Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supplementary Information

Carbon dots-silica composite nanoparticle: A excitation-independent fluorescence material with tunable fluorescence

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1. Experimental details for cytotoxicity assay

HEK-293T cells (human embryonic kidney cells, normal cells) were cultured in Dulbecco's modified Eagle's medium (DMEM) supplemented with 10% FBS (fetal bovine serum), penicillin (100 U mL^{-1}) and streptomycin (100 mg mL^{-1}) in a humidified atmosphere with 5% CO_2 at 37 °C.

The cytotoxicity assay of SCDs against HEK-293T cells were assessed by the standard MTT assay. Typically, HEK-293T cells were seeded at a density of 8×10^3 cells per well and incubated in 96-well plates for 24 h to allow cell attachment. Then the cells were treated with SCDs at various concentrations and incubated for 48 h at 37 °C. Next, 20 μL of MTT solution (5 mg mL^{-1} in phosphate buffer) was replaced with fresh DMEM containing MTT (5 mg mL^{-1}), and the cells were incubated for another 4 h. Then, the supernatant was removed, and 150 μL of dimethyl sulfoxide (DMSO) was added to each well to dissolve the formazan. The absorbance was monitored at 570 nm using a spectrophotometer after 10 min of incubation. Each data point was collected by averaging that of five wells, and the untreated cells were used as controls. Percentage cell viability was calculated by comparing the absorbance of the control cells to that of treated cells.

2. Supplementary figures

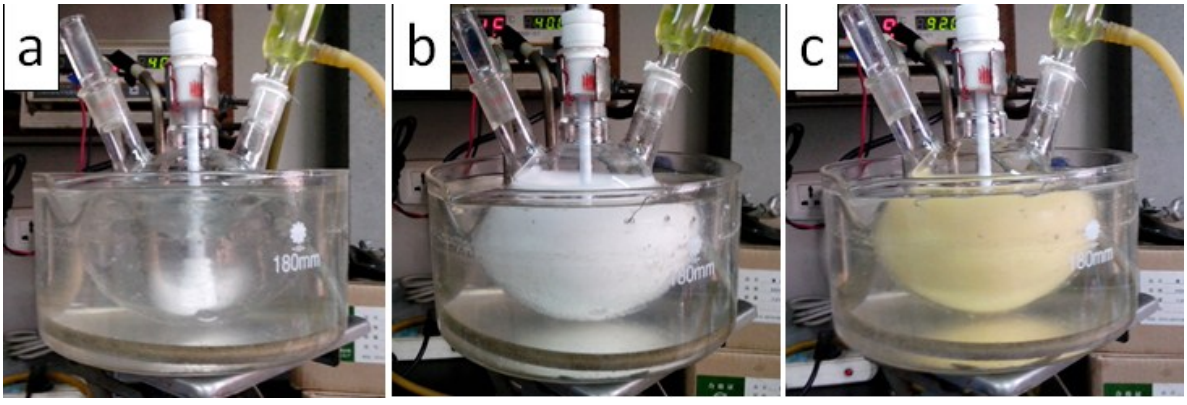

Figure S1. Photographs of synthesis process of SCDs. Captured immediately after TEOS added (a), 3 h later (b), and heated to reflux for 3 h (c).

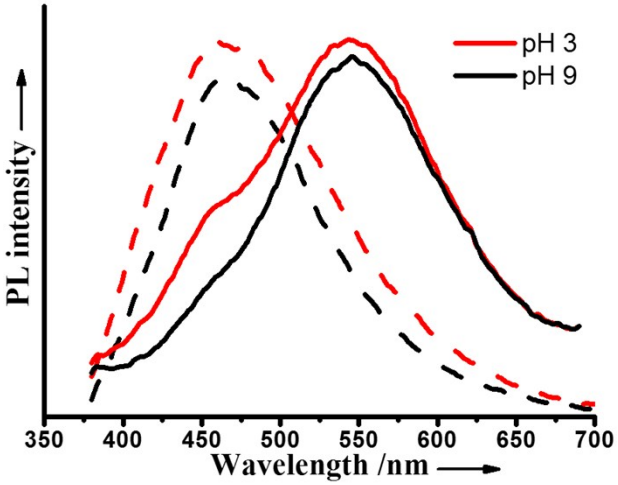

Figure S2. pH stability measurements for CDs (dash) and $SCDs^{0.1}$ (solid).

