

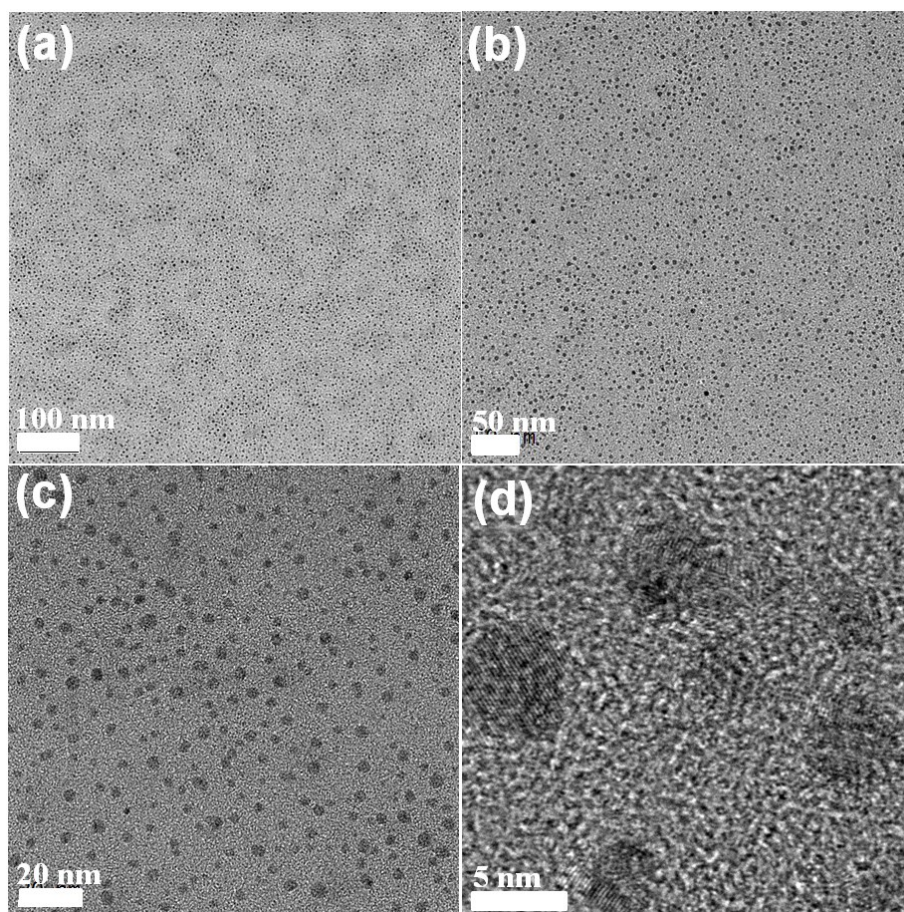
# Carbon based dots nanoclusters with enhanced roles of de-fect states on the fluorescence and singlet oxygen generation

Rongjing Hu,<sup>a</sup> Juanxia Su,<sup>a</sup> Qian Wang,<sup>a</sup> Mingming Chen,<sup>a</sup> Yajie Jiao,<sup>a</sup> Lichan Chen,<sup>b</sup> Binhua Dong,<sup>c</sup> Fengfu Fu,<sup>a</sup> Yongqiang Dong<sup>a\*</sup>

