

Electronic supplementary Information

Low-temperature synthesis of luminescent and mesoporous β -NaYF₄ microspheres via Polyol-Mediated Solvothermal Route

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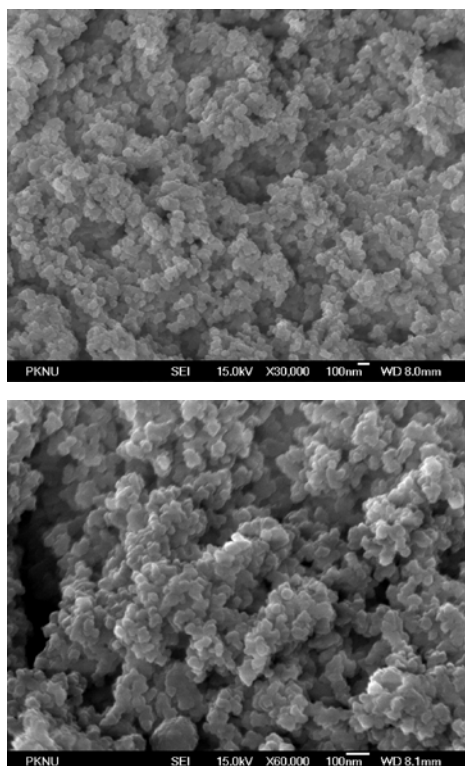


Fig. S1 FE-SEM images of NaYF₄ sample prepared at 80 °C for 2 h.

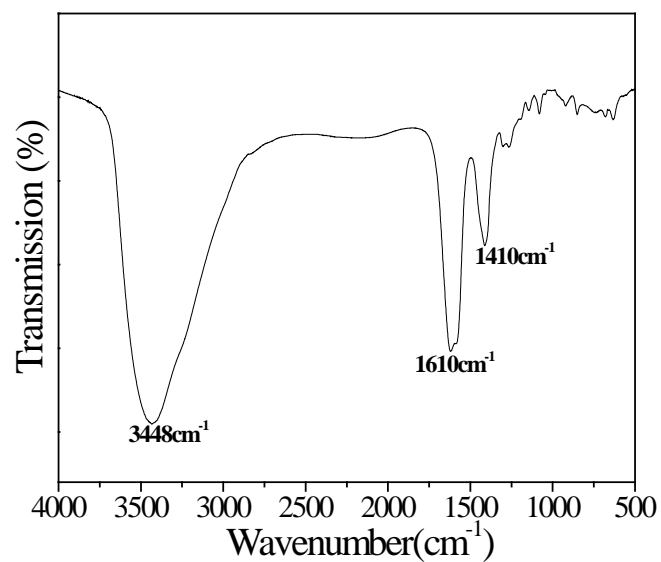


Fig. S2: FTIR spectrum of β -NaYF₄ mesoporous microspheres prepared at 80 °C for 12 h.

The broad absorption band appearing at 3448 cm⁻¹ is ascribable to the O-H vibration of absorbed H₂O. The bands at about 1610 and 1410 cm⁻¹ are assigned to the COO⁻ vibrations in the citrate. It suggests the presence of amounts of water and citrate ligands adsorbed in the final product.

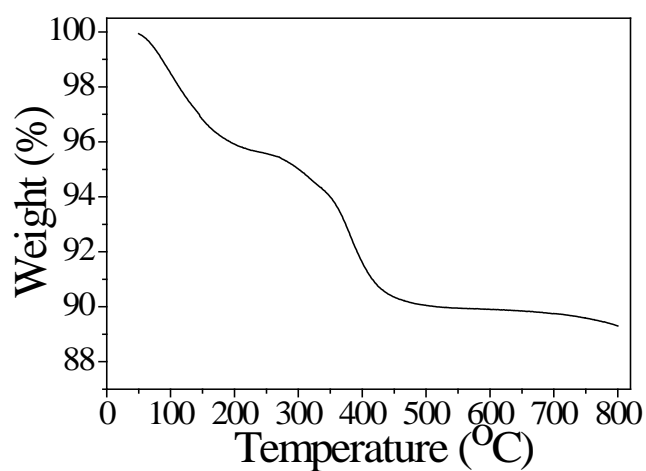


Fig. S3 Thermogravimetric analysis curve of β - NaYF₄ mesoporous microspheres prepared at 80 °C for 12 h.

