

Electronic Supplementary Information(ESI) for:
**Upconversion Nanoparticle-Based Fluorescence Resonance
Energy Transfer System for Effective Sensing Caspase-3 Activity**

Lin Liu,^a Hua Zhang,^{b,*} Daqian Song,^{a,*} Zhenxin Wang^b

^aCollege of Chemistry, Jilin University, Changchun 130012, P. R. China

^bState Key Laboratory of Electroanalytical Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun 130022, P. R. China.

Contents

Additional figures S1-S8

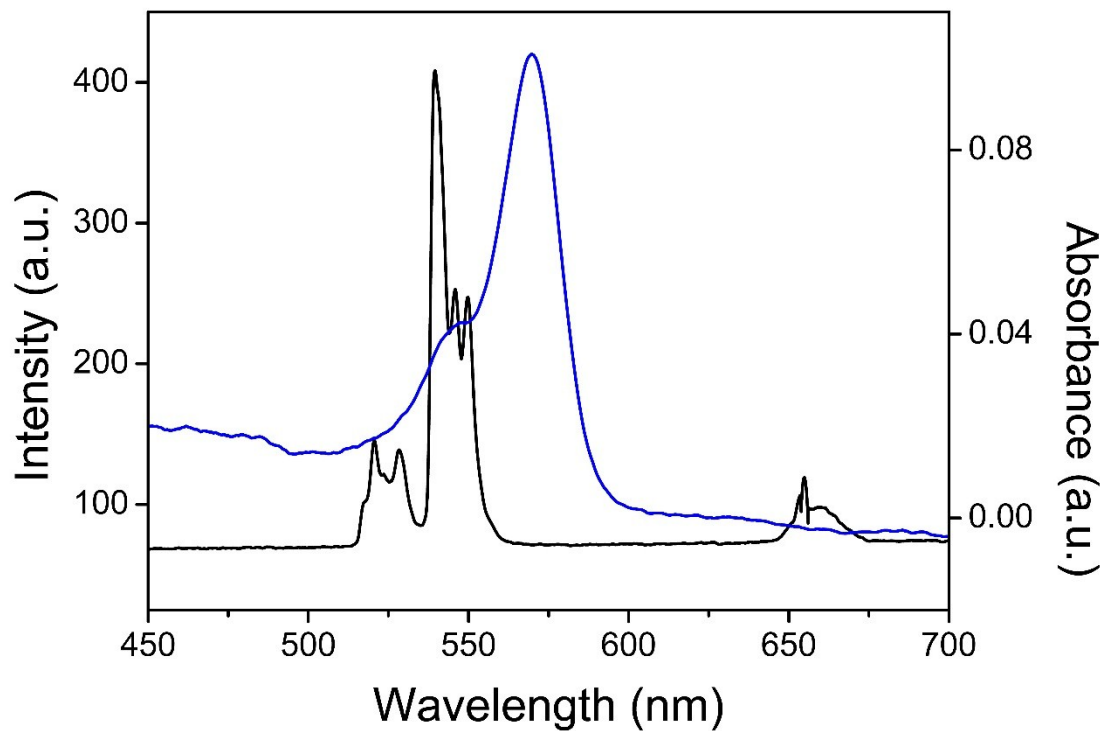


Fig. S1 The UCL spectrum of NaGdF₄: Yb³⁺, Er³⁺@NaGdF₄ UCNPs (0.3 mg mL⁻¹ in cyclohexane, black line) and absorption spectrum of RB-pCasCPP (0.5 mg mL⁻¹ in PBS, blue line).

