Electronic Supplementary Material (ESI) for Environmental Science: Nano.

Supporting information

3,4-Hydroxypyridinone-Modified Carbon Quantum Dot as a Highly Sensitive and Selective Fluorescence Probe for Rapid Detection of Uranyl Ions

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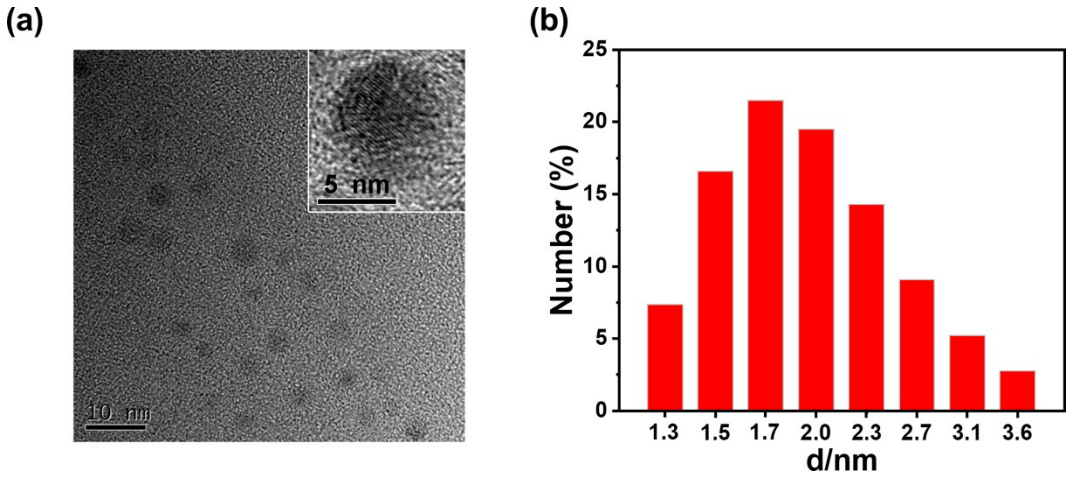

Figure S1. (a) TEM image of BPEI-CQD, inset is the HRTEM image. (b) The size dispersion of BPEI-CQD.

