

**Supporting Information Available**

# Controlled Hydrothermal Growth and Up-conversion Emission of $\text{NaLnF}_4$ (Ln=Y, Dy-Yb)

*Jianle Zhuang, Lifang Liang, Herman H.Y. Sung, Xianfeng Yang, Mingmei Wu,\* Ian D. Williams,*

*Shouhua Feng, and Qiang Su*

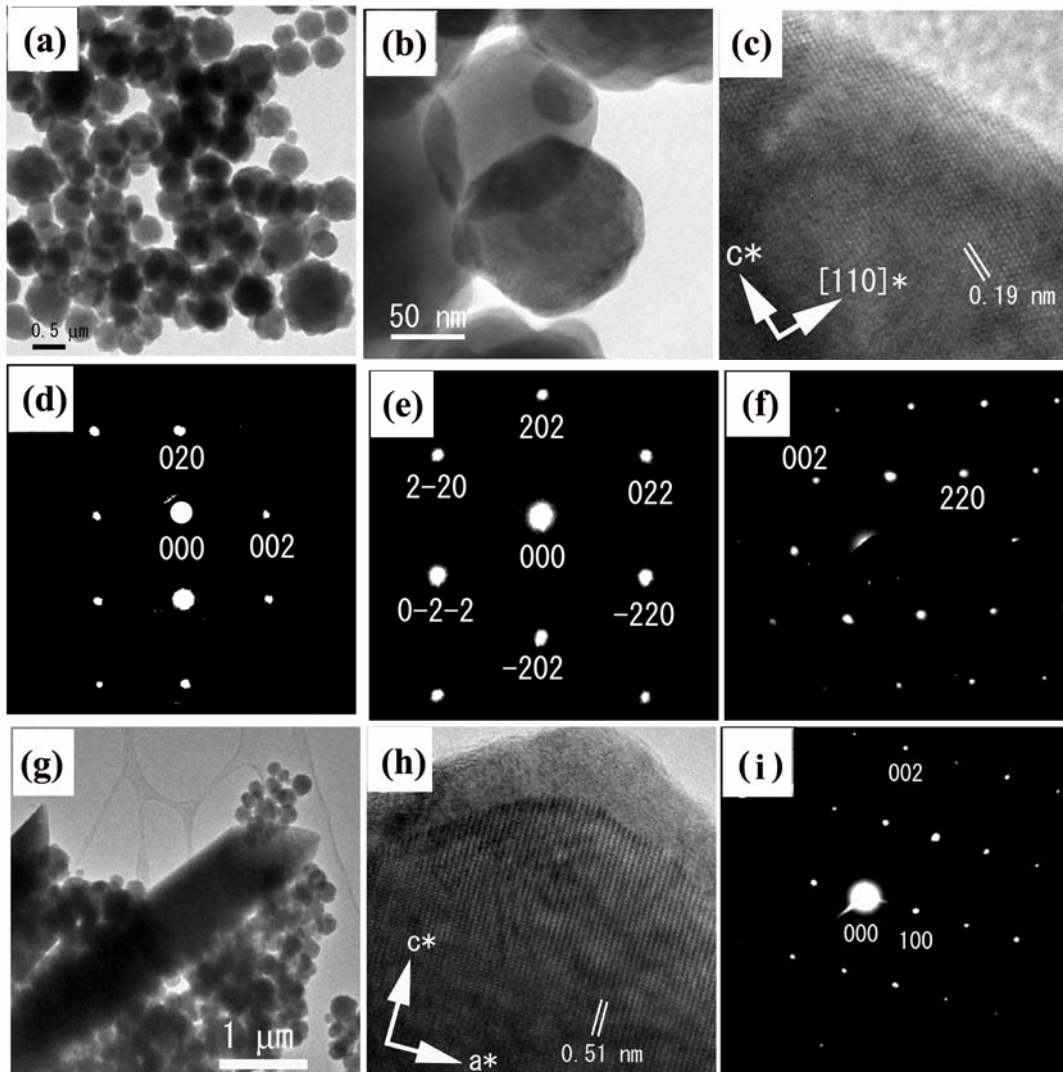
*MOE Key Laboratory of Bioinorganic and Synthetic Chemistry, State Key Laboratory of Optoelectronic  
Materials and Technologies, School of Chemistry and Chemical Engineering, Sun Yat-Sen (Zhongshan)  
University, Guangzhou 510275, P. R. China.*