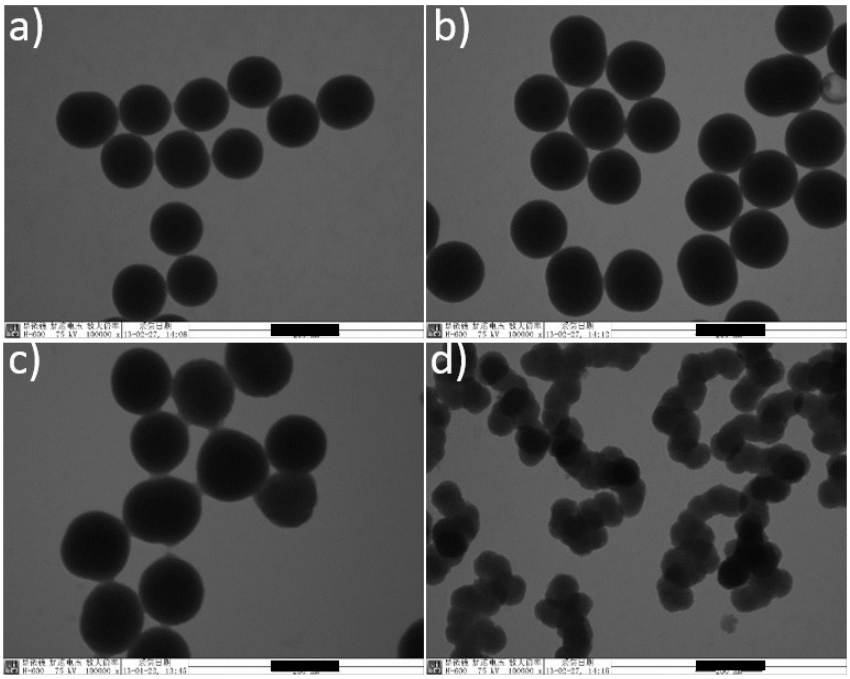

Figure S3. TEM images of SCDs with different volume of EDA and H_2O. 0.10 mL EDA (a), 0.25mL EDA (b), 1.0 mL EDA (c) and 1.0 mL H_2O (d). Scale bar: 200 nm.

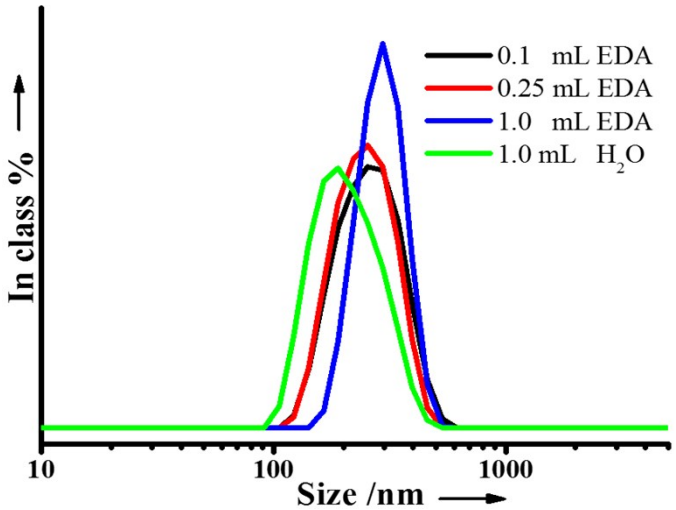

Figure S4. Hydrodynamic size distribution for SCDs with different volume of EDA and H_2O.

