Supporting Information

Environment-Dependent Photon Emission from Carbon Dots in Solid State and

The Mechanism

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Fig. S1 Digital photographs of CDs/PEG 20000 and bare PEG 20000 under 365 nm UV light illumination. It should be noted that only carbon dots that are in direct contact with PEG 20000 are fluorescent. Although most carbon dots are on the ring pattern, only those at the bottom of the ring are sitting on PEG 20000 substrate and then emissive. Therefore, the emission intensities inside and on the ring pattern are nearly the same. PEG 20000 is not emissive, the emission from the brim of the CDs/PEG 20000 tablet is scattered light from emissive carbon dots.



Fig. S2 Digital photographs of carbon dots (CDs) prepared by furnace tube pyrolysis method on various substrates including polyvinyl alcohol (PVA), polyacrylamide (PAM), glass, indium tin oxide (ITO) and silicon under daylight (a) and UV light (b). Digital photographs of Cotton (c) or cellulose paper (d) contains carbon dots (left) or not (right) under UV light.



Fig. S3 Digital photographs of CDs prepared by hydrothermal method on various substrates of PVA, PAM, PEG20000, glass, ITO and silicon under daylight (a) and UV light (b). Cotton (c) or cellulose paper (d) contains CDs (left) or not (right) under UV light.



Fig. S4 Photoluminescence (PL) of CDs prepared by hydrothermal method in water and in solid state on different substrates excited by a 325 nm He-Cd laser. The PL of CDs on Teflon red shifts with respect to the PL of CDs in water or on the other substrates.



Fig. S5 (a) The precipitation of S1 when acetone is added to the original CDs aqueous solution. The solutions become turbid after adding acetone, indicating the precipitate of CDs which can be collected by

centrifugation. (b) The precipitation of S2 when acetone is added in the second time to the supernatant after the first centrifugation.



Fig. S6 Emission and excitation spectra of S1-S3 in water recorded with a F4500 Hitachi spectrometer. We can see that the spectra are the same from S1 to S3 except an increase in intensity from S1 to S3.



Fig. S7 ¹³C NMR spectra of S1-S3 in D₂O. The peak at 168 ppm is from ¹³C in Ar-C(O)OH (carboxylic acid conjugated with aromatic carbons); the peaks at 181-185 ppm are from ¹³C in Ar-C=O (C=O bonds conjugated with aromatic carbons); the peaks at 123-130 ppm are from ¹³C in C=C bonds; the peaks at 72-76 ppm are from ¹³C in C-O bonds; the broad distribution of peaks at 10-50 ppm are from ¹³C in C-C bonds and C-H bonds in different chemical environments.¹ There is an increase of Ar-C=O signal from S1 to S3.

Reference:

1 Sadtler Handbooks of Carbon NMR spectra, Bio-Rad Laboratories, Inc., Informatics Division, 2004.