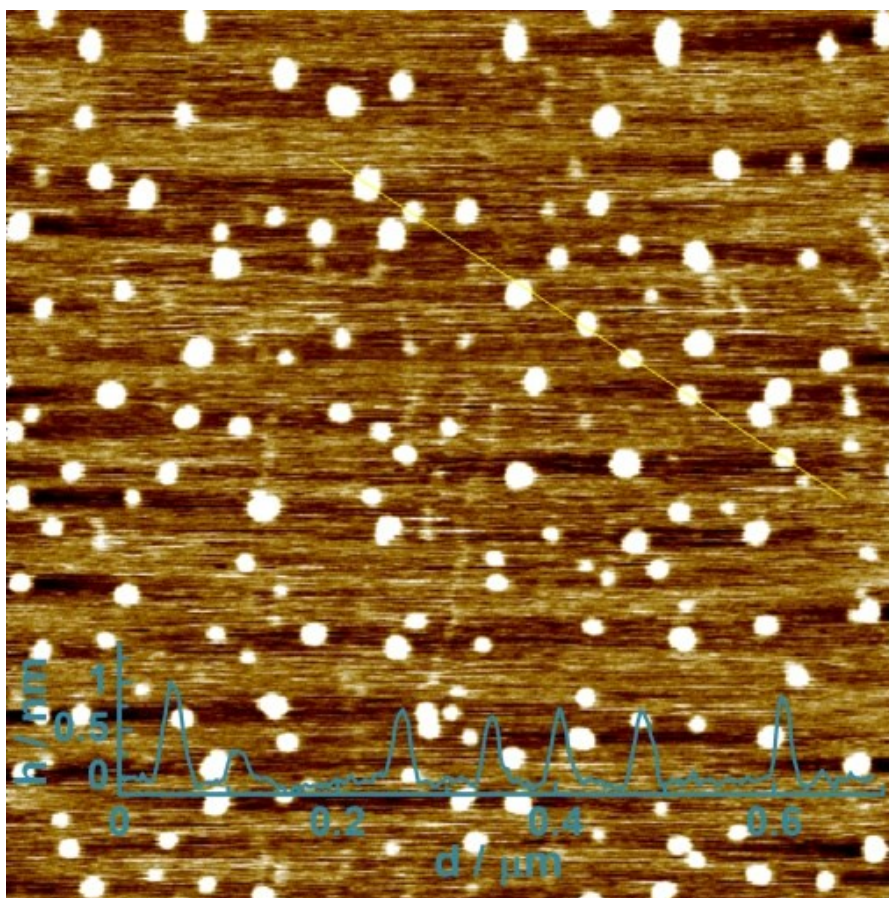
<sup>a</sup>MOE Key Laboratory for Analytical Science of Food Safety and Biology, Fujian Provincial Key Laboratory of Analysis and Detection Technology for Food Safety, College of Chemistry, Fuzhou University, Fuzhou, China.

<sup>b</sup>College of Chemical Engineering, Huaqiao University, Xiamen, 361021, China.

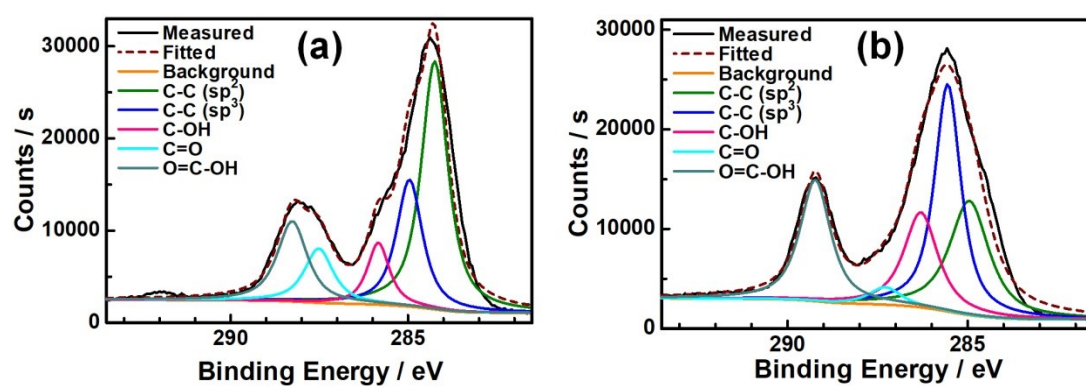
<sup>c</sup>Fujian Provincial Maternity and Children's Hospital, Affiliated Hospital of Fujian Medical University, Fuzhou, China.



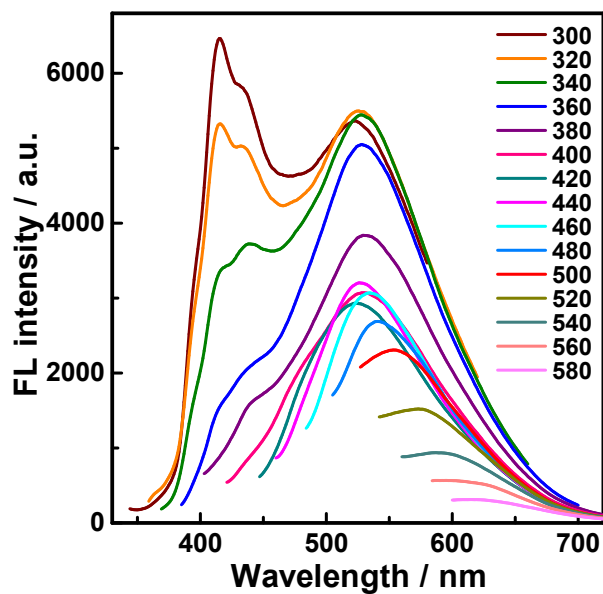
**Figure S1.** TEM images of CDs with different magnifications (a), (b) and (c), and HRTEM image of CDs (d).



