Electronic Supplementary Information

Carbon quantum dots derived by direct carbonization of carbonaceous microcrystals in mesophase pitch

Haibin Wang†, Guoqing Ning†,*, Xing He, Xinlong Ma, Fan Yang, Zhiming Xu, Suoqi Zhao, Chunming Xu, Yongfeng Li*

Table S1. The amounts of precipitate in different solvents for MP440. For each test, 0.5 g MP440 was added into 100 mL solvent.

Solvents	benzene	methylbenzene	xylene
Residue (%)	75.8	62.8	47.2

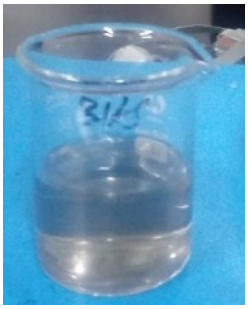

Fig. S1 Optical picture of the CQD430 ethanol suspension.

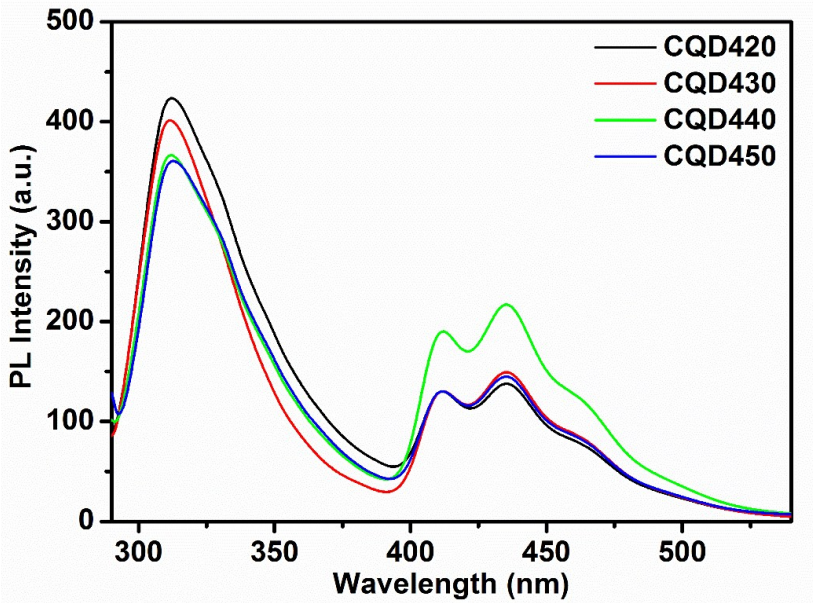

Fig. S2 PL emission spectra at 280 nm excitation of the as-prepared CQDs.

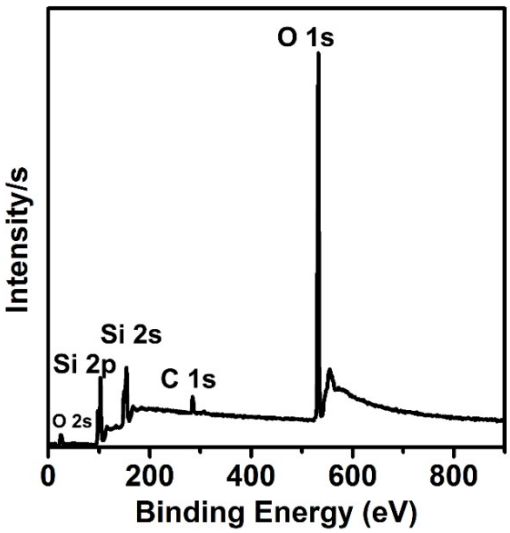

Fig. S3 XPS survey spectrum of CQD440. The strong peaks of Si and O should come from the SiO_2/Si wafer.

