

NaF-Mediated Controlled-Synthesis of Multicolor Na_xScF_{3+x}:Yb/Er Upconversion Nanocrystals

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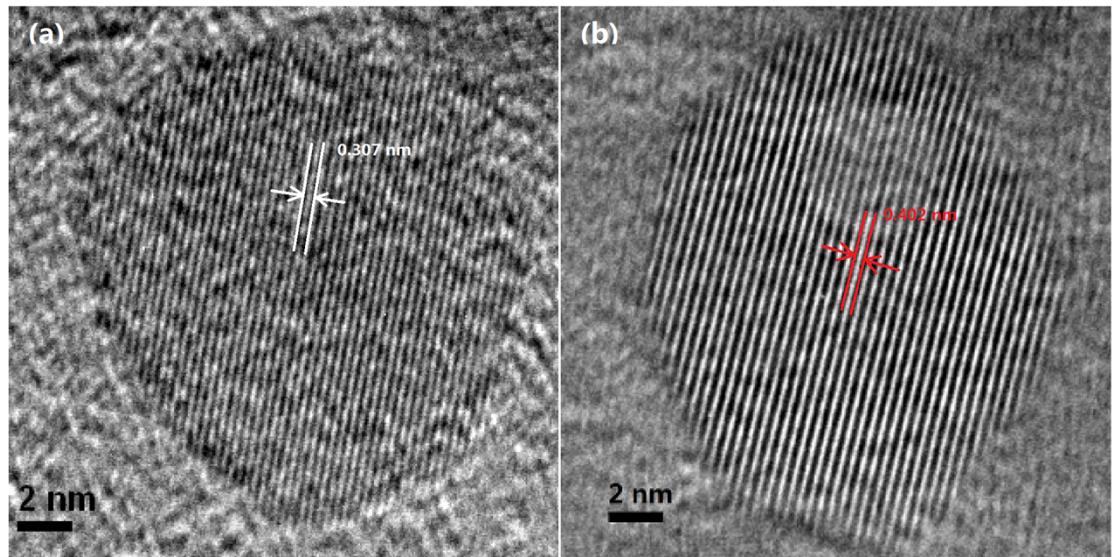


Figure S1 High resolution TEM images of the resulting $\text{NaScF}_4:\text{Yb/Er}$ (a) and $\text{Na}_3\text{ScF}_6:\text{Yb/Er}$ (b) nanocrystals, showing lattice fringes with an observed d-spacing of 0.307 nm and 0.402 nm, respectively.