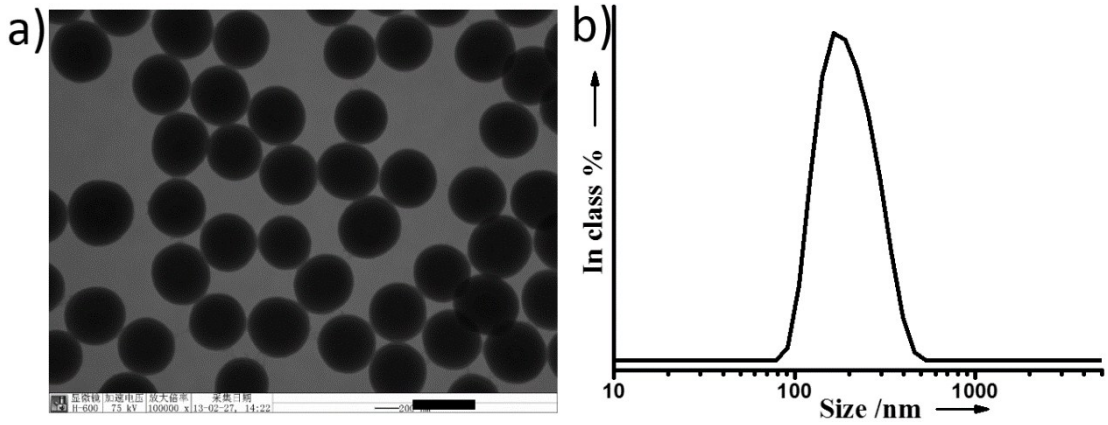

Figure S5. TEM image (a) and hydrodynamic size distribution (b) of BSNs. Scale bar: 200 nm.

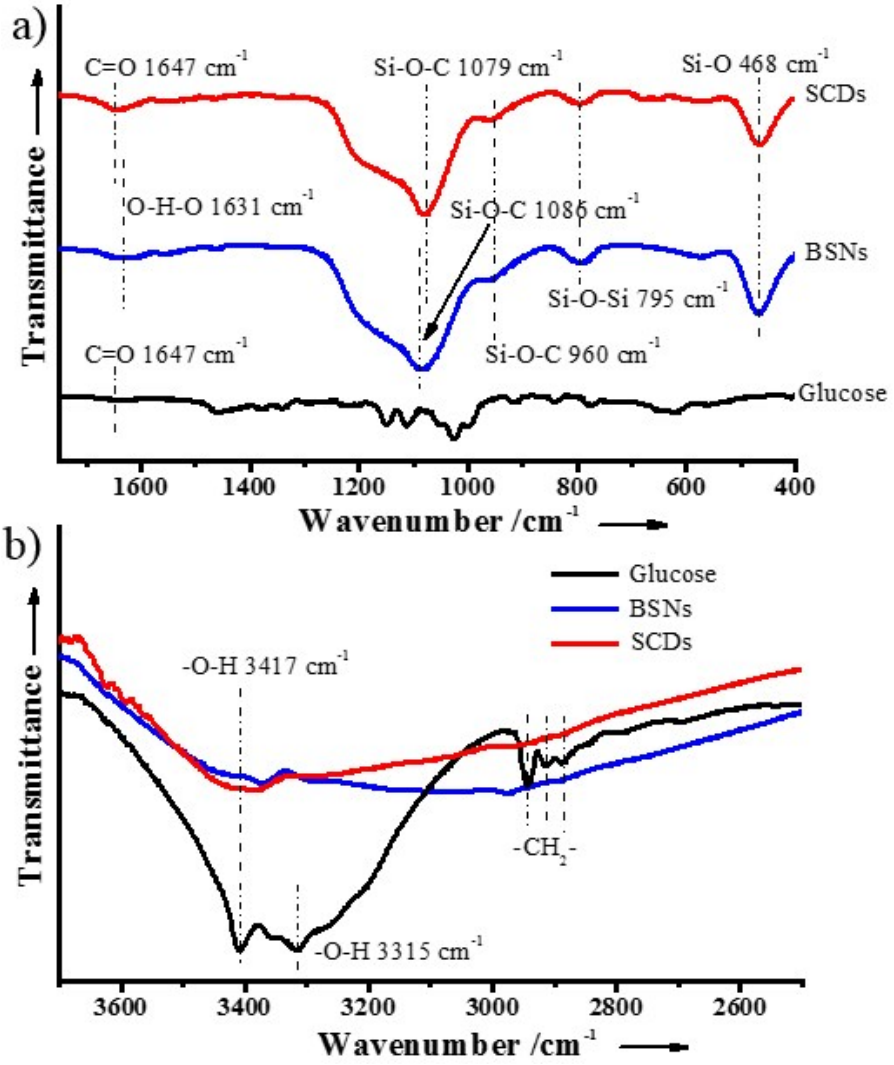

Figure S6. FT-IR spectra of glucose, BSNs, and $SCDs^{0.1}$. In FT-IR spectrum of SCD0.1, the new band at 1647 cm^{-1} is attributed to C=O vibrations and the broad and intense peak centred at 3417 cm^{-1} is assigned to the bending vibrations of O–H bonds mainly from glucose. The symmetrical stretching vibrations of Si-O C shift from 1086 cm^{-1} of BSNs to 1079 cm^{-1} of SCD0.1 as a result of condensation between TEOS and glucose.

