Supporting Information

Fluorescent Carbon Nanoparticle: Mimic of Hydrogen Peroxide Property for Chemiluminescence System

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Experimental Section

Reagents. All chemicals used in our work were analytical grade and were used without any purification. diphosphorus pentoxide(P_2O_5), acetic acid(CH_3COOH), sodium hydroxide (NaOH), sodium hydrogen carbonate ($NaHCO_3$), sodium bisulfite($NaHSO_3$) were brought from Beijing Chemical Reagent Co. (Beijing, China). 2,2,6,6-tetramethyl-4-piperidine (TEMP), luminol and 2, 2,-azino-bis(3-ethyl-benzothiazoline-6-sulfonic acid) (ABTS) was purchased from J＆K Scientific. Ltd (Beijing, China). NaOH solution was prepared freshly before using.

Apparatus. Batch CL experiments were carried out with a BPCL luminescence analyzer (Institute of Biophysics, Chinese Academy of Sciences, Beijing, China). The flow injection was performed with a flow CL analyzer (LumiFlow LF 800 detector, NITI ON, Funabashi, Japan). UV-vis spectra were collected by a UV-3900 spectrophotometer (Hitachi, Japan). Emission spectra were measured with a F-7000 fluorescence spectrophotometer (Hitachi, Japan). The Fourier Transform Infrared (FTIR) spectrum was obtained with FTIR spectrometer (Massachusetts, USA). Electron paramagnetic resonance (EPR) spectra were measured on a Model JES-FA200 spectrometer (JEOL, Tokyo, Japan). Transmission electron microscopy image was recorded by a JEM 2010 electron microscope (JEOL, Japan).

Synthesis of FCNs. FCNs were synthesized as previously reported. First, 1ml of acetic acid as carbon source was mixed with water (160 μL). Then homogeneous mixture solution was quickly added to 2.5 g of P_2O_5 in a 10 ml sample vial without stirring and then sticky brown product was obtained. The as-prepared FCNs were purified by dialysis for 24h(The cut-off of the dialysis membrane equivalent to Mw ~ 1000). The FCNs solution was collected in a 25 ml volumetric flask to reserve, which was used as original solution for diluting to different ratio.

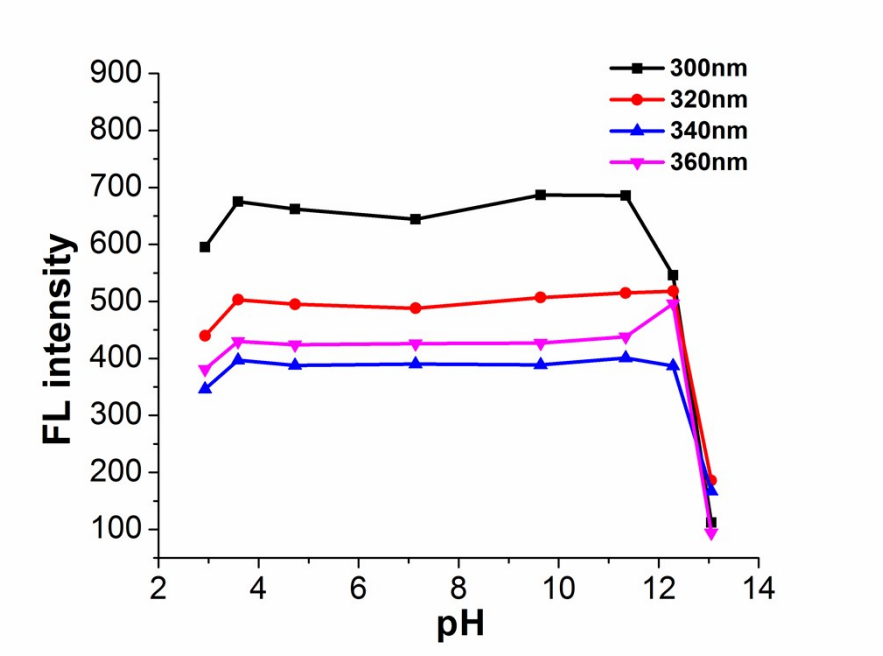

Figure S1 The FL stability upon pH range of 3-13.