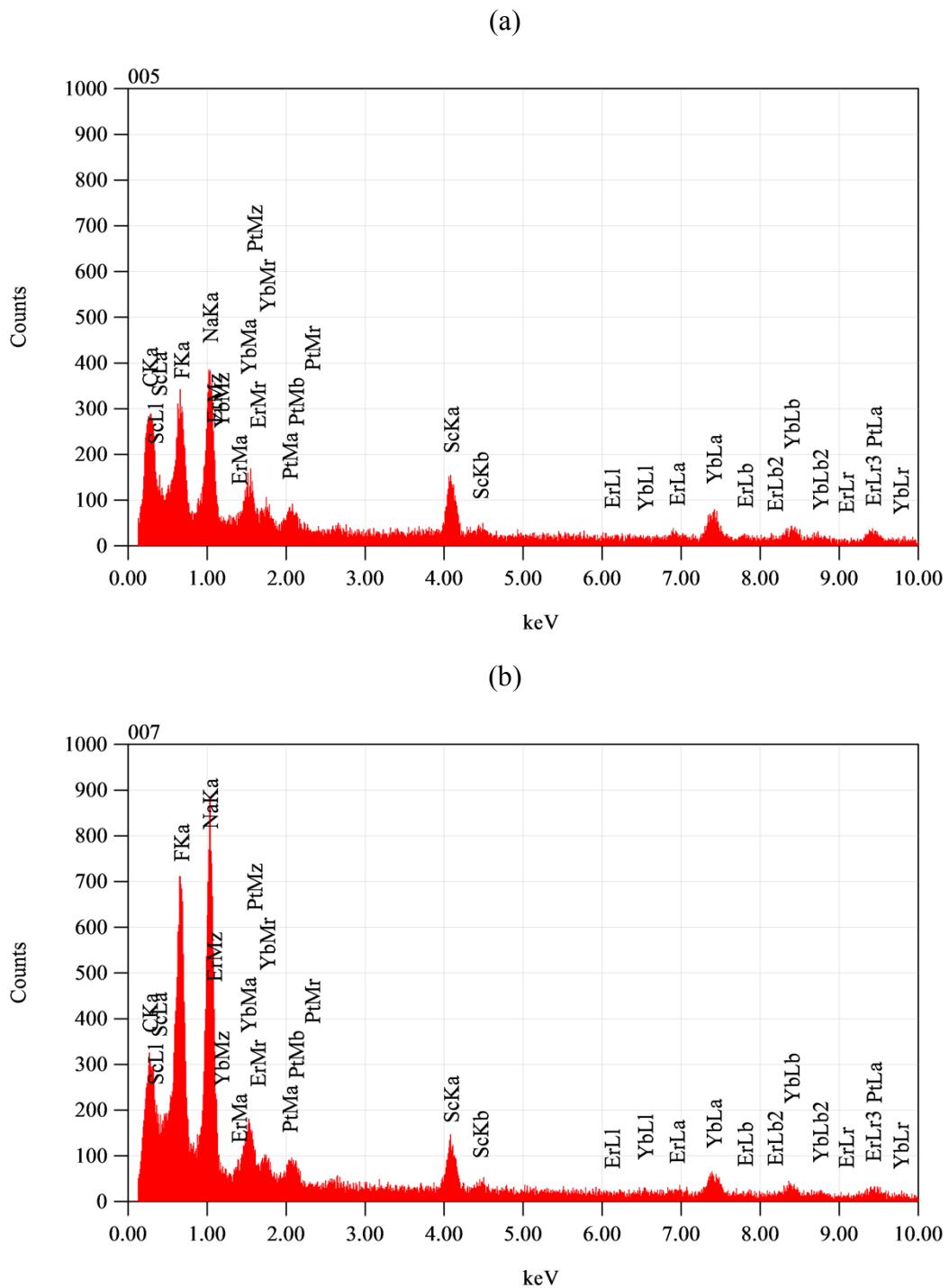


Figure S2 EDS data of the resulting $\text{NaScF}_4\text{:Yb/Er}$ (a) and $\text{Na}_3\text{ScF}_6\text{:Yb/Er}$ (b) nanocrystals showing the presence of the doped Yb, Er elements.

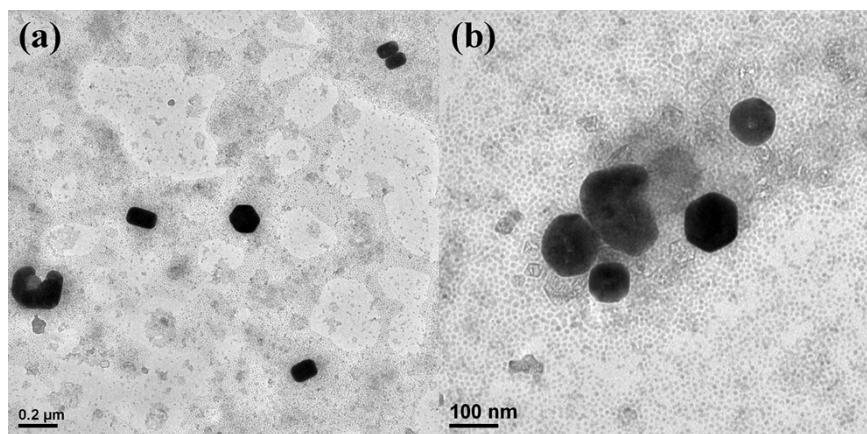


Figure S3 TEM images for the nanocrystals synthesized at NaF:Ln^{3+} mole ratio of 14 (a) and 20 (b).