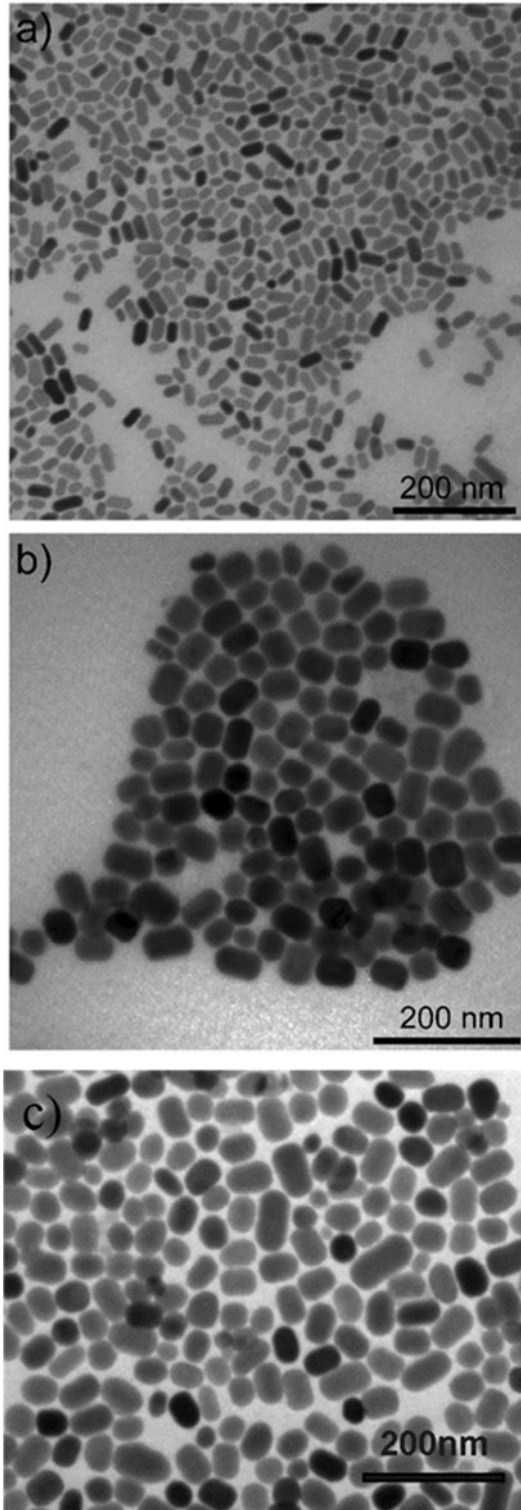


Fig. S2 TEM micrograph of NaGdF₄: Yb³⁺, Er³⁺UCNPs (a), NaGdF₄: Yb³⁺, Er³⁺@NaGdF₄ UCNPs (b) and NaGdF₄: Yb³⁺, Er³⁺@NaGdF₄ UCNP@RB-pCasCPP (c).

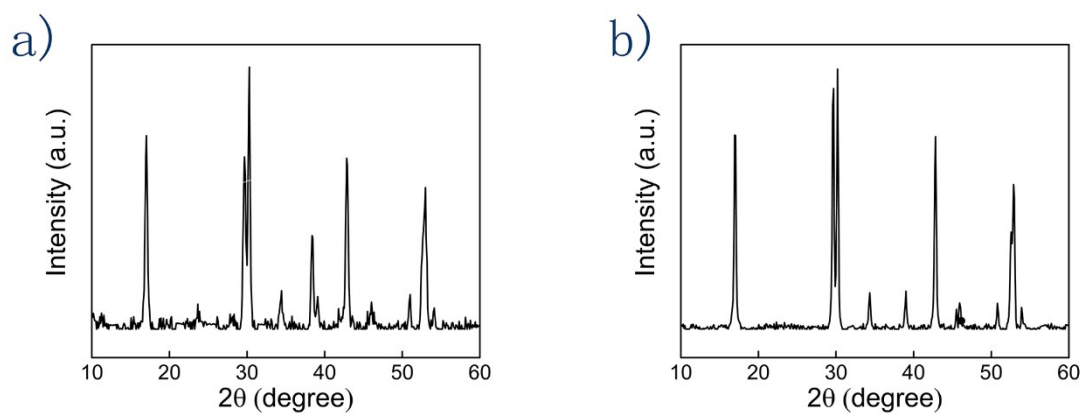


Fig. S3 X-ray diffraction patterns of NaGdF₄: Yb³⁺, Er³⁺ UCNPs (a) and NaGdF₄: Yb³⁺, Er³⁺@NaGdF₄ UCNPs (b).