There was ~ 11% weight loss assigned to desorption of water and citrate ligands from room temperature to 800 °C. The beginning stage ~ 4.08% loss (lower than 200 °C) should be corresponding to desorption of water molecules adsorbed in the product. According to the result of FTIR spectrum, the other weight loss (200-800 °C) may be related to the superposition of dehydration of O-H and decomposition of citrate ligands.

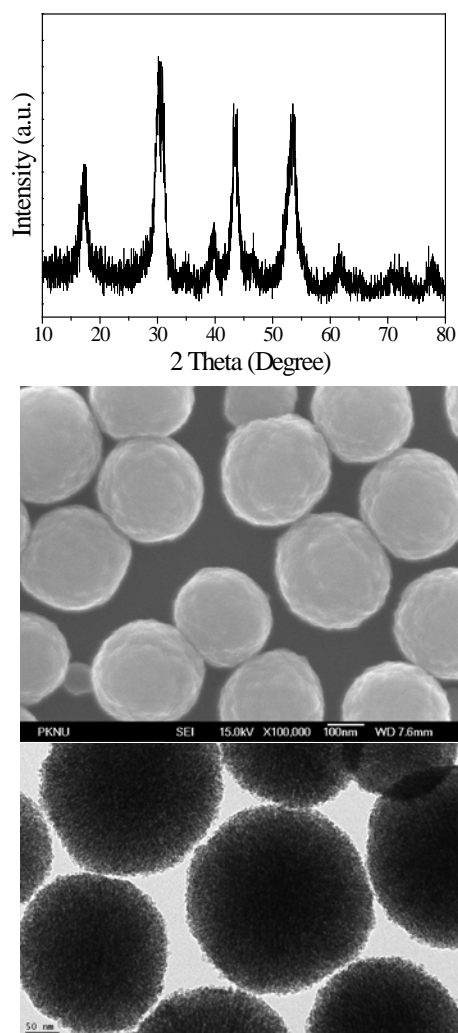


Fig. S4 XRD, SEM and TEM images of β -NaYF₄ mesoporous microspheres prepared at 180 °C for 1 h with the Cit³⁻/Y³⁺ molar ratio of 3:1.

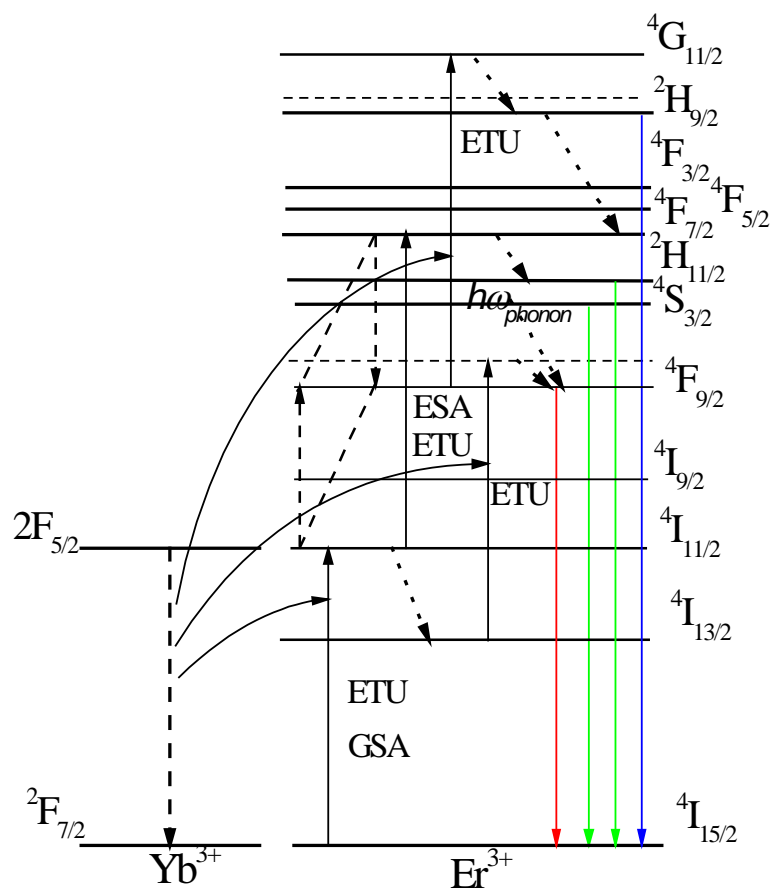


Fig. S5 Schematic representation of the ground-state absorption (GSA), excited-state absorption (ESA), and energy-transfer upconversion (ETU) mechanisms in $\text{Yb}^{3+}, \text{Er}^{3+}$ co-doped $\beta\text{-NaYF}_4$.