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Supporting Information

High pH-induced efficient room-temperature phosphorescence from carbon dots in hydrogen-bonded matrices

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Materials.

All reagents were used as received without further purification. Folic acid, anhydrous citric acid, cyanuric acid and sodium hydroxide (NaOH) were purchased from Aladdin Chemistry Co. Ltd, China. Deionized (DI) water (18.2 MΩ.cm at 25 °C) prepared by a Milli-Q (MQ) water system was used throughout all experiments.

Characterization.

The transmission electron microscopy (TEM) and high-resolution TEM (HRTEM) images were recorded on a H800 instrument (Hitachi, Japan) and a HRTEM JEOL 2100 system operating at 200 kV (Japan), respectively. The X-ray photoelectron spectroscopy (XPS) measurement was performed by using an ESCALAB 250 XPS system (Thermo Electron Corporation, USA). The Fourier transform infrared (FTIR) spectrum was collected on a Bruker Tensor 27 spectrophotometer (Germany). The PL and phosphorescence spectra of CDs and CD-based composites were acquired by using a Hitachi F-7000 fluorescence spectrophotometer (Japan). The absorbance spectra of CDs and CD-based composites was recorded by using a Shimadzu UV-2600 spectrometer (Japan). The absolute PL QY, fluorescence lifetime, and time-resolved phosphorescence lifetimes were measured using an Edinburgh FLS980 fluorescence spectrophotometer (UK). The absolute phosphorescence QY of CD-based RTP composites were obtained on Edinburgh FLS980 spectrometer equipped with an integrating sphere using BaSO4 as the reflectance standard at room temperature. The excitation light source is a microsecond flash-lamp (μF900) equipped with a gating.

The gating time is 100 ns.

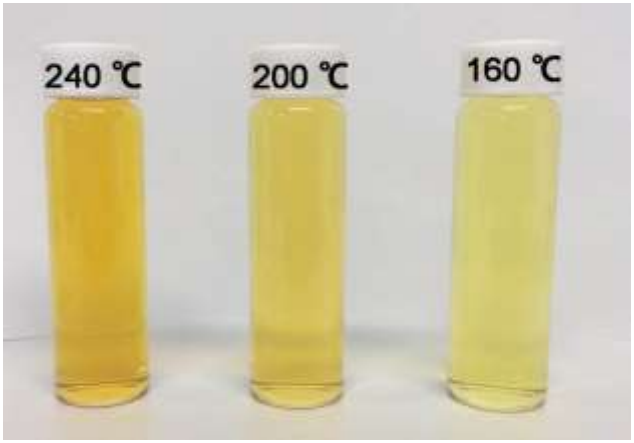

Fig. S1 Digital photographs of the products at different reaction temperature.

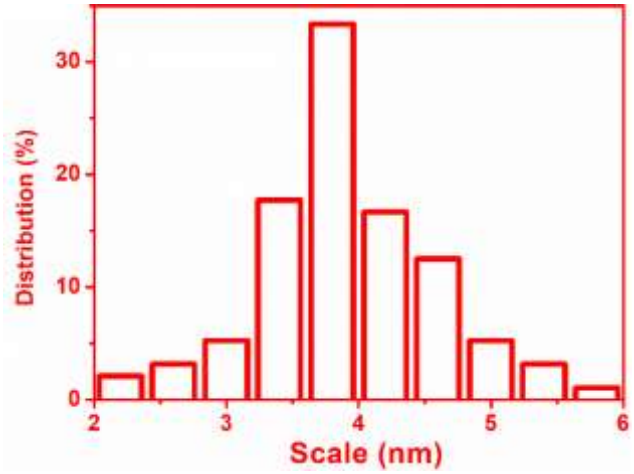

Fig. S2 Particle diameter distribution of CDs.

