Electronic Supplementary Material (ESI) for Chemical Communications

Long lifetime pure organic phosphorescence based on water soluble carbon dots

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Experimental Details:

Preparation of carbon dots from EDTA-2Na:

The preparation procedure is modified from previous report[7]. 1.6g EDTA-2Na was placed in a quartz boat and was heated in a furnace tube under N_2 atmosphere with an accelerating rate of 10℃/min to 400℃. After being annealed for 4h at 400℃, it was allowed to cool to room temperature, and the black product was dispersed in 80ml of deionized water under ultrasonication for 30 min. Then the solution was centrifuged at 9500rpm for 16min to remove larger and insoluble particles. The brown supernatant was collected and heated at 80℃ for hours. After 60ml of water has been evaporated, 60ml of acetone was introduced into the solution, which then became turbid under ultrasonication. The solution was then again centrifuged at 9500rpm for 16min and the supernatant was collected and awaits further characterization.

Preparation of Carbon dots/PVA composites film:

Firstly, 1 ml (2 mg /ml) of carbon dots aqueous solution was mixed with 5ml PVA solution (10 wt %) by slow shaking in order to obtain uniform carbon dots/PVA solution. Then the mixture was coated onto glass or plastic substrate and then dried in an oven under 60℃ for hours to obtain the carbon dots/PVA composite films.

Characterizations:

The transmission electron microscopy (TEM) and high resolution transmission electron microscopy (HRTEM) of carbon dots was performed on a JEOL transmission electron microscope operating at 200kV. The photoluminescence of carbon dots and carbon dots/PVA composite films were performed on a Hitachi F4500 fluorescence spectrophotometer. The absorbance spectra of carbon dots were collected by a Shimadzu UV-3101PC spectrometer. The attenuated total reflection Fourier transformed infrared (ATR-FTIR) spectroscopy of carbon dots was recorded with a Bruker ALPHA spectrometer. The time-resolved phosphorescence spectra were recorded using a FLS920 time-corrected single photon counting system. The X-ray photoelectron spectrum of C1s of carbon dots was collected by a Thermo ESCALAB 250 photoelectron spectrometer. All of the digital pictures were captured by a Canon camera. It should be noted that the camera has been set to be more sensitive to light when capturing the afterglow images than it was when capturing the fluorescence images.

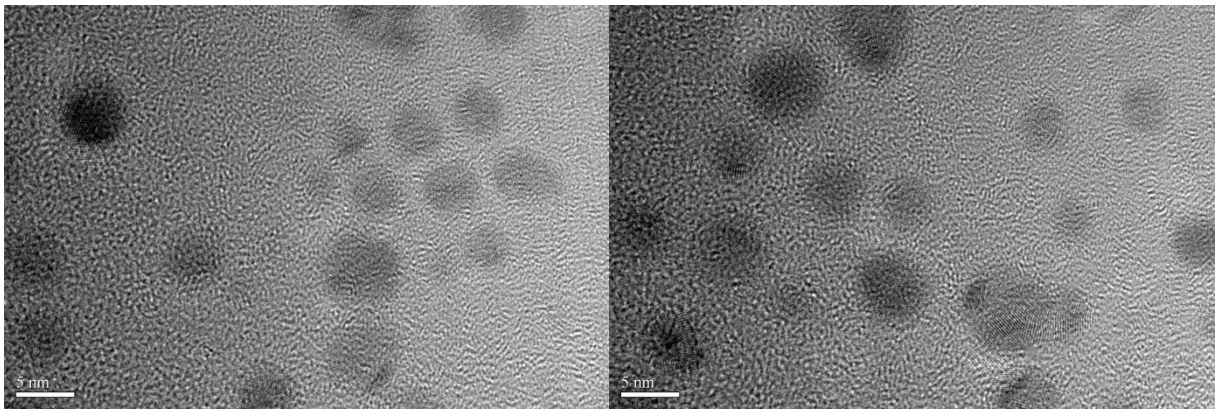

Figure S1. HRTEM images of carbon dots. They are generally spherical, though not perfect.

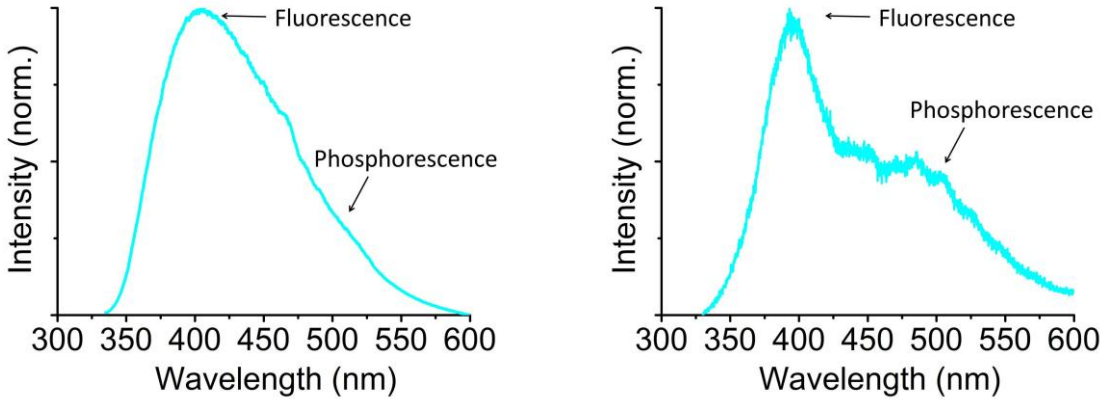

Figure S2. The steady-state PL spectrum excited by a F4500 spectrometer (left) and a He-Cd laser (right) (both at 325 nm). The fluorescence is stronger than phosphorescence in both spectra. The relative intensity of phosphorescence increases when use a laser instead of a lamp.