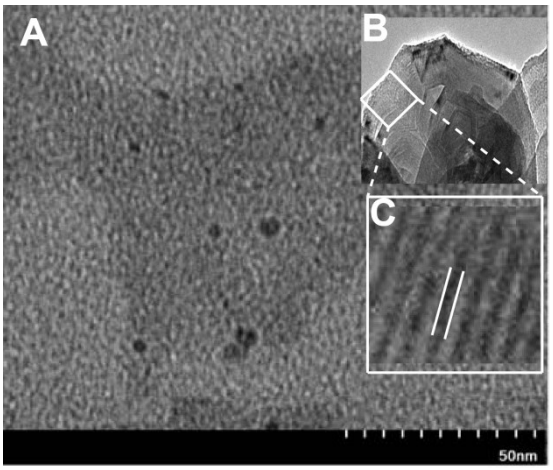

Figure S2 HRTEM image of the FCNs

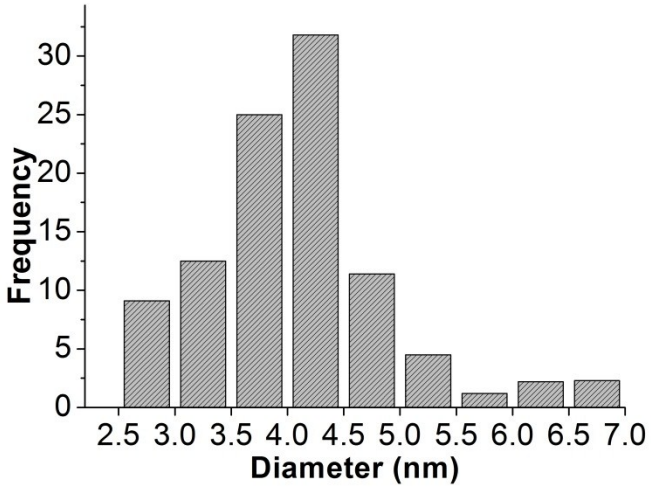

Figure S3 The image of diameter distribution of FCNs

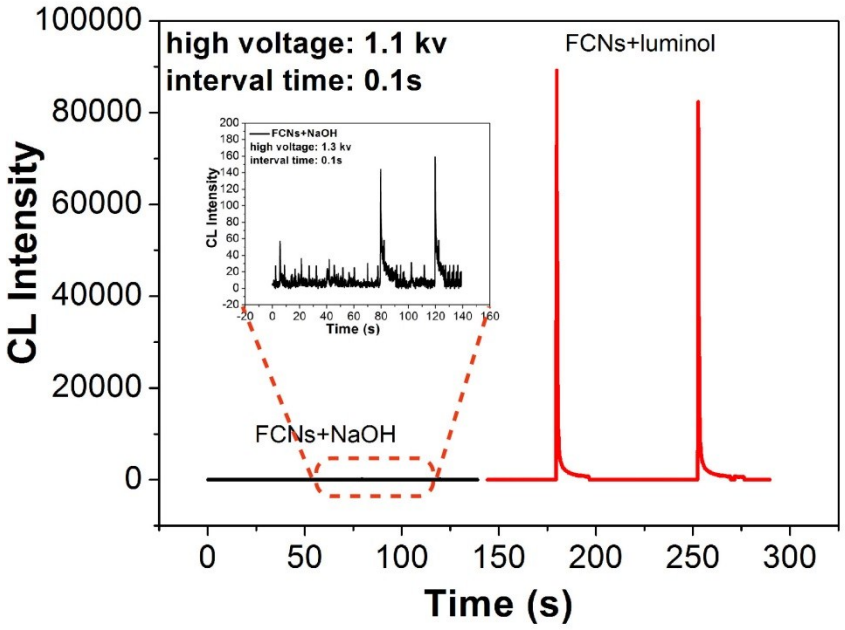

Figure S4 The comparison of CL signal for FCNs-NaOH and FCNs-luminol system. Conditions: High voltage was -1.1 kV; interval time was set for 0. 1 s. The concentration of luminol is 10^{-5} M; The concentration of NaOH is 0.1 M; the FCNs is in the dilution of 1:5000 with water.

