ARTICLE TYPE

Electronic Supplementary Material for Nanoscale

Highly bright multicolor tunable ultrasmall β-Na(Y,Gd)F_4:Ce,Tb,Eu/β-$NaYF_4$ core/shell nanocrystals

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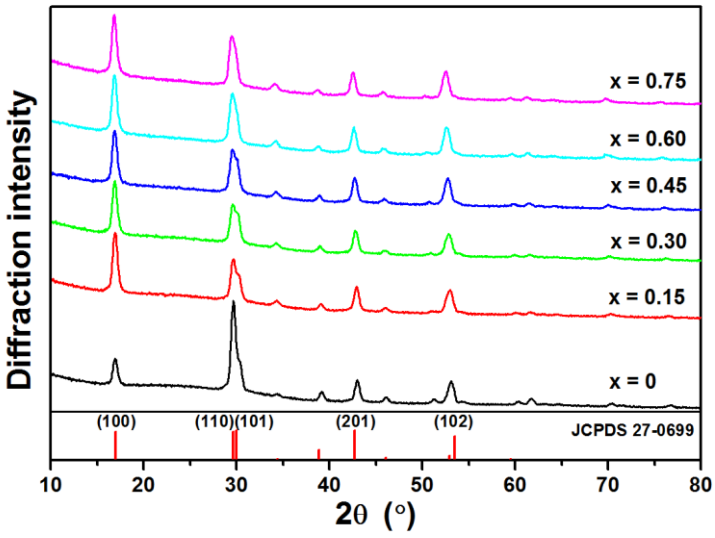

Figure S1. XRD patterns of β-Na($Y_{0.75-x}Gd_x$)F_4:$Ce_{0.1}$,$Tb_{0.15}$ NPs.

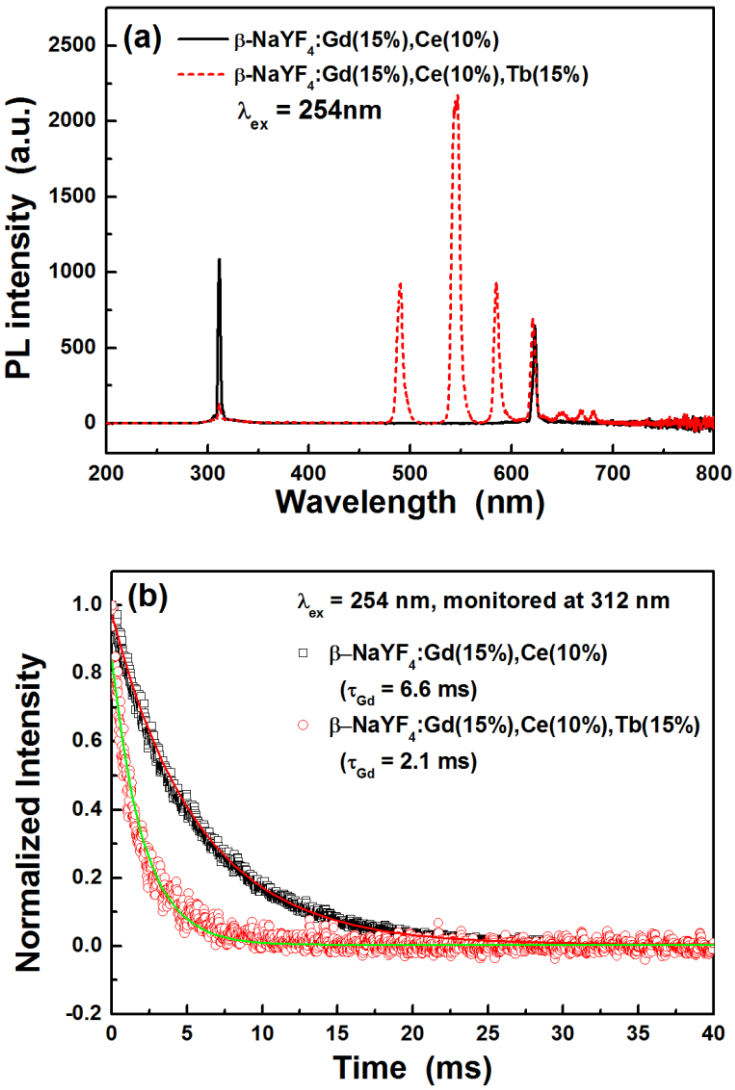

Figure S2. (a) PL spectra and (b) decay profiles of β-$NaYF_4$:Gd(15%),Ce(10%) and β-$NaYF_4$:Gd(15%),Ce(10%),Tb(15%) under the excitation of 254 nm.