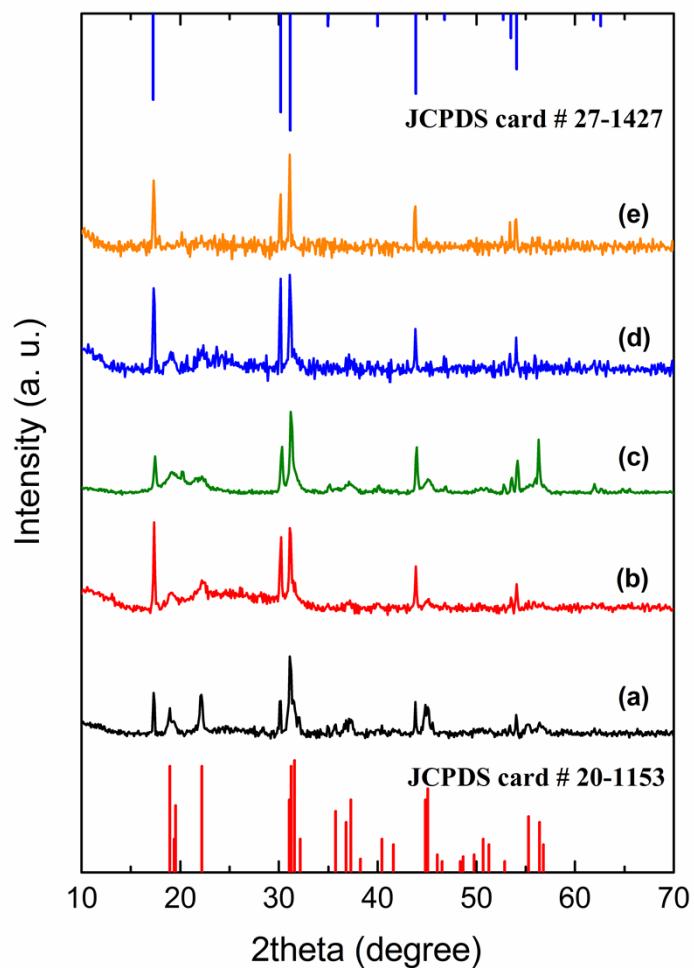


Figure S4 XRD patterns for the nanocrystals synthesized at NaF:Ln^{3+} mole ratio of 6 (a), 8 (b), 10 (c), 14 (d) and 20 (e), proving the mixture of both monoclinic Na_3ScF_6 phase and hexagonal NaYbF_4 crystal phase (blue and red lines at the top and bottom are the standard XRD patterns of hexagonal phase NaYbF_4 crystals (JCPDS card No. 27-1427) and monoclinic phase Na_3ScF_6 crystals (JCPDS card No. 20-1153)).

