Supplementary Information

Facile synthesis of red dual-emissive carbon dots toward ratiometric fluorescence sensing and cellular imaging

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Supplementary Figures



Fig. S1 Diameter distribution of red dual-emissive CDs calculated from TEM image.







Fig. S3 Photographs of red dual-emissive CDs in aqueous solution: (a) under daylight,

and (b) under ultraviolet light.



Fig. S4 (a) PL emission spectra of red dual-emissive CDs obtained from different reaction time of (a) 1 h, (b) 3 h, (c) 6 h, and (d) 9 h.



Fig. S5 (a) Dependence of absolute PL QY of red dual-emissive CDs on molar ratio of dicyandiamide/o-phenylenediamine used in the synthesis process. (b) Effect of reaction temperature on absolute PL QY of red dual-emissive CDs.



Fig. S6 (a) PL emission spectra of CDs prepared from dicyandiamide and ophenylenediamine without acid. (b-d) PL emission spectra of CDs prepared from dicyandiamide and o-phenylenediamine in the presence of different acids: (b) nitric acid, (c) hydrochloric acid, and (d) phosphoric acid. (e) PL emission spectra of CDs prepared from dicyandiamide, o-phenylenediamine and sodium sulfate.



Fig. S7 The influences of standing time in natural light on the fluorescence intensity of CDs.



Fig. S8 The influences of standing time in ultraviolet light exposure on the fluorescence intensity of CDs.



Fig. S9 The influences of standing time in high ionic strength on the fluorescence intensity of CDs.



Fig. S10 Linear relationship between F_{630}^0/F_{630} of red dual-emissive CDs and concentration of methyl blue.



Fig. S11 Linear relationship between F_{680}^0/F_{680} of red dual-emissive CDs and concentration of methyl blue.



Fig. S12 Dependence of F_{630}/F_{680} of red dual-emissive CDs on response time after adding methyl blue into an aqueous solution of CDs with pH = 2. The fluorescence measurement was performed under excitation wavelength of 560 nm.



Fig. S13 (a) Fluorescence spectra of CDs before and after adding methyl blue. (b, c) TEM images of CDs (a) before and (c) after the addition of methyl blue. (d) FT-IR spectra of methyl blue, CDs and the sample after adding methyl blue. (e) UV-vis absorption spectrum of CDs (the red line) and fluorescence spectrum of methyl blue (the black line). (f) Time-resolved fluorescence decay curves of CDs and CDs + methyl blue are normalized.

Sample	Zeta potential (mV)
CDs (as-prepared)	0.57
CDs+ methyl blue	-1.68
CDs (pH = 12, adjusted by \Box	-1.67
NaOH)	

Table S1. Zeta potential of CDs under different conditions