

## Electronic Supplementary Information

# A General Synthesis of Small-size and Water-soluble $\text{NaYF}_4\text{:Yb, Ln}$ Upconversion Nanoparticles at High Temperature

Mingda Liu,<sup>a,1</sup> Jianwen Xu,<sup>a,1</sup> Kai Zhu,<sup>a</sup> Ming Yan,<sup>\*a</sup> Min He,<sup>b</sup> Xiaowei Huang,<sup>b</sup> Yan Xu,<sup>b</sup> Wei Wang,<sup>\*c</sup> Shibo Zhao,<sup>d</sup> and Qinghui Zeng,<sup>\*ab</sup>

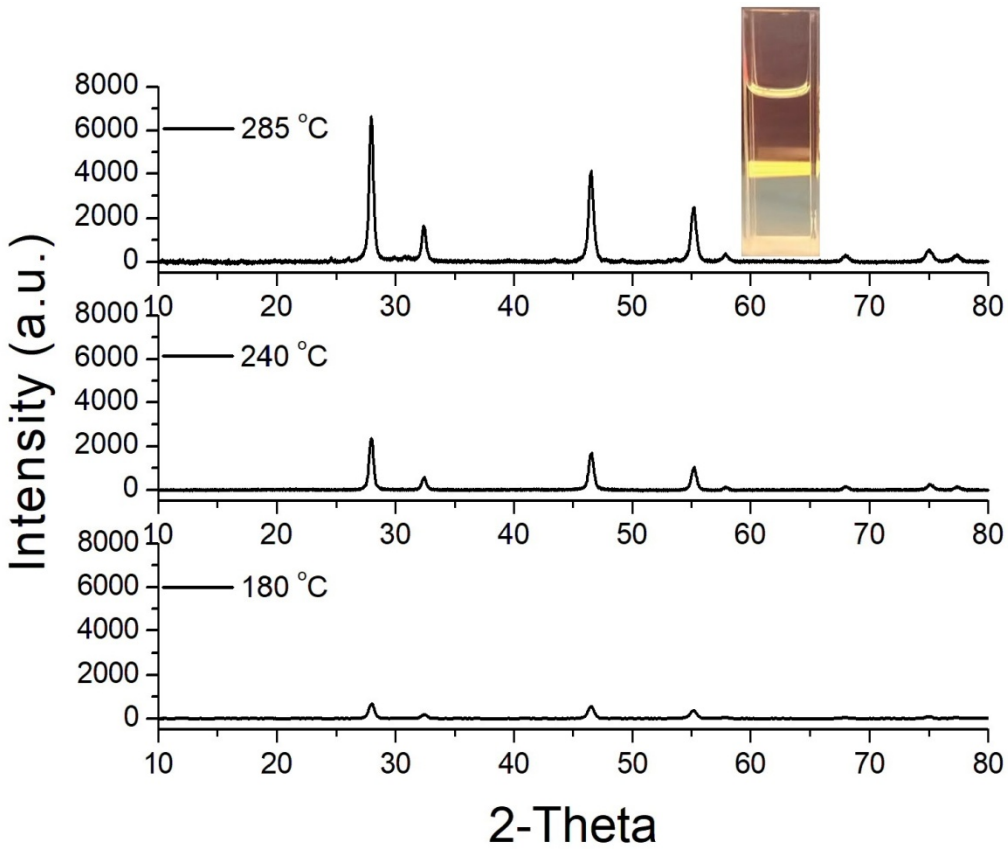
<sup>a</sup> Changchun University of Chinese Medicine, Bo Shuo Road 1035, Changchun 130117, P. R. China. E-mail: mingyan.ccucm@outlook.com (Yan M.) and zengqinghui96000@163.com (Zeng Q.H.)

<sup>b</sup> Northeast Asian Institute of Traditional Chinese Medicine, Changchun University of Chinese Medicine, Bo Shuo Road 1035, Changchun 130117, P. R. China..