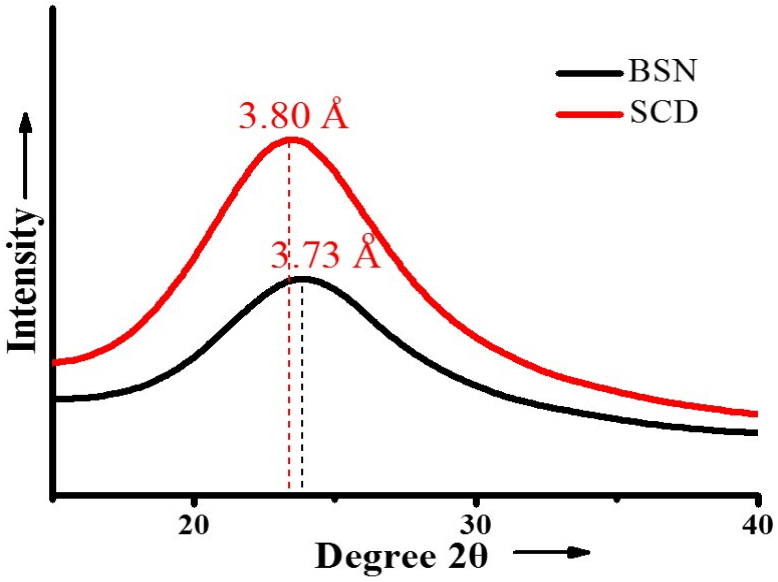

Figure S7. Powder X-ray diffraction (XRD) pattern of SCDs$^{0.1}$.

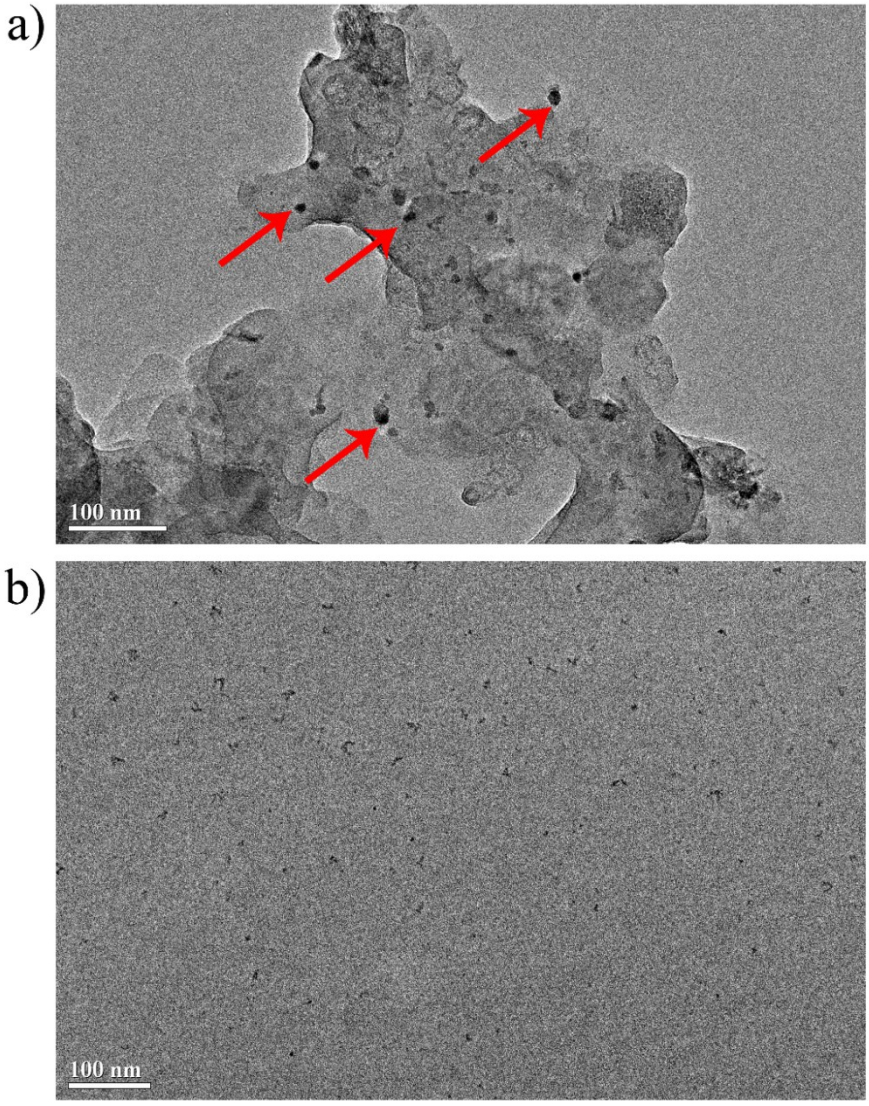

Figure S8. TEM images of rCDs (a) and CDs (b). The red arrows mark some rCDs to guide sight.

