) Representative AFM image; (b) height analysis.

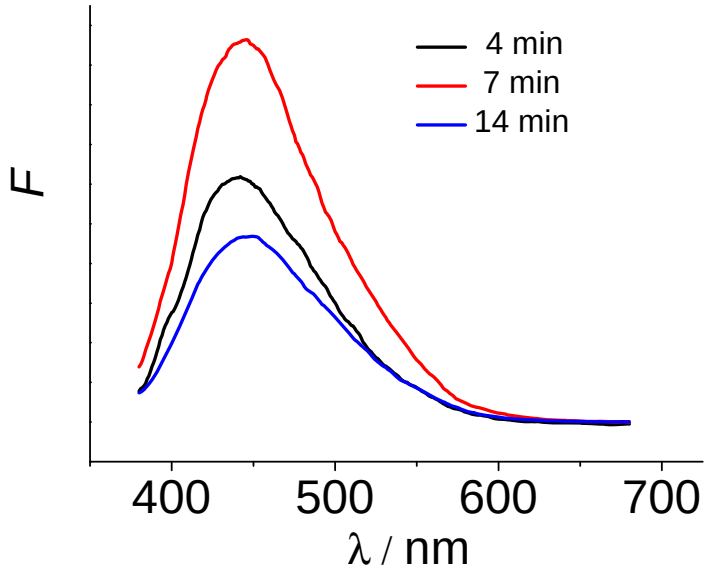

Figure S5 Photoluminescence emission spectra (λ_{ex} = 360 nm) of carbon dots normalized to the absorbance at 360 nm. Microwave synthesis conditions: 70% glycerol, 7.1 mM phosphate, 4, 7 or 14 min.

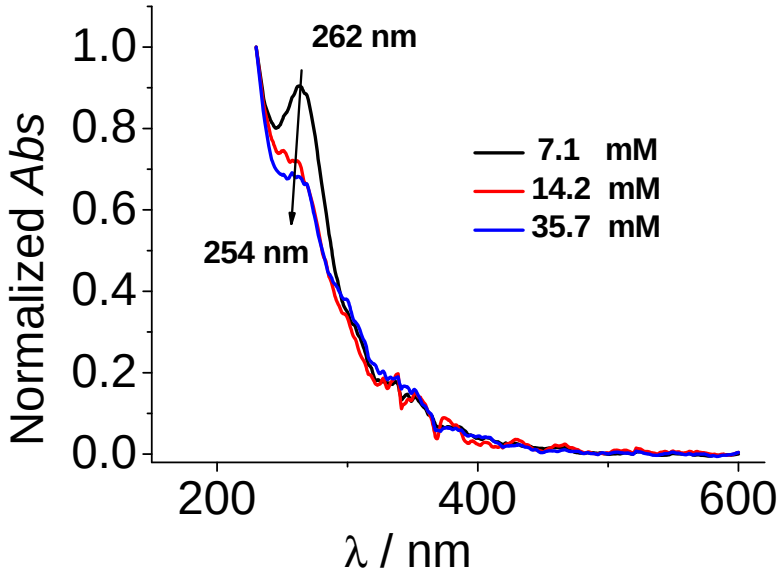

Figure S6. Normalized absorption spectra of carbon dots synthesized by 70% glycerol in the presence of different amounts of phosphate salt with 12 min microwave treatment.

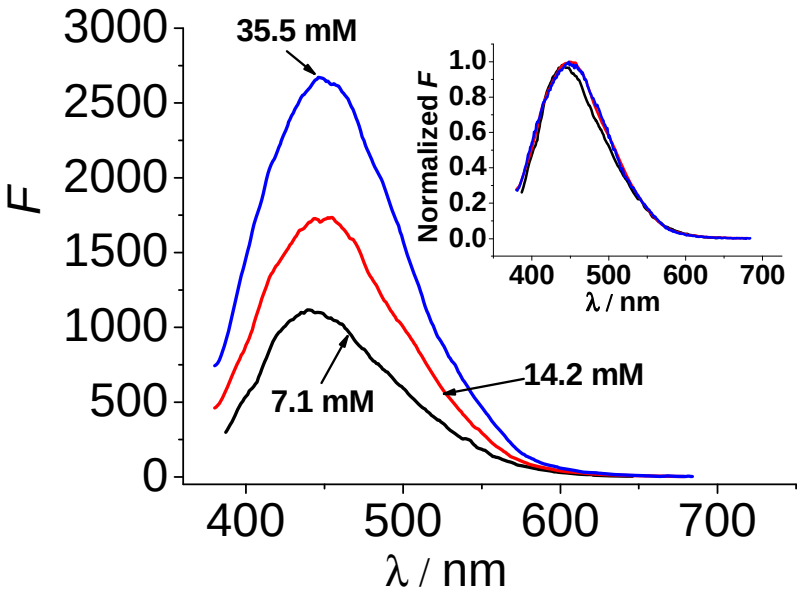

Figure S7. Photoluminescence emission spectra (λ_{ex} = 360 nm) of carbon dots normalized to the absorbance at 360 nm. Microwave synthesis conditions: 70% glycerol, 7.1, 14.2 or 35.5 mM phosphate, 12 min. Inset: normalized photoluminescence emission spectra.