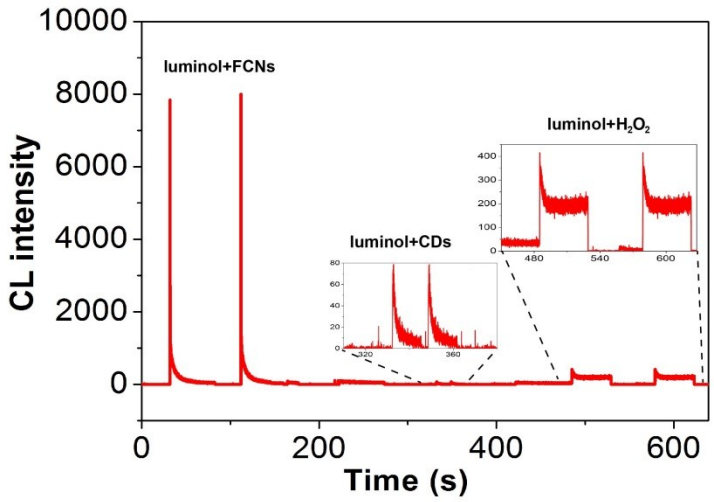

Figure S5 The CL files luminol-FCNs, luminol-CDs and luminol-H_2O_2 system with the same NaOH concentration of 0.1M. Conditions: High voltage was -1.2 kV; interval time was set for 0.01 s. The concentration of luminol is 10^{-5} M; the FCNs is in the dilution of 1:5000 with water. The CDs is in the dilution of 1:100 with water.

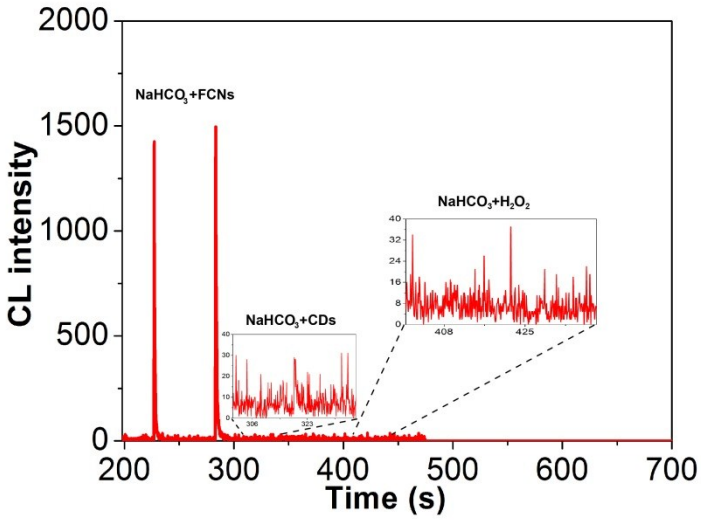

Figure S6 The CL files $NaHCO_3$-FCNs, $NaHCO_3$-CDs and $NaHCO_3$-H_2O_2 system with the same NaOH concentration of 0.1M. Conditions: High voltage was -1.4kV; interval time was set for 0. 1 s. The concentration of $NaHCO_3$ is 0.1M; the FCNs is in the dilution of 1:5000 with water. The CDs is in the dilution of 1:100 with water.