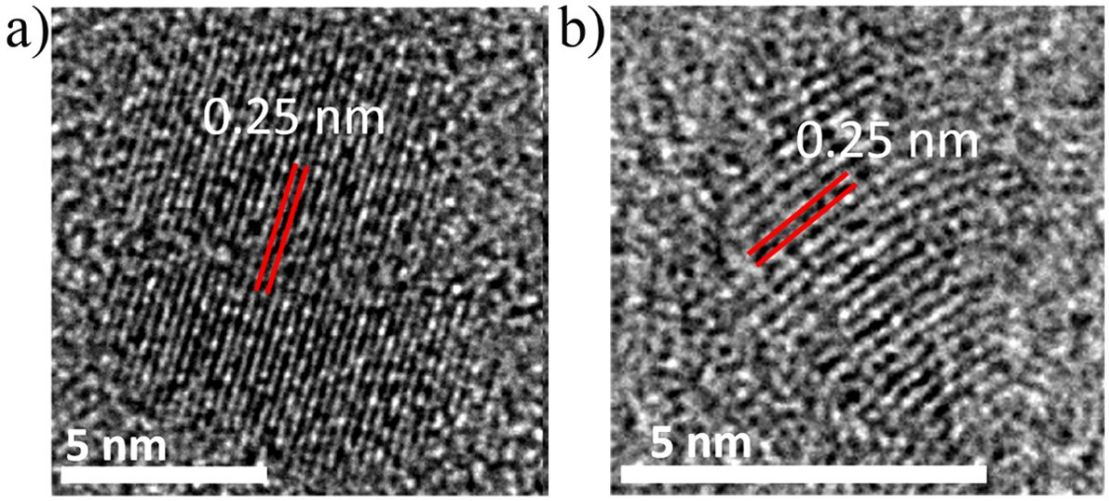

Figure S9. HRTEM images of rCDs (a) and CDs (b).

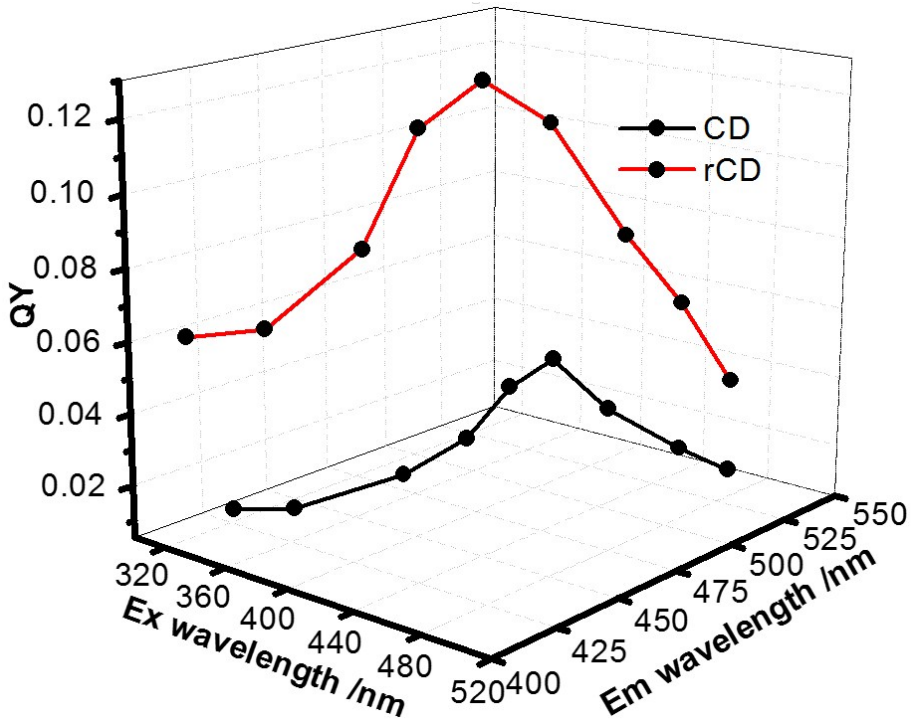

Figure S10. Quantum yield and emission wavelength of CDs and rCDs at different excitation wavelength (Standard: rhodamine 6G, 5×10^{-5} mg/mL in absolute alcohol, QY % = 94% excited at 488 nm).

