# **Support Information**

# **Aggregation Induced Red Shift Emission of Phosphorus Doped**

## **Carbon Dots**

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## Materials

Concentrated phosphoric acid ( $\geq$ 85 wt. %), triethyl phosphonoacetate (98%), quinine sulfate and glucose were purchased from Aladdin Chemistry Co., Ltd (Shanghai, China). 4,7,10-Trioxa-1,13-tridecanediamine (97%, TTDDA) was obtained from Sigma-Aldrich Co., Ltd. Spectra/Por molecular porous membrane tubing (MWCO 1000) was purchased from 3Bio Co., Ltd (Shanghai, China). All chemicals were analytical grade or better and used without further purification.

### Synthesis of carbon dots

For the preparation of phosphorous doped carbon dots (P-CDs), 0.6 ml of concentrated phosphoric acid and 2.4 ml of triethyl phosphonoacetate were mixed. The solution was then transferred to a 50 ml Teflon-lined autoclave chamber. The chamber was sealed and put into an oven at 200 °C for 12 hours. After hydrothermal

reaction, a dark yellow solution was obtained. The solution was centrifugated 8000 rpm for 10 min to remove large particles.

For the purification of P-CDs, the solutions of P-CDs were neutralized by the addition of NaOH. After centrifugation, the supernatant was transferred to a dialysis membrane tube with molecular weight cut-off of 1000 and dialyzed in flowing water for 24 hours.

The preparation procedure of N-CDs is similar to that of P-CDs. Glucose and 4, 7, 10-trioxa-1, 13-tridecanediamine were used as the reaction precursors. After reaction, the product was purified by dialysis. For the preparation of P-N-CDS, glucose and 4, 7, 10-trioxa-1, 13-tridecanediamine were carbonized in the presence of 2 ml of concentrated phosphoric acid in the Teflon-lined autoclave chamber.

#### **Characterization**

UV-visible absorption spectra and PL spectra were measured by using a UV-visible spectrophotometer (TU-1901, Puxi Beijing) and a Perkin Elmer LS55 fluorescence spectrometer, respectively. The morphologies of prepared CDs were characterized by a transmission electron microscopy (TEM, JEM 2100F, Japan). Atomic force microscopy (AFM) measurements were performed using a Nanoscope V multimode atomic force microscope (Veeco Instruments, USA) under ambient conditions, and samples were prepared by dropping the solution on the substrate of mica. The elemental compositions (C, H and N) of prepared CDs were analyzed by using a Vario EL III Element Analyzer (Germany). The content of oxygen was obtained by calculation. The dynamic light scattering (DLS) measurements were performed on Malvern Zetasizer Nano.



Fig. S1 Absorption spectrum of P-C-dots and PL spectra recorded at different excitation wavelengths as indicated in the figure.