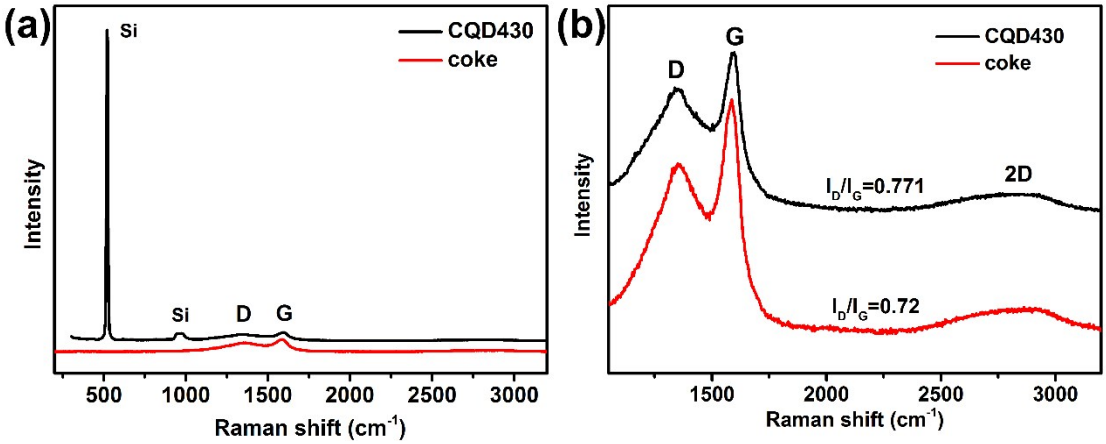

Fig. S4 Full range (a) and enlarged (b) Raman spectra of CQD430, in comparison with the coke. In the Raman spectrum of CQD430, the peaks at 520 and 960 cm^{-1} come from the SiO_2/Si wafer.

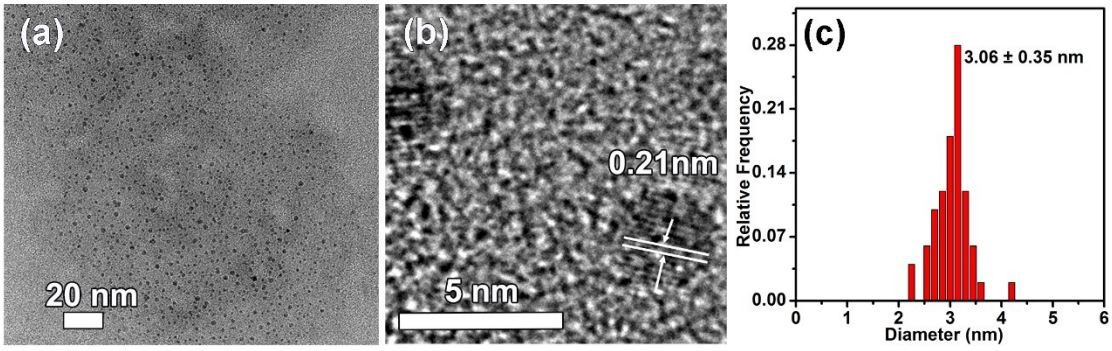

Fig. S5 (a) TEM, (b) HRTEM images and (c) diameter distribution of CQD440.

