Supporting Information

Cyanine dye-assembled composite upconversion nanoparticles for the sensing and cell imaging of nitrite based on a single particle imaging method

Yunchun Liu*, Wanru Zhu, Xinru Wei, Lun Wang, Hongqi Chen*

Anhui Key Laboratory of Chemo-Biosensing, Key Laboratory of Functional Molecular Solids, Ministry of Education, College of Chemistry and Materials Science, Anhui Normal University, Wuhu 241000, PR China

*Correspondence.

E-mail addresses: wblych@ahnu.edu.cn (Y Liu); hq80chen@mail.ahnu.edu.cn (H Chen).
**Fig. S1.** Comparison of the luminous intensity of NaYF$_4$:Yb,Tm and NaYF$_4$:Yb,Tm@NaGdF$_4$.

**Fig. S2.** Chromatographic detection results of dye IR-798 before and after adding 150 μM NO$_2^-$.

(Liquid chromatograph conditions: the mobile phase is methanol: water=90:10; the flow rate is 0.600 mL/min).
Fig. S3. (A) The graph of the absorbance of the dye IR-798 over time. (B) The graph of the luminous intensity of the probe UCNPs-IR-798 over time, and the recovery of the probe's luminous intensity after adding 100 μM NO₂⁻ (CUCNPs=0.12 mg/mL, CIR-798=0.044 mg/mL).

Fig. S4. (A) Influence of the dye concentration on the luminous intensity of UCNPs. (B) Changes in the luminescence intensity of UCNPs in buffer solutions with different pH values. (C) The change of luminescence intensity under different reaction times between UCNPs-IR-798 and
NO$_2^-$: (D) The effect of different UCNPs concentration ($I_0$ and $I$ respectively represent the change in luminous intensity before and after the addition of NO$_2^-$).

**Fig. S5.** Effect of the probe formation time ($I_0$ and $I$ respectively represent the change in luminous intensity before and after the presence of IR-798).

**Fig. S6.** Luminous images and intensity traces of tap water (A) and river water (B) under different NO$_2^-$ concentrations.
Fig. S7. (A) Upconversion luminous intensity changes in the pH range of 6.8-7.8. (B) Cell survival rate under different UCNPs-IR-798 probe concentrations.