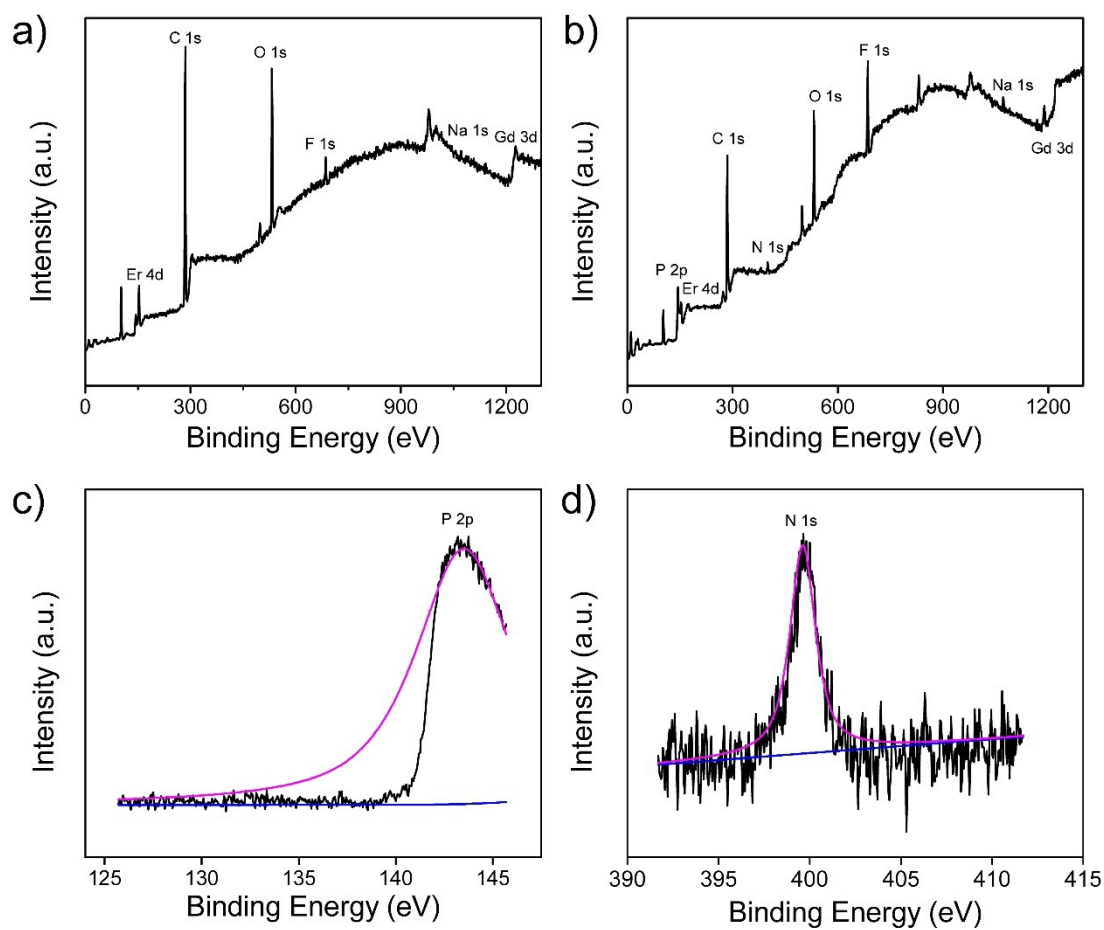


Fig. S4 XPS survey spectra of oleate capped NaGdF₄: Yb³⁺, Er³⁺@NaGdF₄ UCNPs (a) and NaGdF₄: Yb³⁺, Er³⁺@NaGdF₄ UCNP@RB-pCasCPP (b), and P 2p(c) and N 1s (d) XPS spectra of NaGdF₄: Yb³⁺, Er³⁺@NaGdF₄ UCNP@RB-pCasCPP.