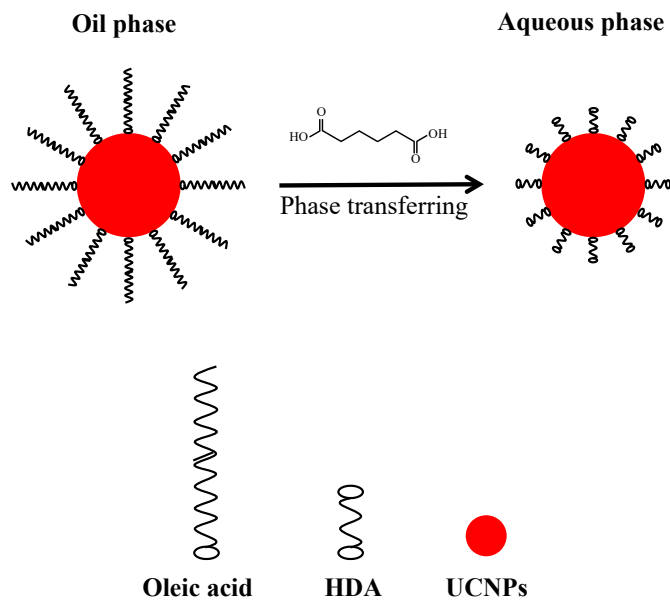
<sup>c</sup> Department of Neurosurgery, The First Hospital of Jilin University, Changchun 130000, P. R. China. E-mail: wangv@jlu.edu.cn (Wang W.).

<sup>d</sup> Medicine and Information College, Changchun University of Chinese Medicine, Changchun 130117, P. R. China.

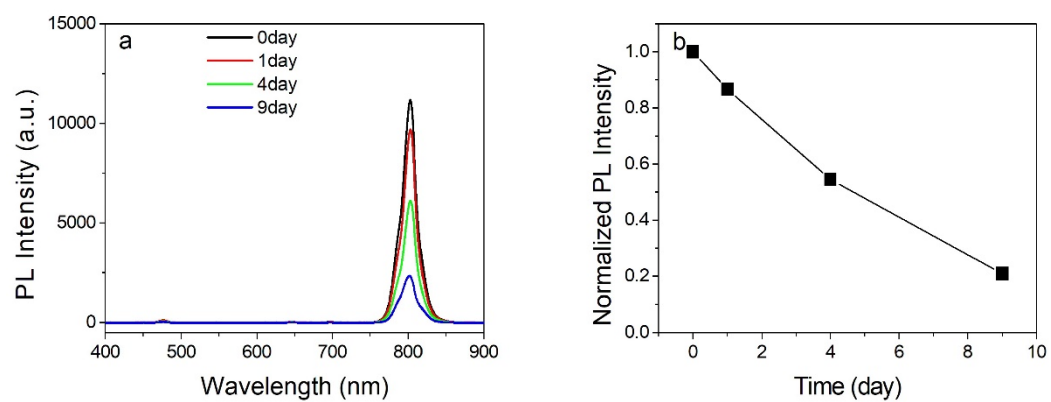
<sup>1</sup> These authors contributed equally to this work.



**Figure S1.** XRD results of NaYF<sub>4</sub>:Yb, Er NPs prepared at 180 °C, 240 °C, and 285 °C. The vertical coordinates are unified to the same standard. Inset is the digital photo of the UCNPs prepared at 285 °C in aqueous solution under the 980 nm laser.



**Scheme S1.** Traditional phase transferring of UCNPs prepared originally in oil phase by using HDA as substitutional ligand.



**Figure S2.** Time evolution of room-temperature UC luminescent spectra and 803 nm emission intensity of NaYF<sub>4</sub>:20%Yb, 2%Tm NPs obtained by phase transferring of the original oil phase UCNPs under natural position to compare the stability of the NPs. The Mass concentration of the NPs was kept constant at 10 mg/mL.  $\lambda_{\text{ex}}=980$  nm.