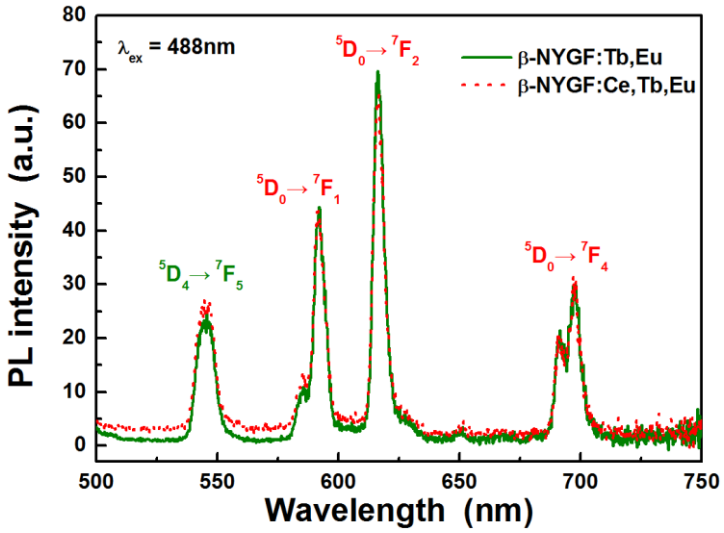

Figure S3. PL spectra of β-Na(Y,Gd)F_4:Tb(15%),Eu(5%) and β-Na(Y,Gd)F_4:Ce(10%),Tb(15%),Eu(5%) under the excitation of 488 nm.

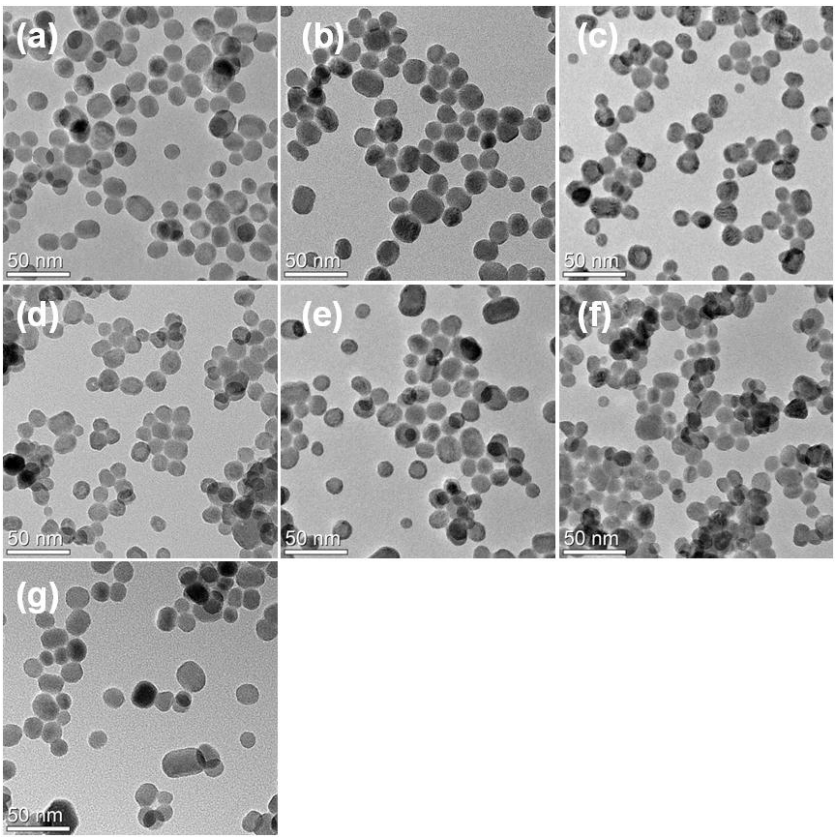

Figure S4. TEM images of β-Na(Y,Gd)F_4:Ce,Tb,Eu NPs. [(Tb, Eu) = a: (15%, 0%), b: (15%, 0.5%), c: (15%, 1%), d: (15%, 2%), e: (15%, 5%), f: (15%, 10%), and g: (0%, 5%)]