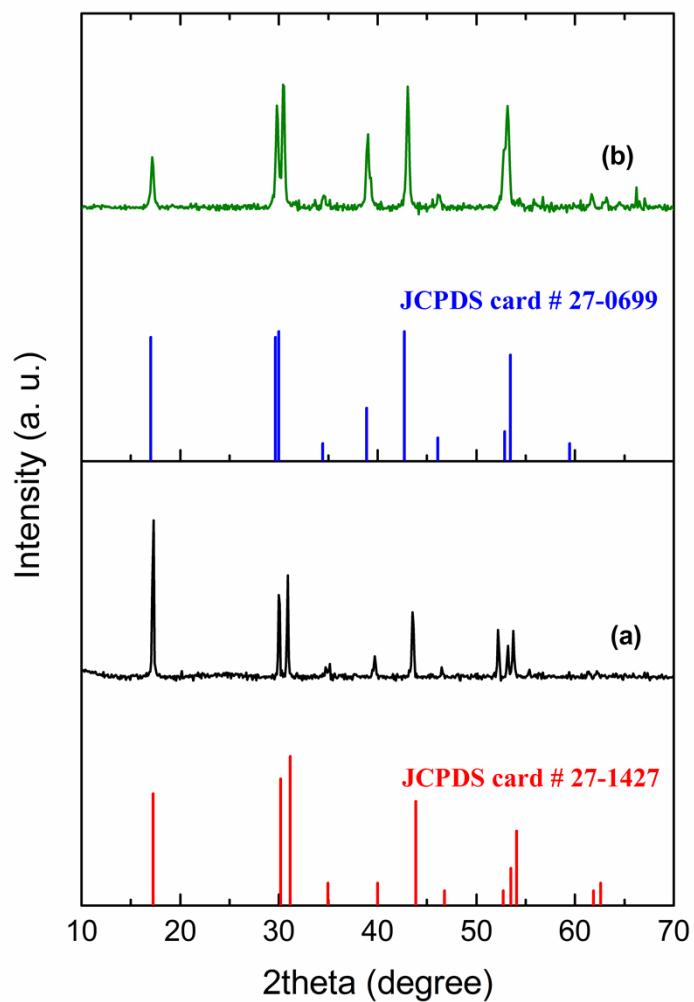


Figure S5 XRD patterns for the $\text{NaYF}_4:\text{Yb/Er}$ (a) and $\text{NaGdF}_4:\text{Yb/Er}$ (b) nanocrystals synthesized at NaF:Ln^{3+} mole ratio of 10 (blue and red lines are the standard XRD patterns of hexagonal phase NaGdF_4 crystals (JCPDS card No. 27-0699) and hexagonal phase NaYF_4 crystals (JCPDS card No. 27-1427)).

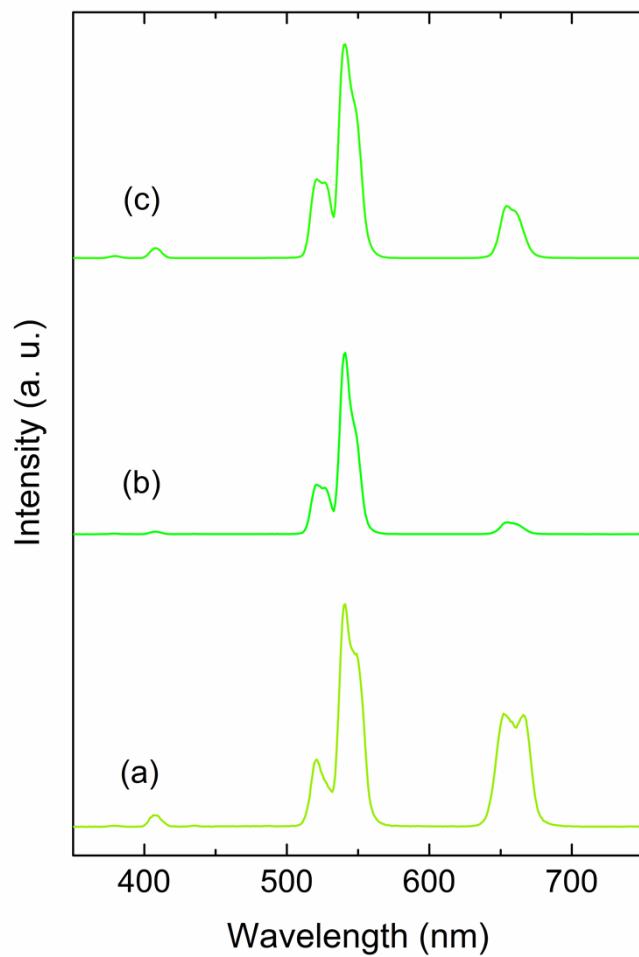


Figure S6 UC fluorescence spectra of the corresponding $\text{NaYF}_4:\text{Yb}/\text{Er}$ nanocrystals synthesized at $\text{NaF:Ln}^{3+} = 1$ (a), 4 (b) and 10 (c), with a R/G ratio of 0.6516, 0.0707 and 0.2151 respectively.

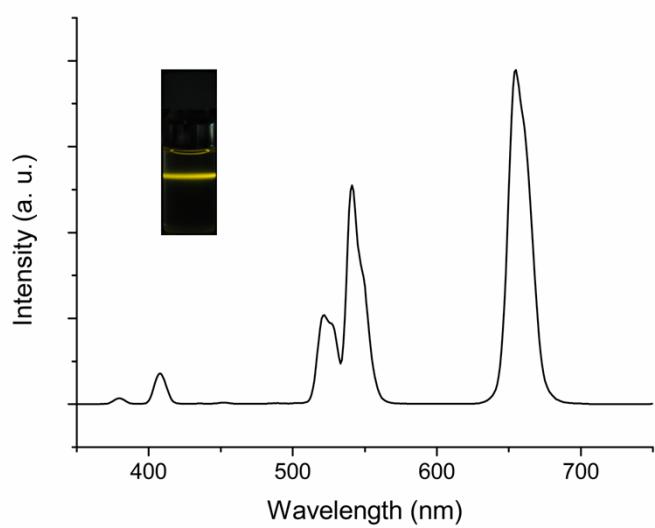


Figure S7 UC fluorescence spectra of the corresponding NaYbF₄:Er nanocrystals with R/G ratio of 1.4077, the inset photo shows the corresponding PL photograph of nanoparticles dispersed in cyclohexane.