*Department of Chemistry, Hong Kong University of Science and Technology, Clear Water Bay,  
Kowloon, Hong Kong, P. R. China.*

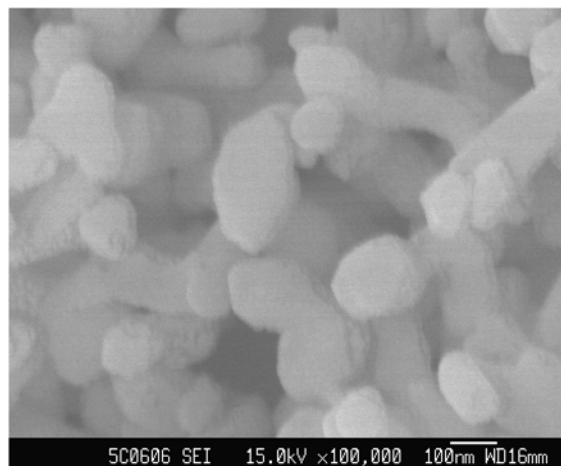
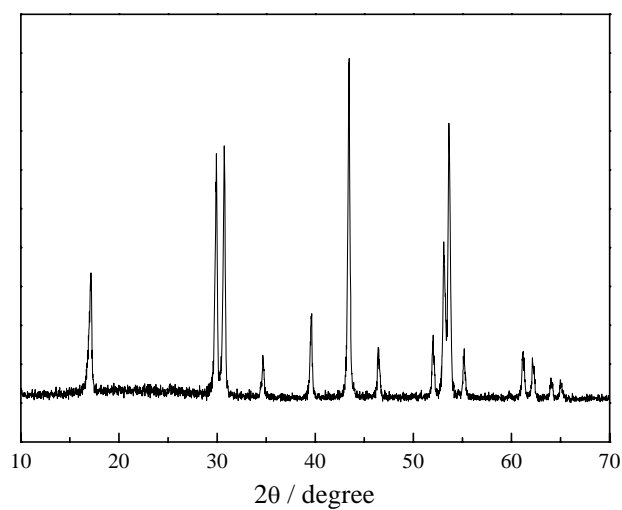
*State Key Laboratory of Inorganic Synthesis and Preparative Chemistry, Jilin University, Changchun  
130023, P. R. China*

[ceswmm@mail.sysu.edu.cn](mailto:ceswmm@mail.sysu.edu.cn)

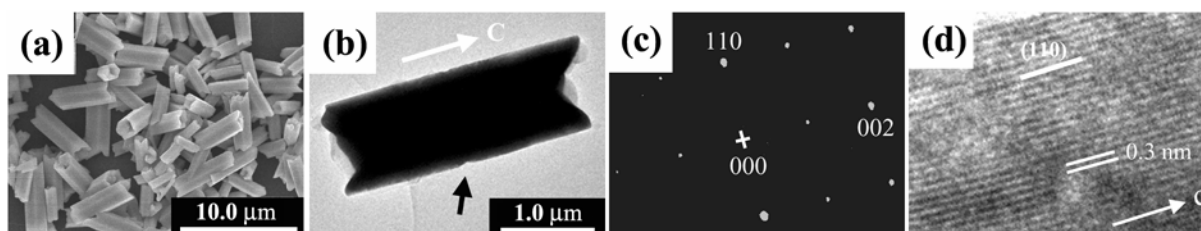
**SI-1:** (a, b) Bright-field TEM images of cubic NaYF<sub>4</sub> crystals; (c)  $[\bar{1}10]$  zone-axis HRTEM image of cubic NaYF<sub>4</sub>; (d, e, f)  $[\bar{1}10]$ ,  $[\bar{1}\bar{1}1]$ , and  $[\bar{1}10]$  SAED patterns of cubic NaYF<sub>4</sub>; the hkl reflections confirm the space group of Fm3m; (g) bright-field TEM images of the tubular H-NaYF<sub>4</sub> and granular C-NaYF<sub>4</sub> crystal; (h)  $[0\bar{1}0]$  zone axis HRTEM image; and (i)  $[0\bar{1}0]$  zone axis SAED pattern of the hexagonal NaYF<sub>4</sub>, the 00l with l = 2n+1 is systematically weak where the specimen is tilted along the c axis, whereas the 00l reflections always appear.