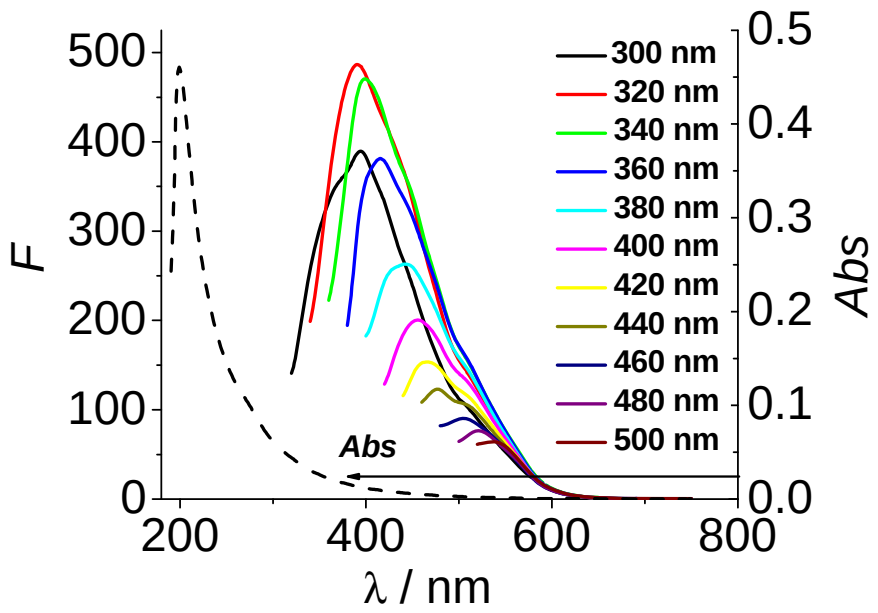

Figure S8. UV-Visible absorption spectrum and photoluminescence emission spectra (with progressively longer excitation wavelengths from 300 nm to 500 nm in 20 nm increment) of carbon dots (microwave pyrolysis condition: 70% glycerol, 10 mM $CuSO_4$, 9 min).

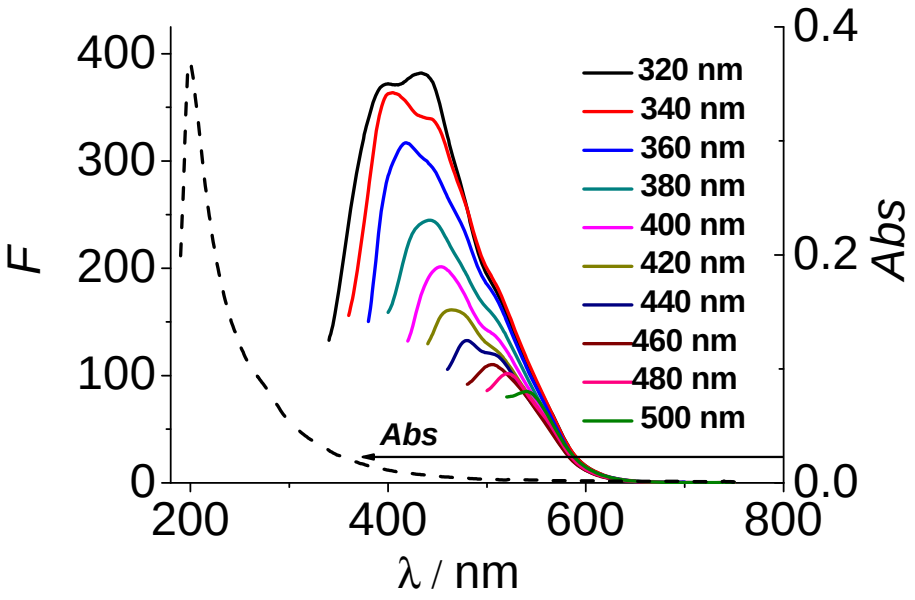

Figure S9. UV-Visible absorption spectrum and photoluminescence emission spectra (with progressively longer excitation wavelengths from 320 nm to 500 nm in 20 nm increment) of carbon dots (microwave pyrolysis condition: 70% glycerol, 5 mM H_2SO_4, 8 min). By selecting quinine sulfate as the standard and 360 nm as the excitation wavelength, the photoluminescence quantum yield was measured and calculated to be 7.7%.