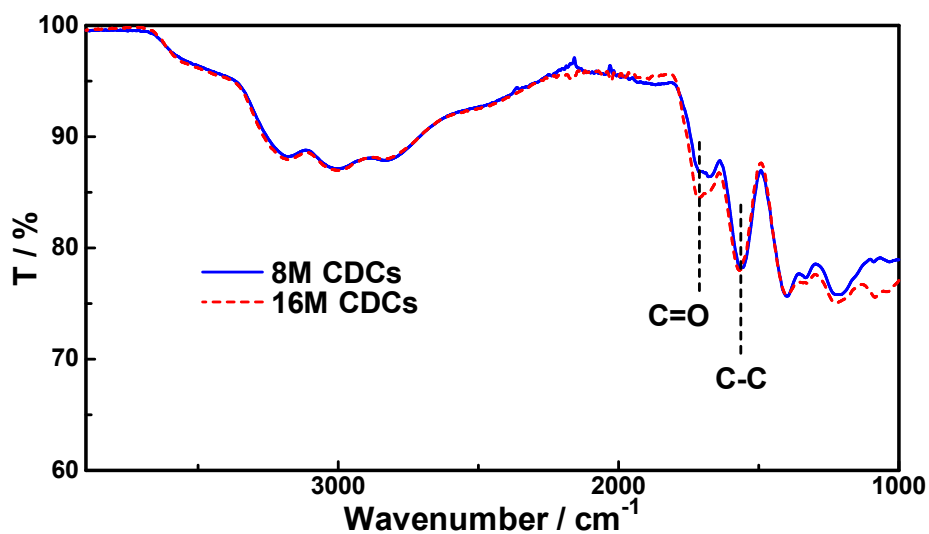
**Figure S2.** AFM image of CDs. The inset shows the height profile along the yellow line.



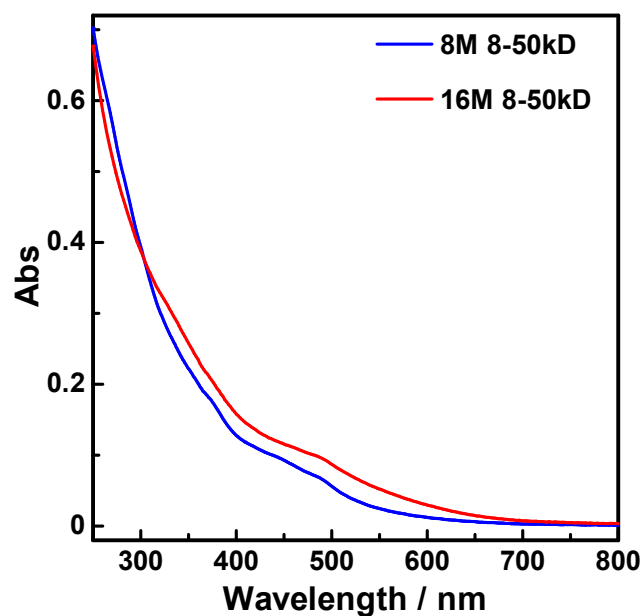
**Figure S3.** High resolution XPS spectra of C1s for CDCs (a) and free CDs (b).



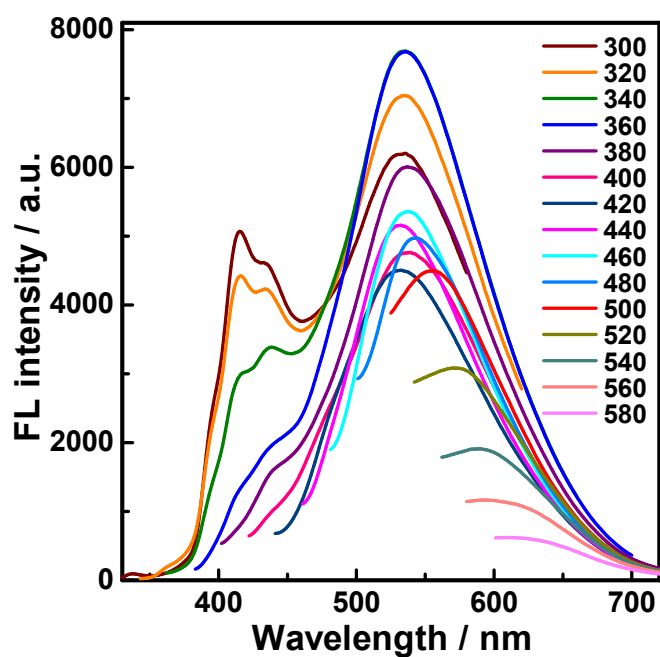
**Figure S4.** FL spectra of free CDs, recorded for progressively longer excitation wavelengths in 20 nm increments. The maximum emission wavelength of the defect emission is about 520 nm