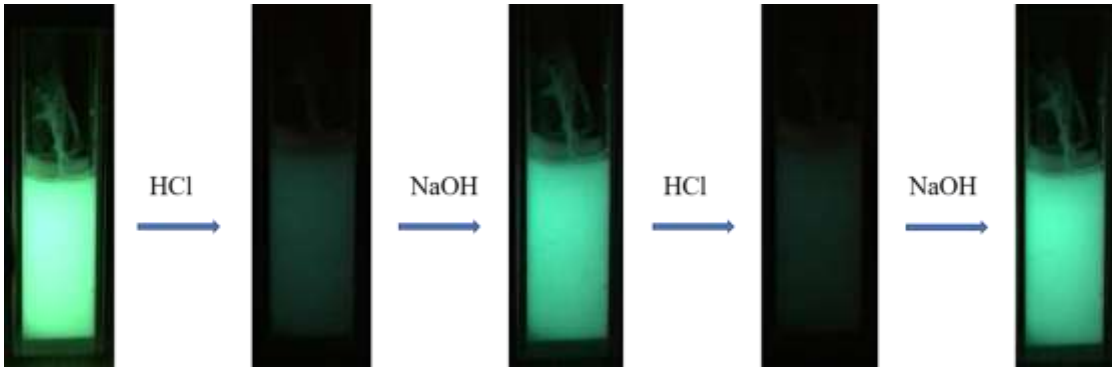

Fig. S3 Photographs of the RTP intensity for the CD/$H_2CANa_{11.5}$ composites under alternate treatment of HCl and NaOH.

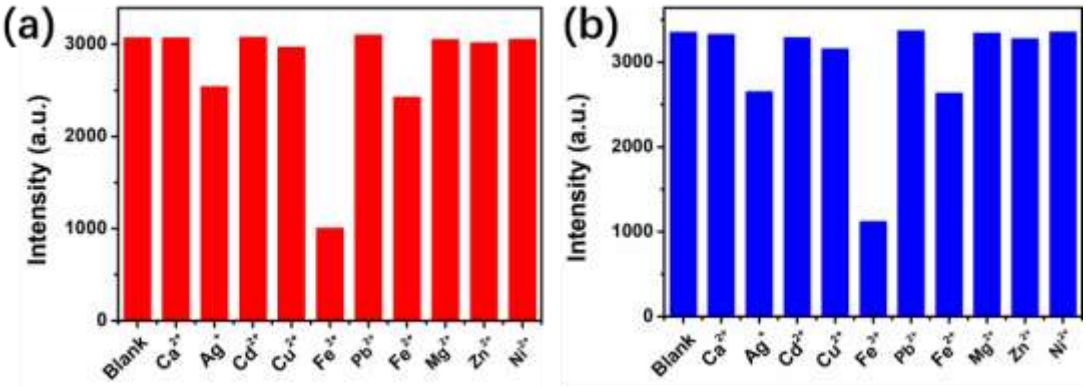

Fig. S4 Comparison of a) PL and b) RTP intensities of the CD/$H_2CANa_{7.3}$ composites after adding different metal ions (PL: λ_{ex} = 380 nm, λ_{em} = 438 nm; RTP: λ_{ex} = 360 nm, λ_{em} = 480 nm).

Table S1 The time resolved phosphorescence decay components (λ_{ex} = 377.4 nm and λ_{em} = 470 nm) of the CDs in different pH values. Where α_i, τ_i are the amplitude and decay time (ns)[a].

pH	τ_1 [ns]	A_1 [%]	τ_2 [ns]	A_2 [%]	T_3 [ns]	A_3 [%]	τ_{ave} [ns]
4.8	1.508	17.32	4.648	53.45	13.84	29.24	10.00376
5.8	1.087	8.54	3.954	53.16	12.39	38.3	9.683821
7.3	1.028	25.66	4.008	38.68	12.4	35.66	9.832643
10.0	1.534	12.19	4.37	40.47	12.66	47.34	10.5538
11.5	4.648	13.08	10.86	86.92	--	--	10.48412
12.3	3.724	12.38	9.128	87.62	--	--	8.833471

[a] The average lifetimes were calculated using the equation: $\tau_{ave} = \sum \alpha_i \tau_i^2 / \sum \alpha_i \tau_i$