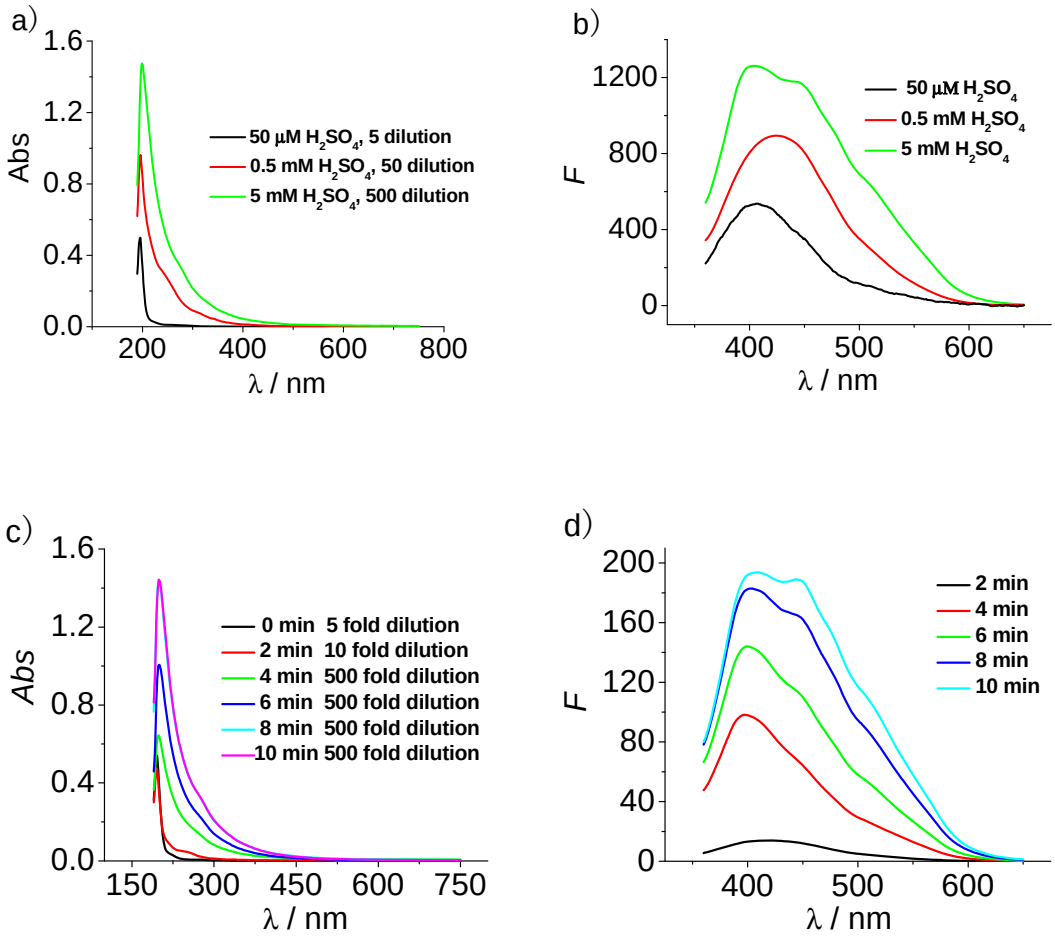

Figure S10. (a, b), Absorption spectra (a) and photoluminescence emission spectra (E_x = 340 nm) normalized to the absorbance (b) of carbon dots synthesized by 70% glycerol in the presence of different amounts of H_2SO_4 with 8 min of microwave pyrolysis. (c, d), Absorption spectra (c) and photoluminescence emission spectra (E_x = 340 nm) normalized to the absorbance (d) of carbon dots synthesized by 70% glycerol in the presence of 5 mM H_2SO_4 with different time of microwave pyrolysis.

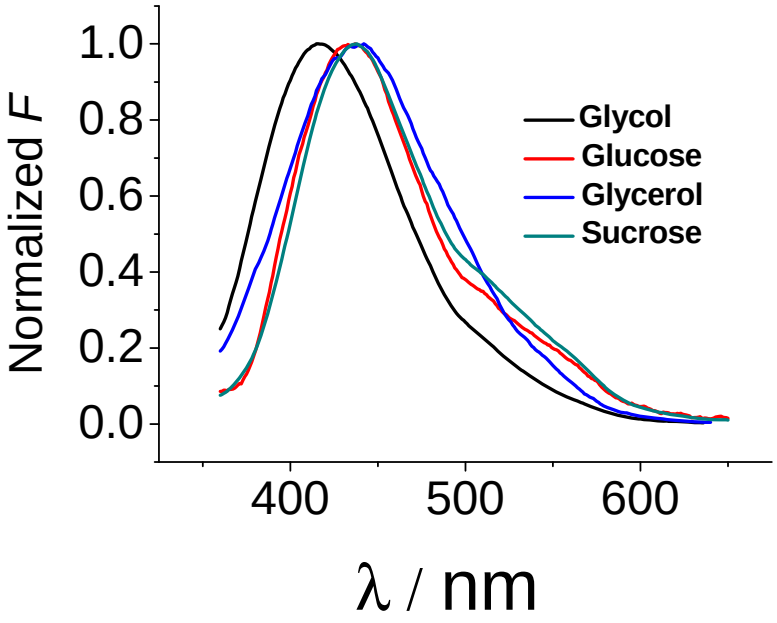

Figure S11. Normalized photoluminescence emission spectra (E_x = 340 nm) of carbon dots synthesized from different carbohydrate starting materials.