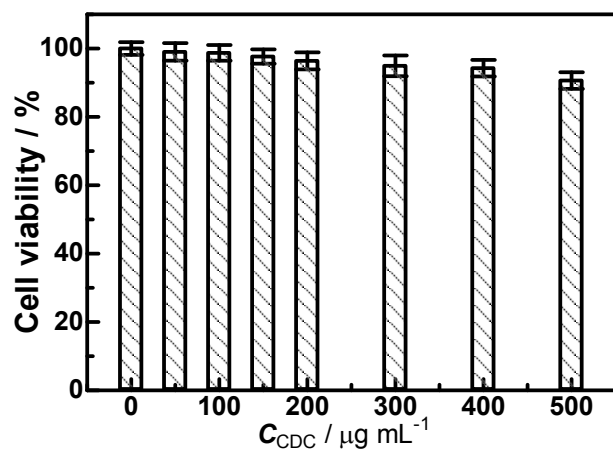
**Figure S5.** Comparison of FTIR spectra for CDCs obtained by chemical oxidation using 8 M and 16 M HNO<sub>3</sub>.



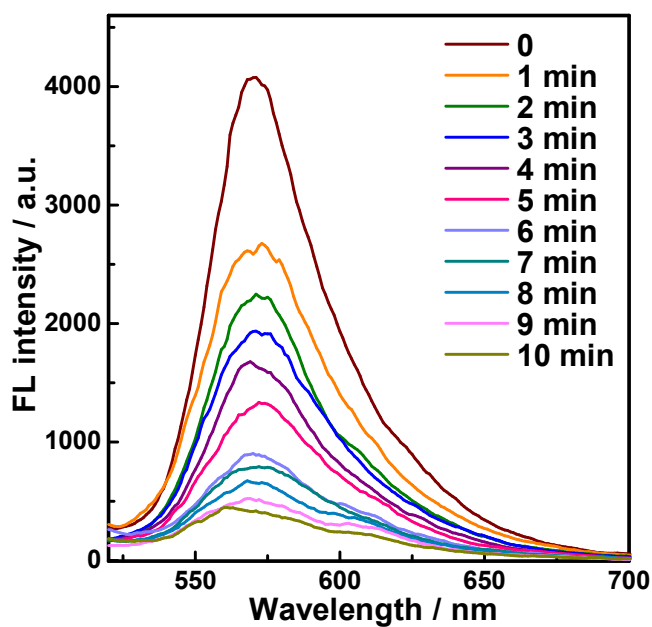
**Figure S6.** Comparison of UV-vis spectra for CDCs obtained by chemical oxidation using 8 M and 16 M  $\text{HNO}_3$ .