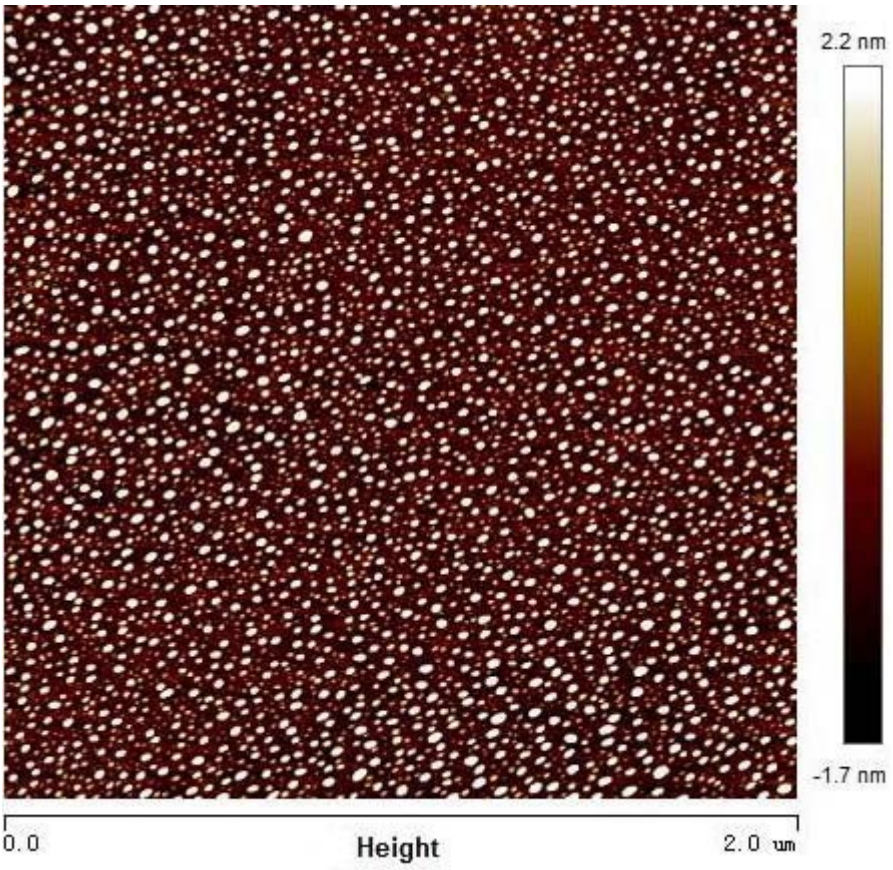

Fig. S6 AFM image of the Si wafer-supported sample prepared using a MP430 suspension with the concentration of 20 mg/L.

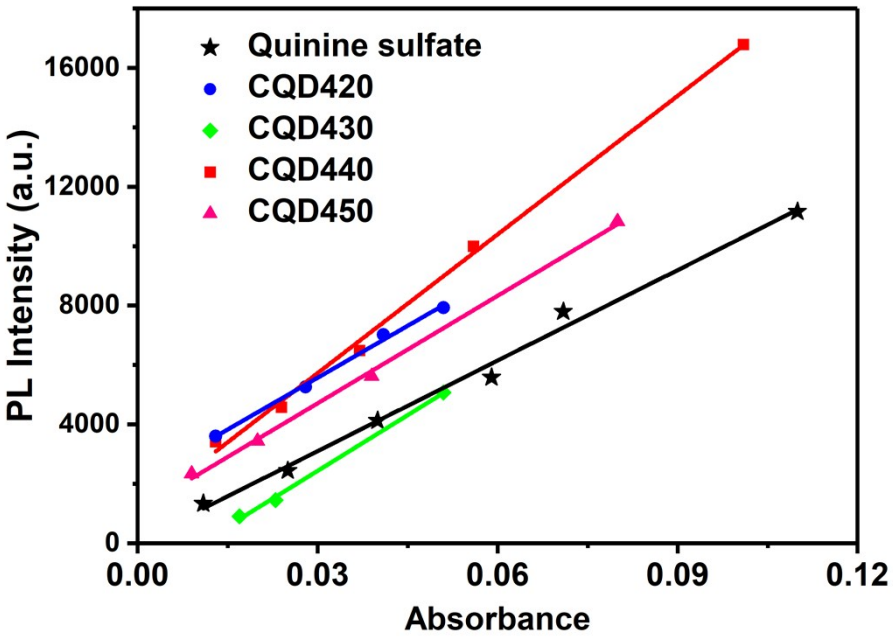

Fig. S7 Integrated PL intensity fitting straight-lines of different CQD samples and the quinine sulfate standard solution.

Calculation of the quantum yield (QY) of CQDs

The QY of CQDs is calculated on the basis of the method previously reported in the literature. The QY of quinine sulfate in 0.1 M of H_2SO_4 solution is 0.546 as a standard. The equation for the calculation of CQD440 is expressed as:

$$Q_x = Q_{st}\frac{I_x}{I_{st}}\frac{A_{st}}{A_x}\left(\frac{n_x}{n_{st}}\right)^2 = Q_{st}\left(\frac{\frac{I_x}{A_x}}{\frac{I_{st}}{A_{st}}}\right)\left(\frac{n_x}{n_{st}}\right)^2 = 0.546 * \left(155533/101559\right)\left(\frac{1.362}{1.333}\right)^2 = 87\%$$

Where Q is the QY, I is the integrated emission intensity, n is the refractive index of the solvent, and A is the absorbance. The subscript "st" refers to standard with known QY and "x" for the sample.

Table S2. The fitting results and QYs of different CQDs. K is the slope of the lines in Fig. S7.

Sample	R^2	K	QY(%)
quinine sulfate (0.1M)	0.996	101559	54.6
CQD420	0.998	116410	65
CQD430	0.996	125891	70.6
CQD440	0.999	155533	87
CQD450	0.999	120570	67