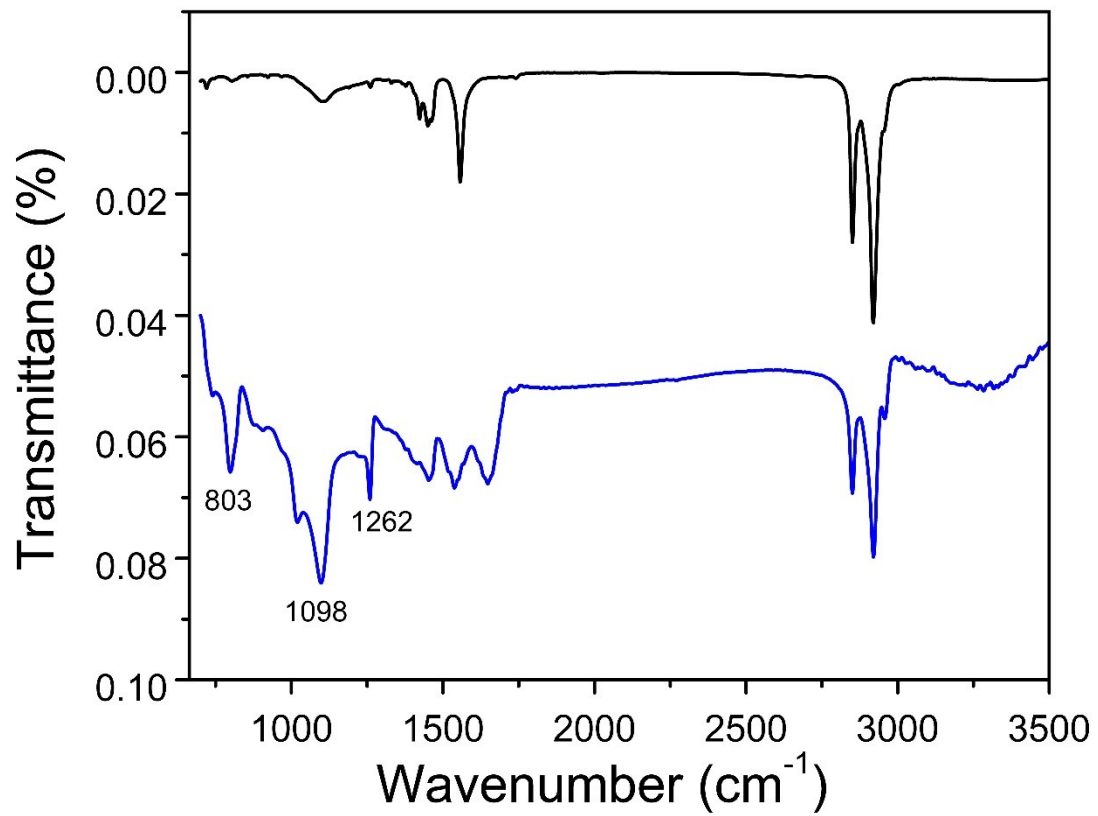


Fig. S5 FTIR spectra of oleate capped $\text{NaGdF}_4: \text{Yb}^{3+}, \text{Er}^{3+}@ \text{NaGdF}_4$ UCNPs (black line) and $\text{NaGdF}_4: \text{Yb}^{3+}, \text{Er}^{3+}@ \text{NaGdF}_4$ UCNP@RB-pCasCPP (blue line).