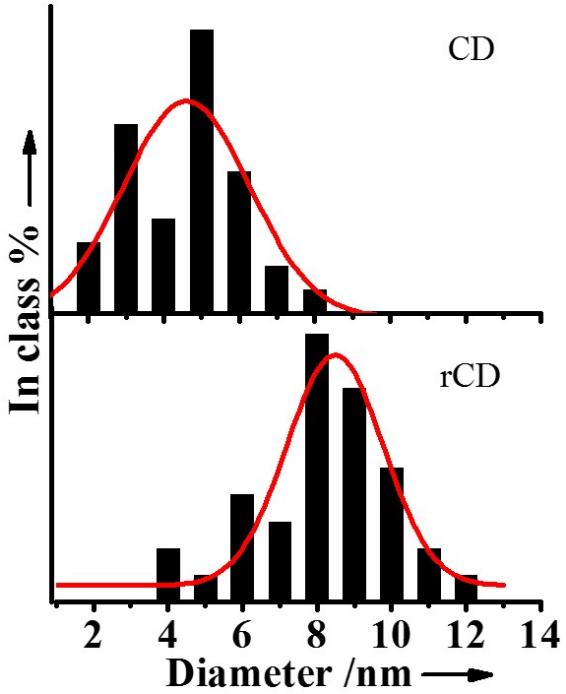

Figure S11. Size distribution of rCDs and CDs determined by HRTEM.

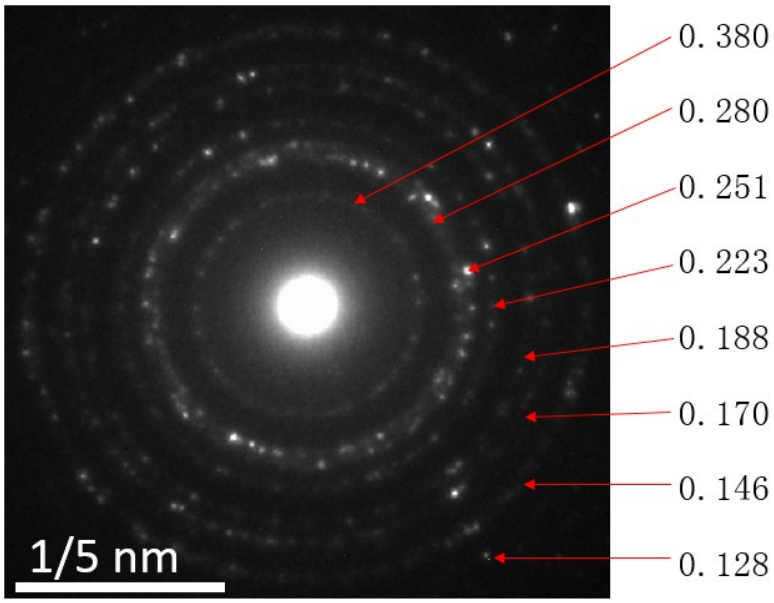

Figure S12. Electron diffraction spectrum for rCDs. The numbers in the right column indicate the corresponding lattice parameters (nm).

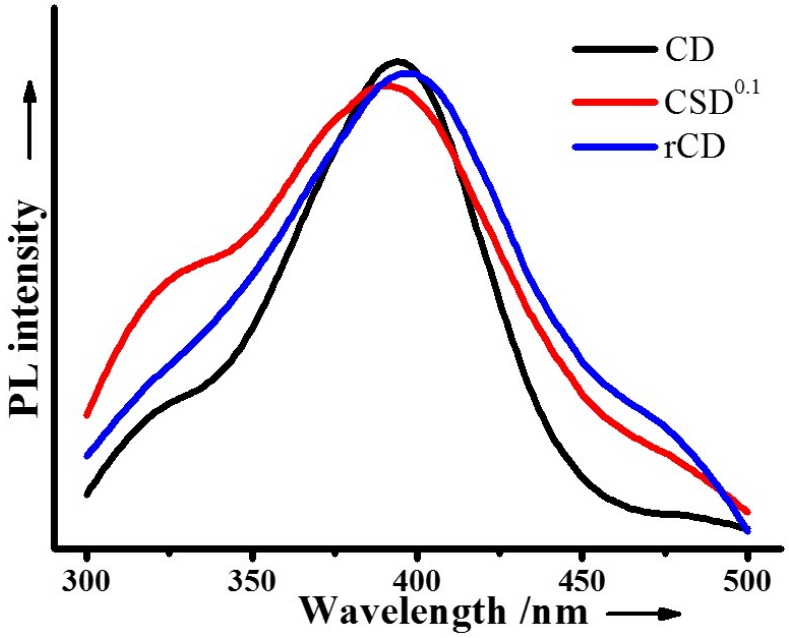

Figure S13. Excitation spectra for SCDs$^{0.1}$, rCDs and CDs. The emission was collected at 550 nm.

