Supporting Information

In Situ Synthesis and Photoluminescence of Eu^{3+} Doped $Y(OH)_3$@β-$NaYF_4$ Core-shell Nanotubes†

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Experimental details

Chemicals: Analytical grade NaOH, $Y(NO_3)_3$, $Eu(NO_3)_3$, NaF, and NH_4HF_2 were obtained from Beijing Chemical Reagents, China. All of the reagents and solvents were used as received without further purification. Deionized water was used throughout.

For the synthesis of $Y(OH)_3$ and $Y(OH)_3$:Eu^{3+} nanotubes: 2 mmol of $Y(NO_3)_3$ was dissolved in 6 mL of deionized H_2O, followed by the dropwise addition of 20 mL of NaOH solution under stirring. After being stirred for 1 h, the milky colloid solution was transferred into a 50 mL Teflon-lined autoclave and subsequently sealed and heated at 130 °C for 12 h. The resulting reaction solution along with the precipitate was cooled to room temperature naturally and then centrifuged. The precipitate was washed with deionized water several times and dried at 60 °C for 24 h in a vacuum oven to obtain $Y(OH)_3$ powders. $Y(OH)_3$:Eu^{3+} nanotubes were prepared by the same procedure, except for adding additional 5% $Eu(NO_3)_3$ into the solution of $Y(NO_3)_3$ at the initial stage.

Preparation of $Y(OH)_3$/β-$NaYF_4$ core/shell nanotubes: One part of as-obtained $Y(OH)_3$ powders was redispersed into deionized water by ultrasonic and vigorous stirring for 1 h; an appropriate amount of NaF/NH_4HF_2 solution was dripped into the dispersion, followed by further stirring for 1 h. Resultant milky suspensions were given another hydrothermal treatment at 130 °C for 6 h. The powders of the $Y(OH)_3$/β-$NaYF_4$ core/shell nanocrystals were finally obtained after washing with deionized water and alcohol and drying at 60 °C for 24 h in a vacuum oven.

Characterization: The crystal structure was analyzed by a Rigaku RU-200b X-ray powder diffractometer (XRD) using a nickel-filtered Cu K*a* radiation (λ = 1.4518 Å). The size and morphology of the final products were characterized with a JEOL JEM-1200EX transmission electron microscope (TEM) with a tungsten filament at an accelerating voltage of 100 kV. High-resolution transmission electron microscopy (HRTEM) images are obtained on a JEOL JEM-2010F transmission electron microscope.

The luminescence spectra were recorded with a Hitachi F-4500 fluorescence spectrophotometer at room temperature. For comparison of the luminescence properties of different samples, the luminescence spectra were measured with the same instrument parameters (2.5 nm for spectral resolution and 400 V for PMT voltage).

Figure S1. Decay curve of 621, 616, and 592 nm emissions of $Y(OH)_3:Eu^{3+}$.

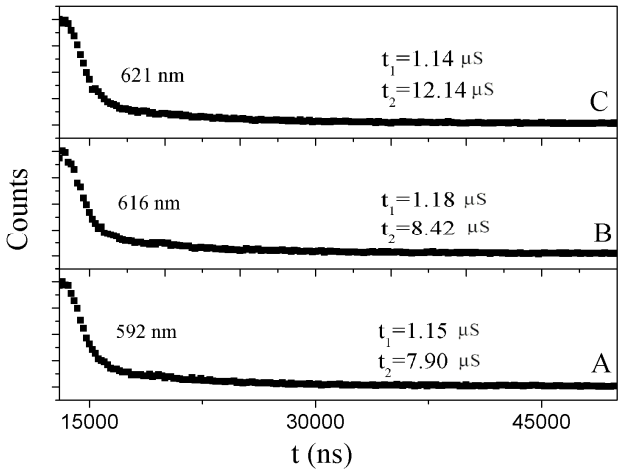

Figure S2. UC luminescence spectrum of $Y(OH)_3$@β-$NaYF_4:Er^{3+}$ nanocrystals under 980-nm excitation.