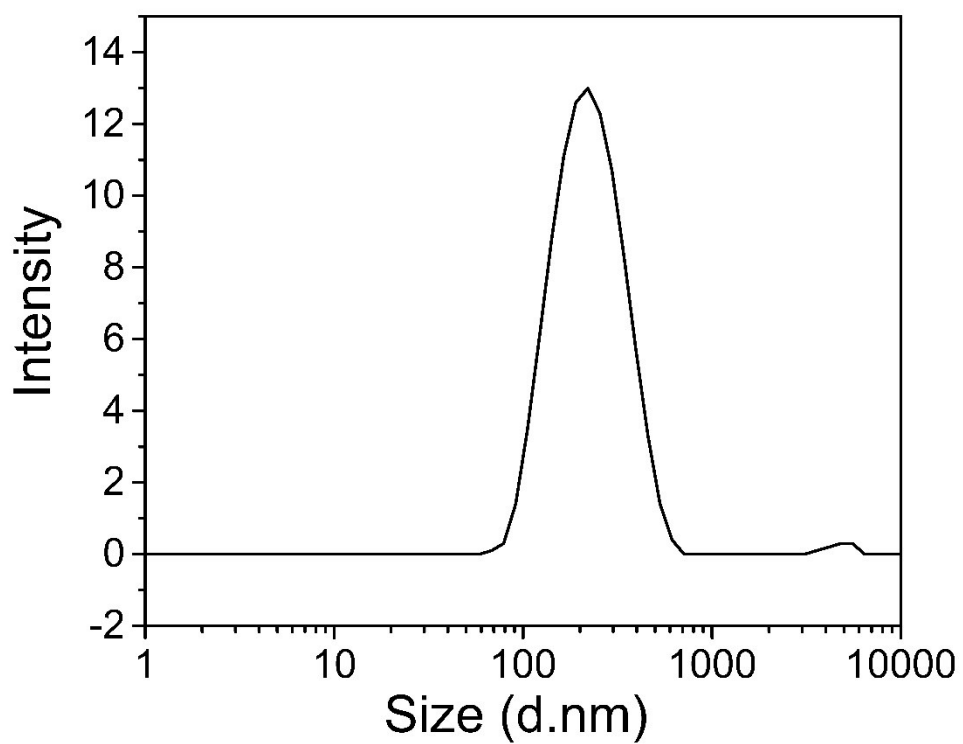


Fig. S6 DLS size distribution of NaGdF₄: Yb³⁺, Er³⁺@NaGdF₄ UCNP@RB-pCasCPP.



Fig. S7 Digital images of NaGdF₄: Yb³⁺, Er³⁺@NaGdF₄ UCNP@RB-pCasCPP re-dispersed in different media after 12 h.

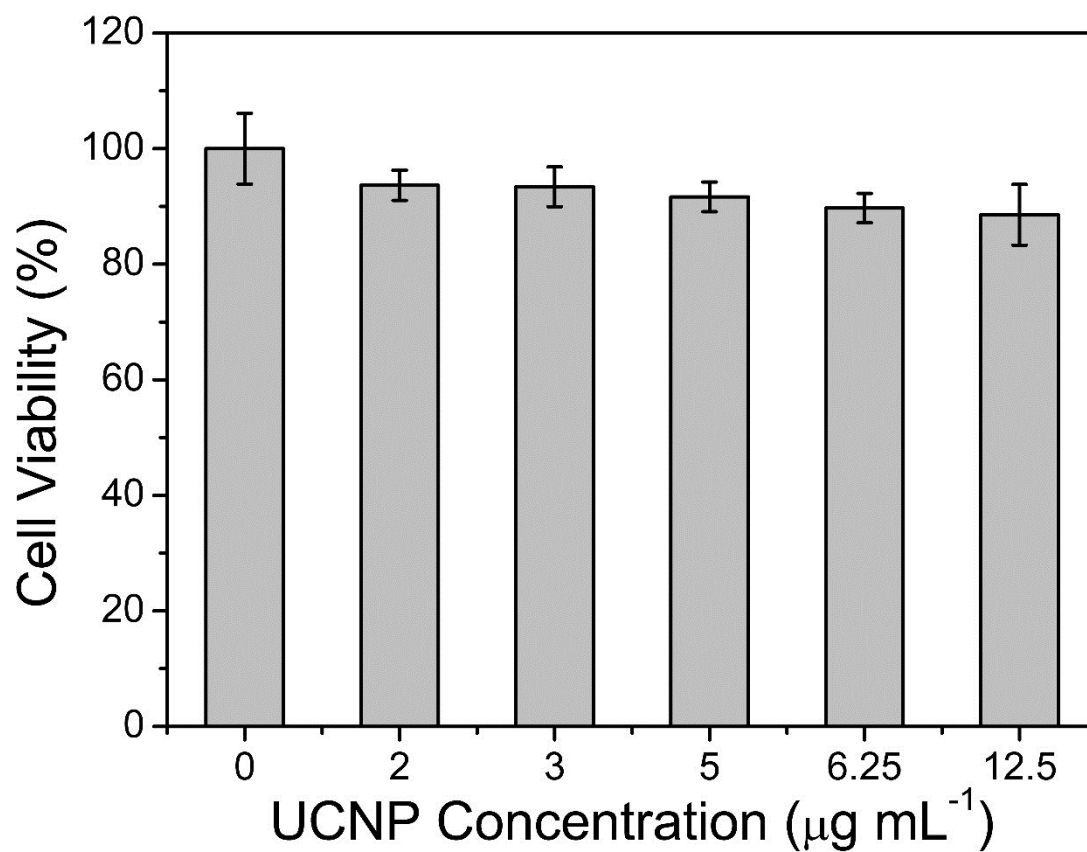


Fig. S8 Cell viability as a function of the concentration of $\text{NaGdF}_4: \text{Yb}^{3+}, \text{Er}^{3+}@\text{NaGdF}_4 \text{UCNP}@ \text{RB-pCasCPP}$.