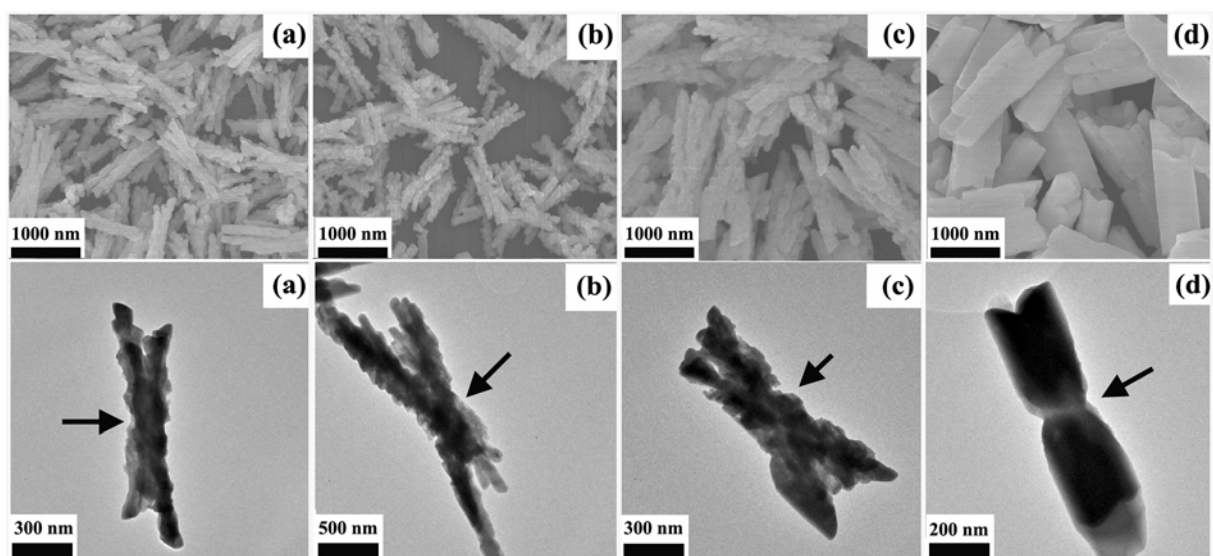
**SI-2:** Powder XRD pattern and SEM image of hexagonal  $\text{NaYF}_4: \text{Yb}^{3+}/\text{Er}^{3+}$  nanoparticles.



**SI-3:** (a) SEM image, (b) low magnification TEM image, (c)  $[1\bar{1}0]$  zone-axis selected-area electron diffraction pattern, and (d) HRTEM image of hexagonal  $\text{NaHoF}_4$  crystals.



**SI-4:** SEM (upper row) and typical TEM (lower row) images of (a) NaEuF<sub>4</sub>, (b) NaGdF<sub>4</sub>, (c) NaTbF<sub>4</sub>, and (d) NaDyF<sub>4</sub>. The arrows point to the sections with solid interiors that initially serve as seeds.



**SI-5:** SEM images of hexagonal (a) NaSmF<sub>4</sub>, (b) NaEuF<sub>4</sub>, (c) NaGdF<sub>4</sub>, (d) NaTbF<sub>4</sub>, (e) NaDyF<sub>4</sub>, (f) NaHoF<sub>4</sub> synthesized at 220 °C for 72 h, and (g) NaDyF<sub>4</sub> and (h) NaHoF<sub>4</sub> synthesized at 220 °C for 6.0 h. Scale bar = 1 μm.