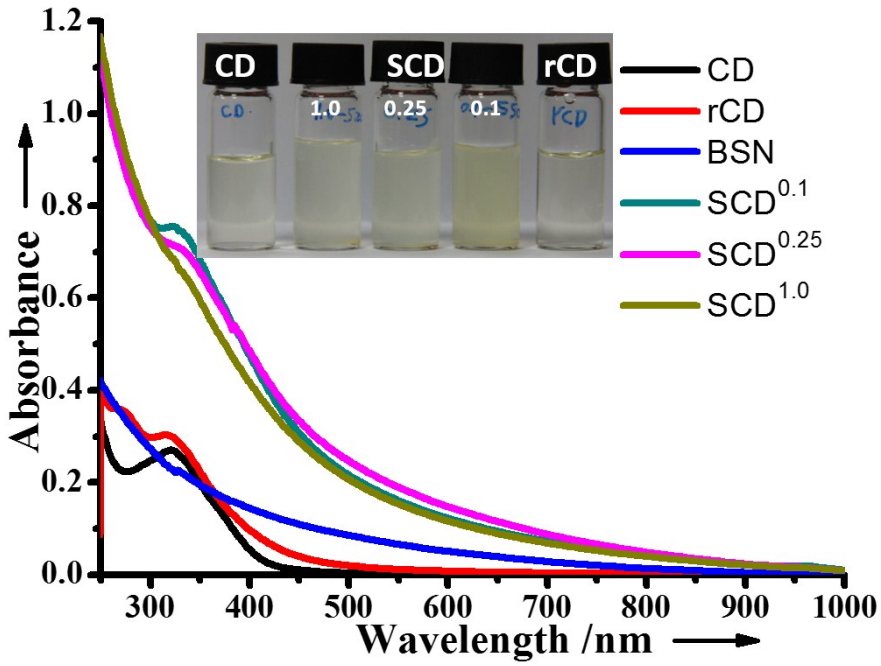

Figure S14. UV-vis spectra of CDs, rCDs, and SCDs with different emission wavelength. Insert: the photograph for samples under visible light.

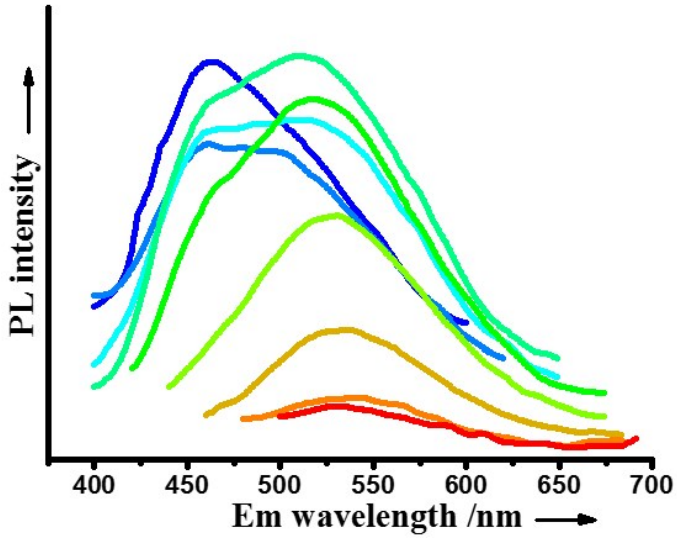

Figure S15. PL spectra of SCDs$^{0.1}$ prepared with much less glucose (TEOS/glucose: 1.5 mL/50 mg) with progressively longer excitation wavelengths from 320 nm in 20 nm increment (from blue to red line).