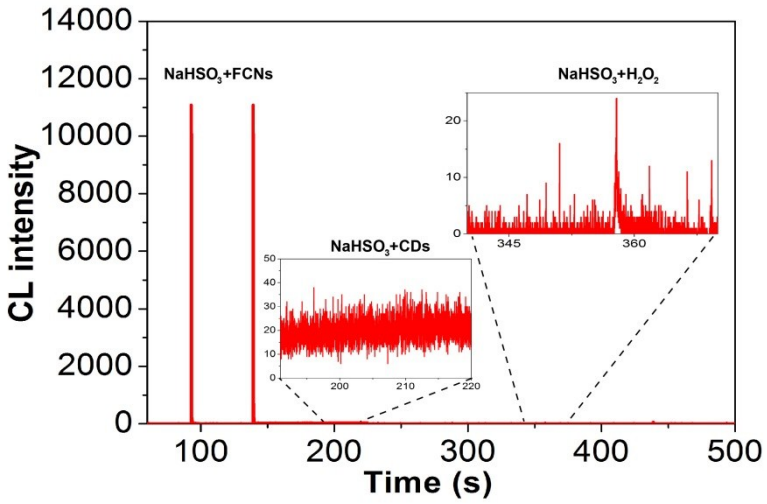

Figure S7 The CL files $NaHSO_3$-FCNs, $NaHSO_3$-CDs and $NaHSO_3$-H_2O_2 system with the same NaOH concentration of 0.1M. Conditions: High voltage was -1.3kV; interval time was set for 0. 1 s. The concentration of $NaHSO_3$ is 0.1M; the FCNs is in the dilution of 1:5000 with water. The CDs is in the dilution of 1:100 with water.

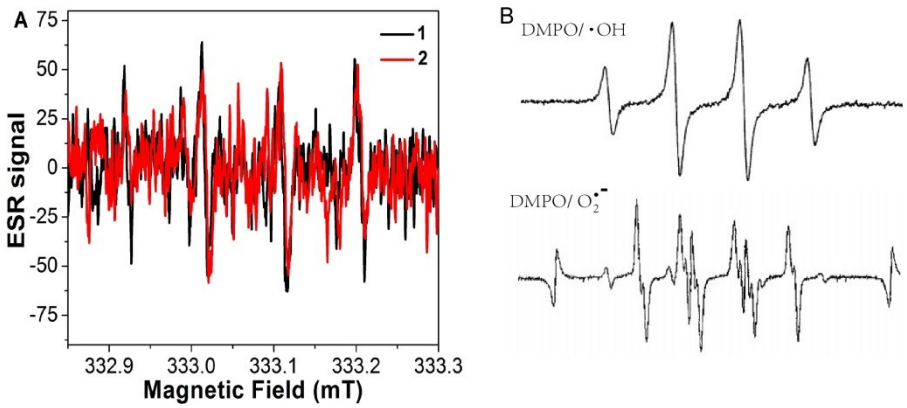

Fig. S8 (A)ESR spectra of DMPO adduct by ·OH and O_2^{-}· trapped with DMPO in (1)luminol solution and (2) FCNs-luminol system. (B) The specific ESR spectra of DMPO/·OH and DMPO/ O_2^{-}· adduct which from ref. 1(Hui Chen et al. 2010) and ref.2(Yasuko Noda et al. 1997).

(1) Hui Chen, Ruibo Li, Ling Lin, Guangsheng Guo, Jin-Ming Lin, *Talanta.* **2010,** 81, 1688–1696

(2)Yasuko Noda, Kazunori Anzai, Akitane Marl, Masahiro Kohno, Masashi Shinmei, *Biochem. Mol. Biol. Int.* **1997**, *42*, 35-44.