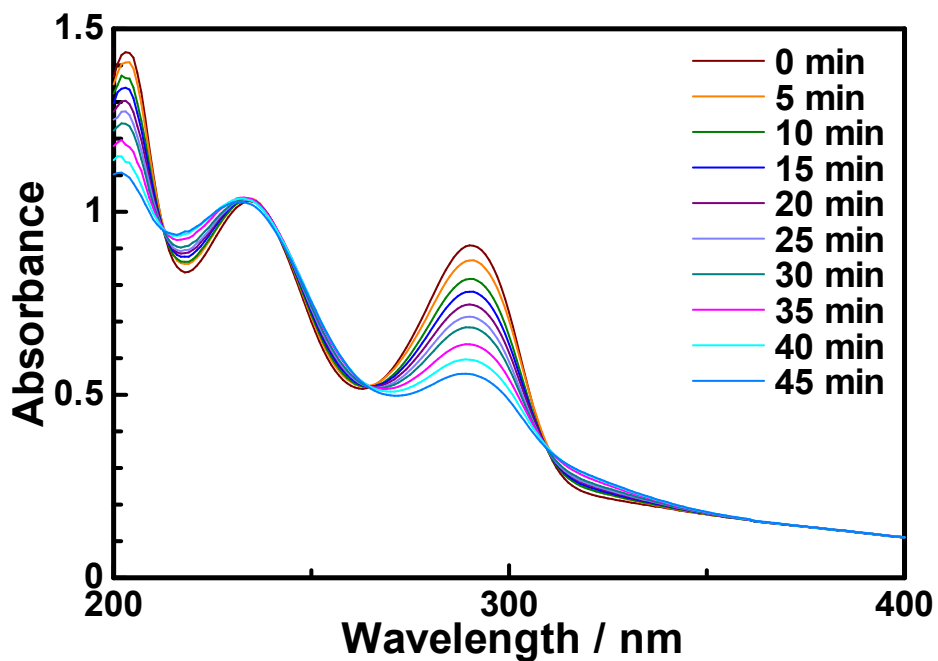
**Figure S7.** FL spectra of CDCs obtained by chemical oxidizing XC-72 carbon black using 8 M  $\text{HNO}_3$ , recorded for progressively longer excitation wavelengths in 20 nm increments. The maximum emission wavelength of the defect emission is about 540 nm



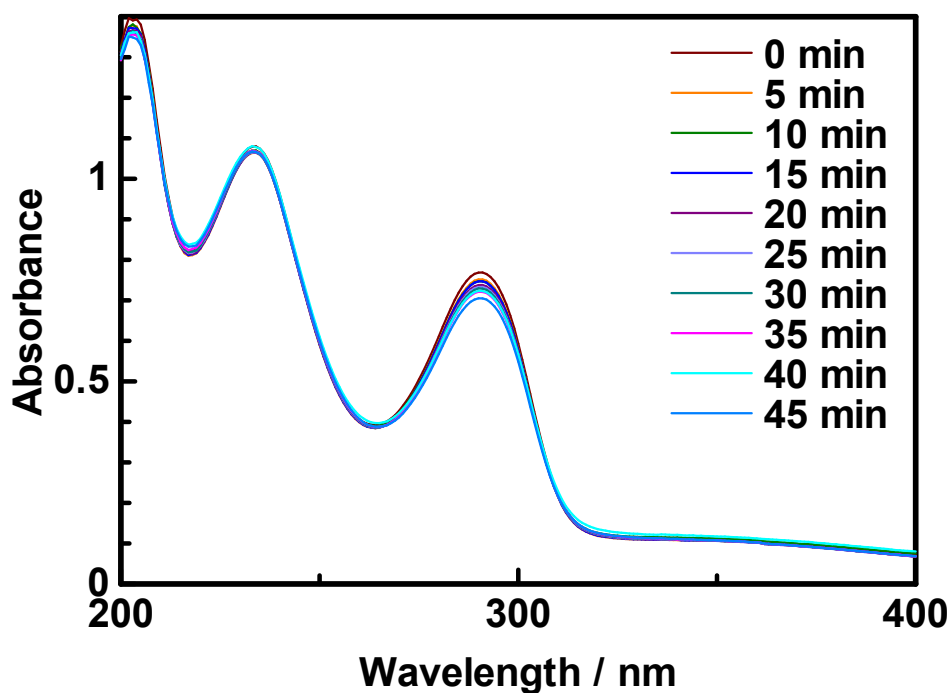
**Figure S8.** Cell viability assay with human breast cancer (MCF-7) cell treated with different concentration of CDCs.



**Figure S9.** FL spectra of Rose Bengale after being irradiated for different times using a 350 W xenon lamp.



**Figure S10.** UV-vis spectra recorded every 5 min for the optic-catalytic degradation of UA in the presence of CDCs. Concentration of UA:  $5 \times 10^{-5}$  M, Concentration of CDCs:  $10 \mu\text{g/mL}$ ; pH: 7.4, light source:  $>590$  nm from a 350 W xenon lamp.



**Figure S11.** UV-vis spectra recorded every 5 min for the optic-catalytic degradation of UA in the presence of CDs. Concentration of UA:  $5 \times 10^{-5}$  M, Concentration of CDs:  $10 \mu\text{g/mL}$ ; pH: 7.4, light source:  $>590$  nm from a 350 W xenon lamp.