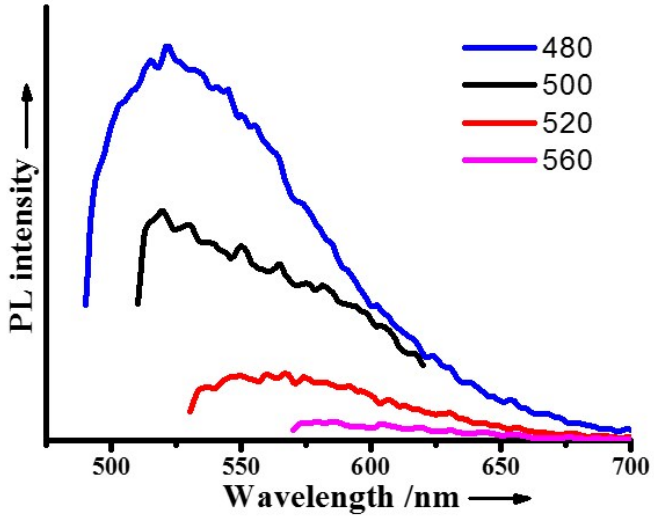

Figure S16. Excitation-dependent fluorescent spectra of rCDs excited at longer wavelengths.

Figure S17. Photograph of pulverous SCDs$^{0.1}$ in solid state under daylight.

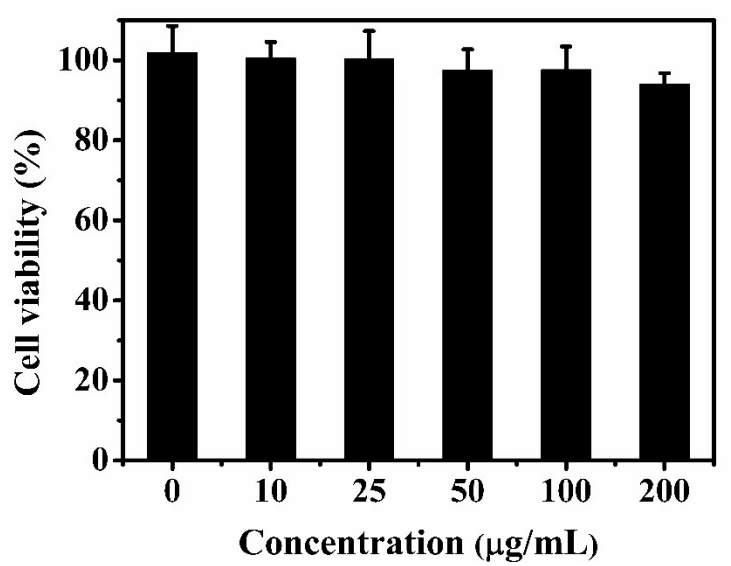

Figure S18. Cell viability of HEK-293T cells exposed to $SCDs^{0.1}$ for 48 h.

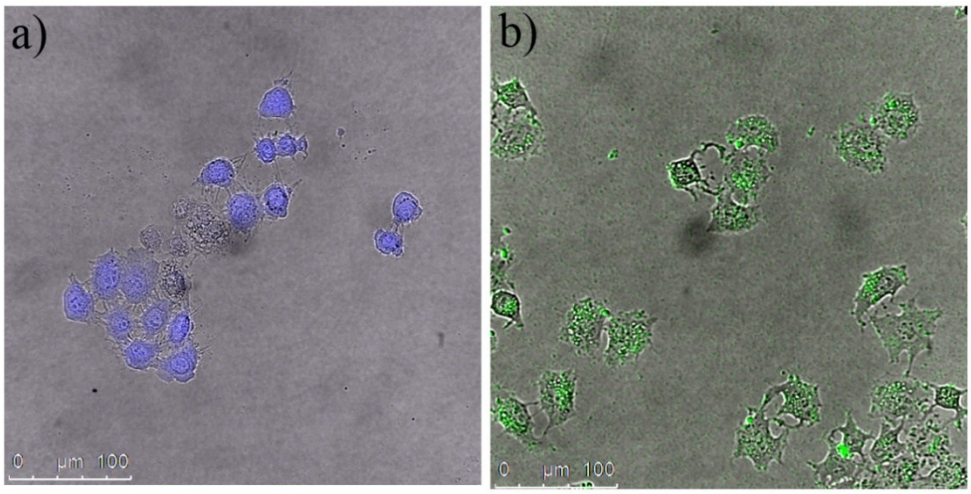

Figure S19. CLSM images of HeLa cells after 4 h incubation with (a) CDs and (b) SCDs (bright field). Collecting emission of 450-500 nm for CDs and 550-600 nm for SCDs excited at 405 nm.