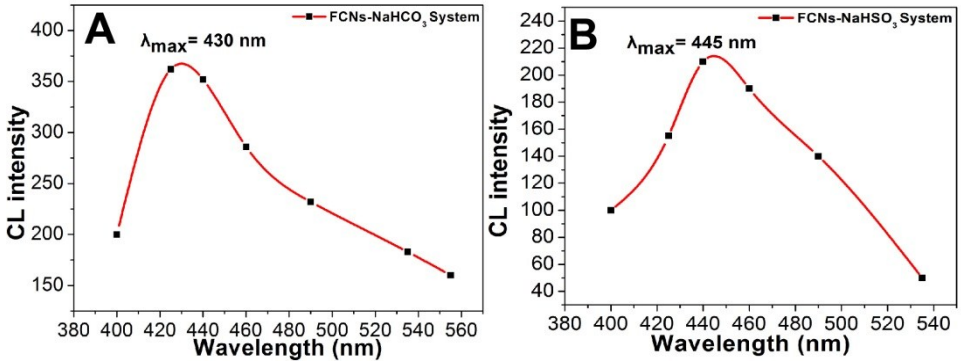

Fig. S9 The CL spectra of FCNs-$NaHCO_3$ and FCNs-$NaHSO_3$ system

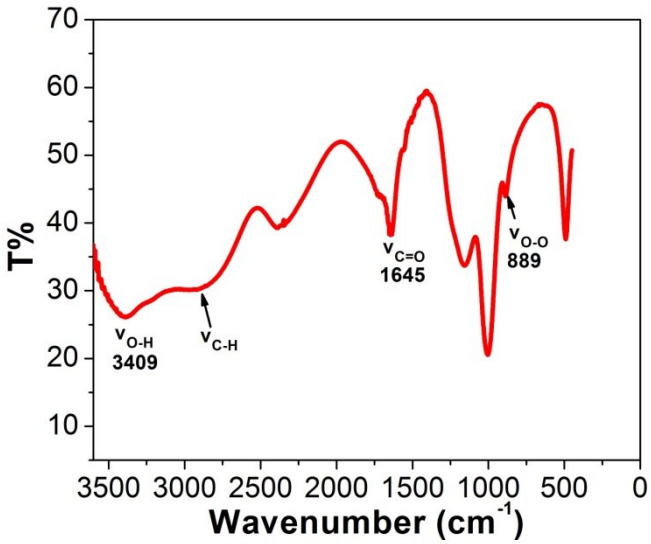

Figure S10 The FTIR spectra of FCNs solution

Table S1 Table Inhibition Effects of Organic Compounds (10^{-5}mol/L) on FCNs-Luminol CL System[a, b]

Organic compounds	Quenching, %	Organic compounds	Quenching, %
ascorbic acid	92.6	Pyrocatechol	96.2
L-proline	38.9	Resorcine Phenylenediamine	95.8
L-cysteine	98	Resorcine	83.4
L-histidine	88.7	DL-Methionine	87.5
2-aminophenol	86	L(+)-Arginine	69
4-nitrophenol	50	L-Lysine	58.9

[a]The experiments were carried out with flow injection system.

[b]Solution condition: the concentration of luminol was 10^{-5} M in 0.1 M NaOH ; FCNs in a dilution of 1:1000.

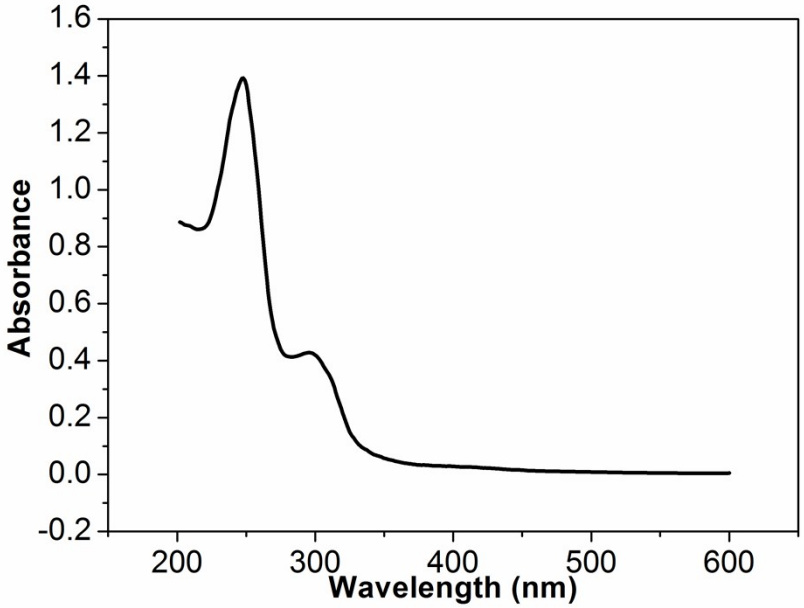

Figure S11 The UV-vis spectra of FCNs solution