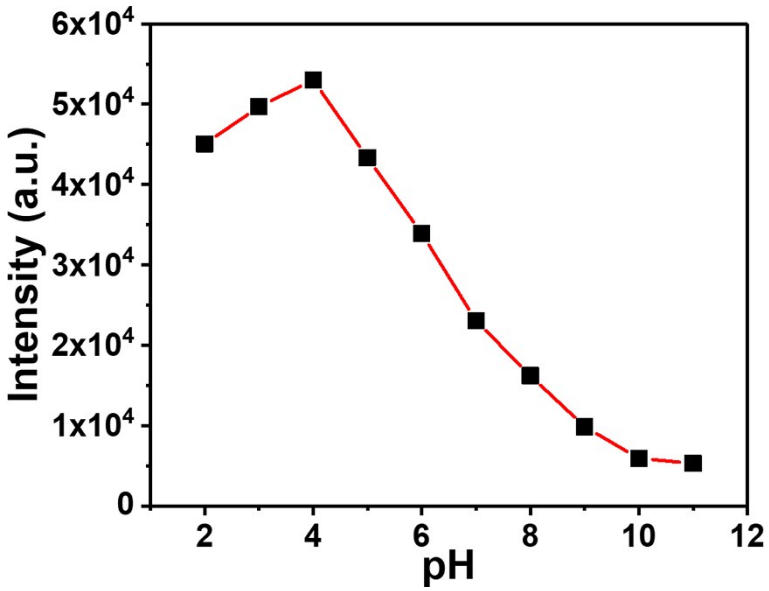

Figure S2. Effect of solution pH on the PL intensity of the BPEI-CQD

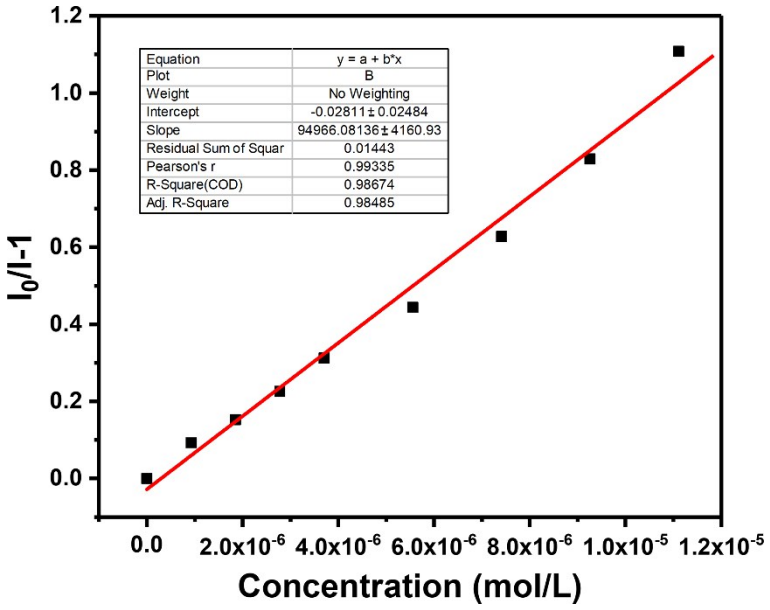

Figure S3. The relationship between (I_0/I)-1 and UO_2^{2+} concentration for HOPO-CQD.

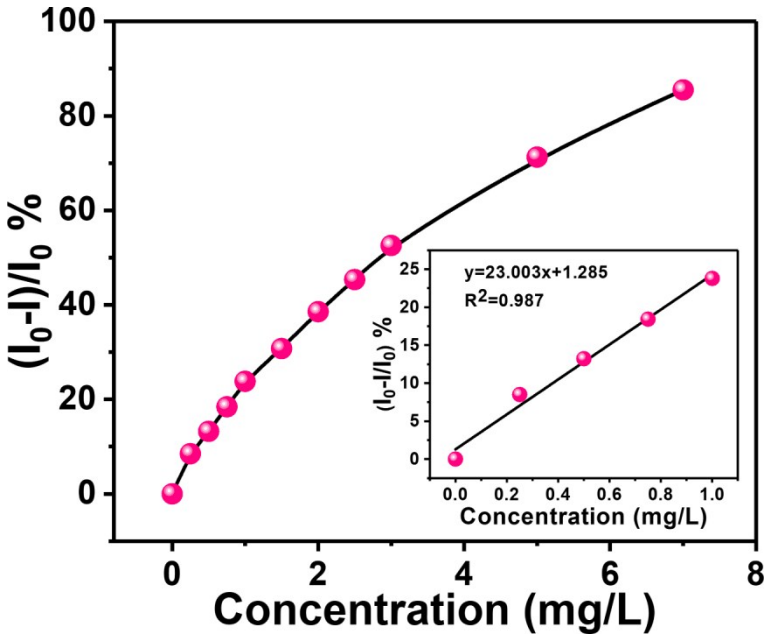

Figure S4. The decrease of fluorescence intensity (measured at 450 nm) of HOPO-CQD as a function of the uranyl concentration, inset is the linear relationship of fitting between $(I_0-I)/I_0$ and low concentration of uranyl (0 to 1 mg/L).

Determination of the detection limit

The limit of detection (LOD) for uranyl was determination based on the fluorescence measurement shown in Figure S4. The linear domain in low concentration range can be fitted as

y=23.003x+1.285

Where y is the relative decrease of fluorescence intensity [100 × (I_0-I)/I_0)] measured at 450 nm, and x is the uranyl concentration.

The standard deviation (σ) is defined as 100 × (I_{SE}/I_0), where I_{SE} is the standard error of the emission measurement, as determined by the baseline measurement of blank samples (monitored at 450 nm), I_0 is the luminescence intensity of HOPO-CQD in deionized water (measured at 450 nm). If defining three times of the standard deviation as the detectable signal, the detection limit can be calculated as 3σ/slope =0.0065 mg/L.