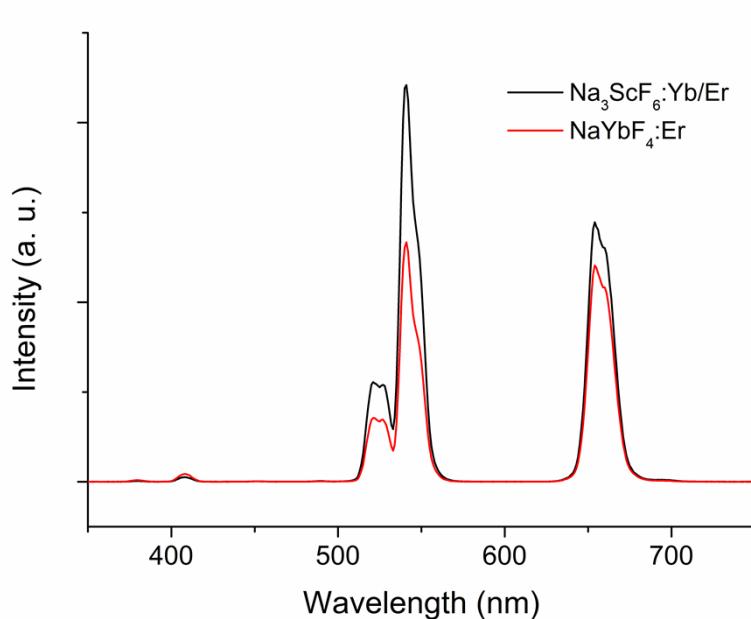
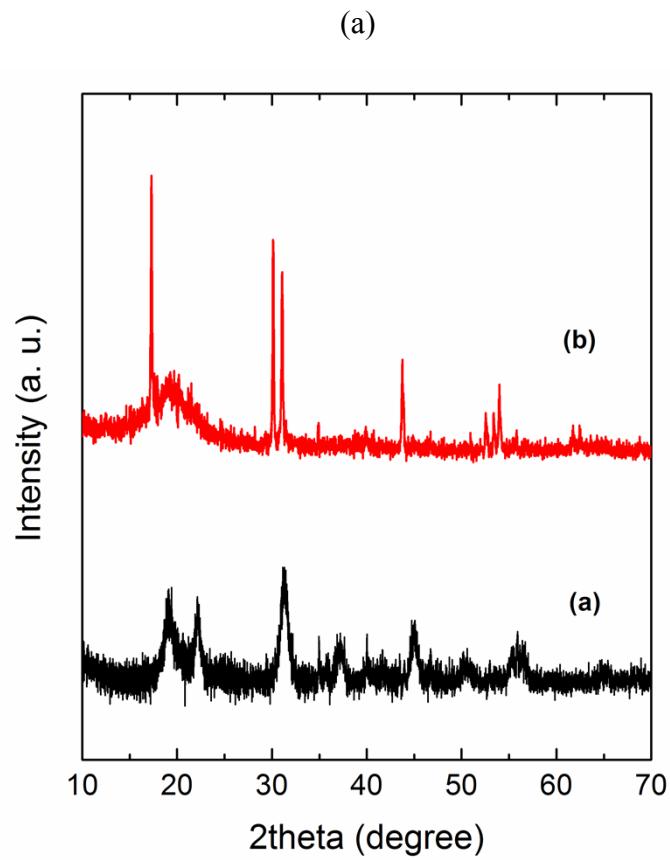


Figure S8 XRD Pattern (top) and UC fluorescence spectra (bottom) of the corresponding $\text{Na}_3\text{ScF}_6:\text{Yb/Er}$ (black line) and $\text{NaYbF}_4:\text{Er}$ (red line) nanocrystals from the sample prepared at NaF:Ln^{3+} mole ratio of 10.