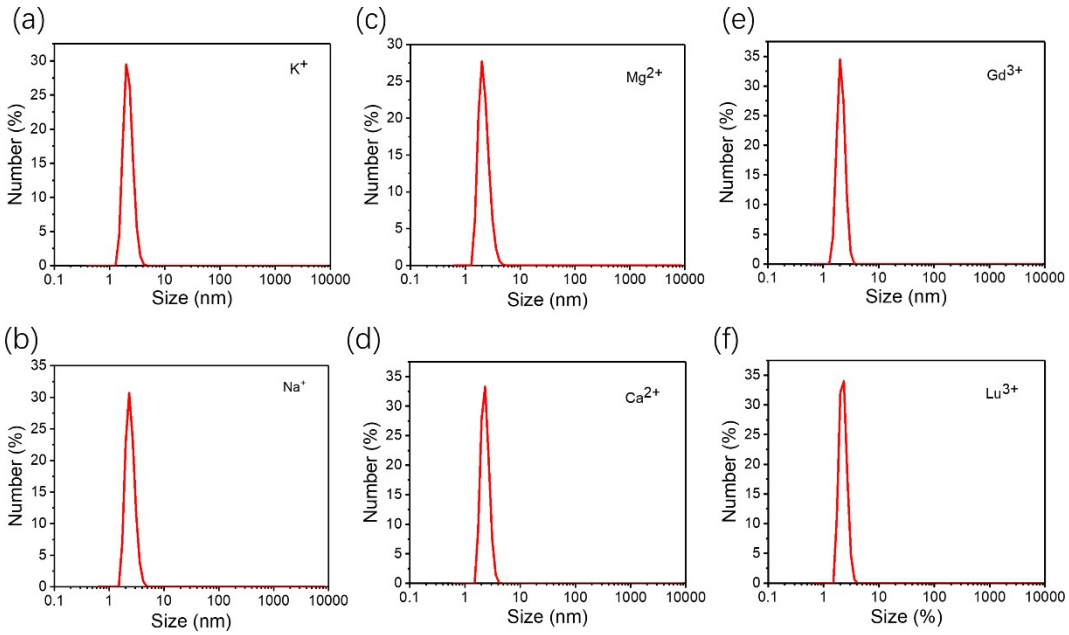

Figure S5. The particle size distribution of HOPO-CQD treated with different metal ions: (a) K^+, (b) Na^+, (c) Mg^{2+}, (d) Ca^{2+}, (e) Gd^{3+}, (f) Lu^{3+}

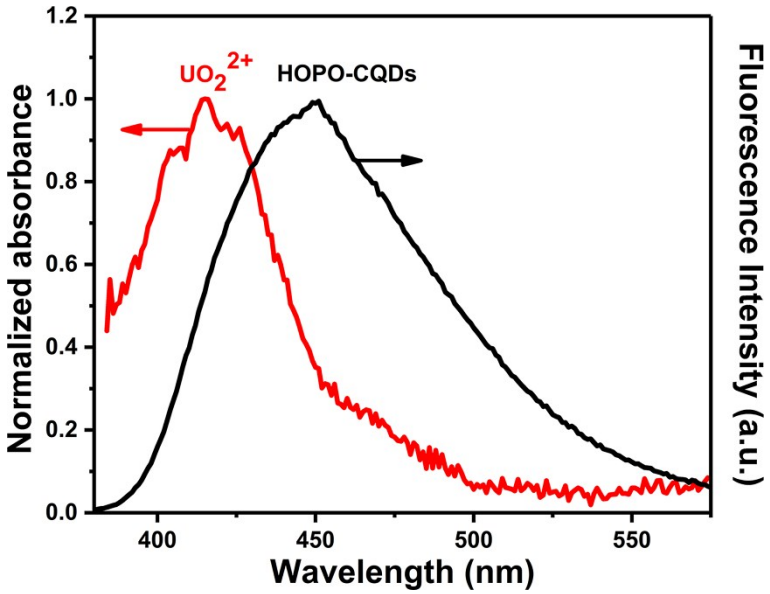

Figure S6. UV-Visible absorption spectrum of the uranyl ion and emission spectrum of HOPO-CQD in aqueous solution.