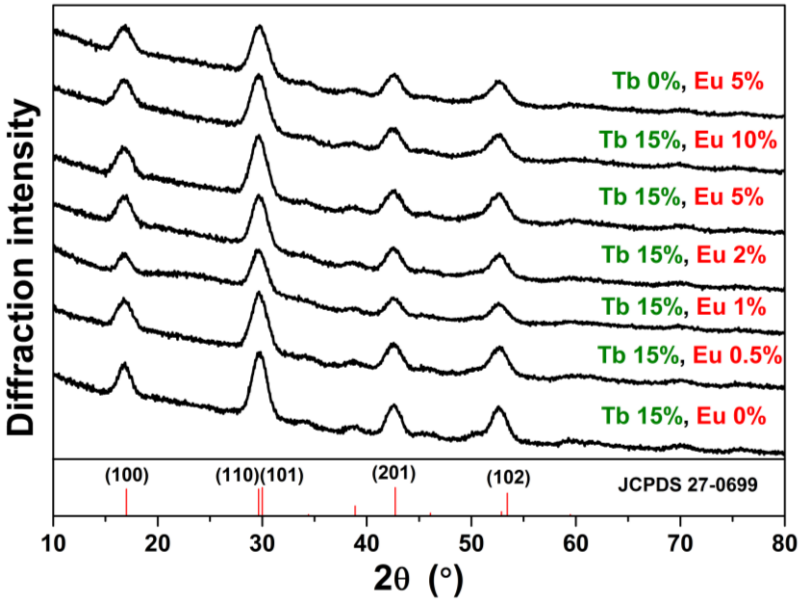

Figure S5. XRD patterns of sub-6 nm ultrasmall β-Na(Y,Gd)F_4:Ce(10%),Tb,Eu NPs with varying Tb and Eu concentrations. [(Tb, Eu) = (15%, 0%), (15%, 0.5%), (15%, 1%), (15%, 2%), (15%, 5%), (15%, 10%), (0%, 5%)]

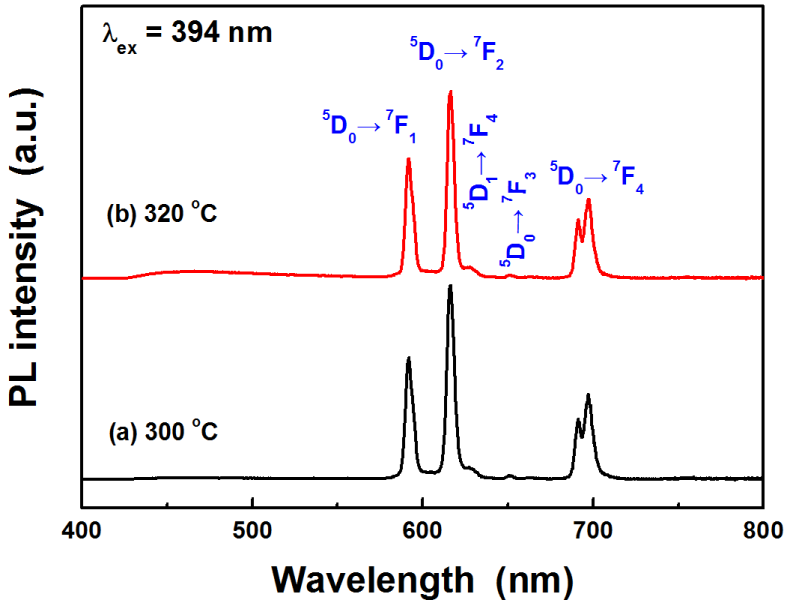

Figure S6. PL spectra of β-Na(Y,Gd)F_4:Ce(10%),Tb(15%),Eu(5%) NPs synthesized at (a) 300 (black line) and (b) 320 °C (red line) under the excitation of 394 nm.

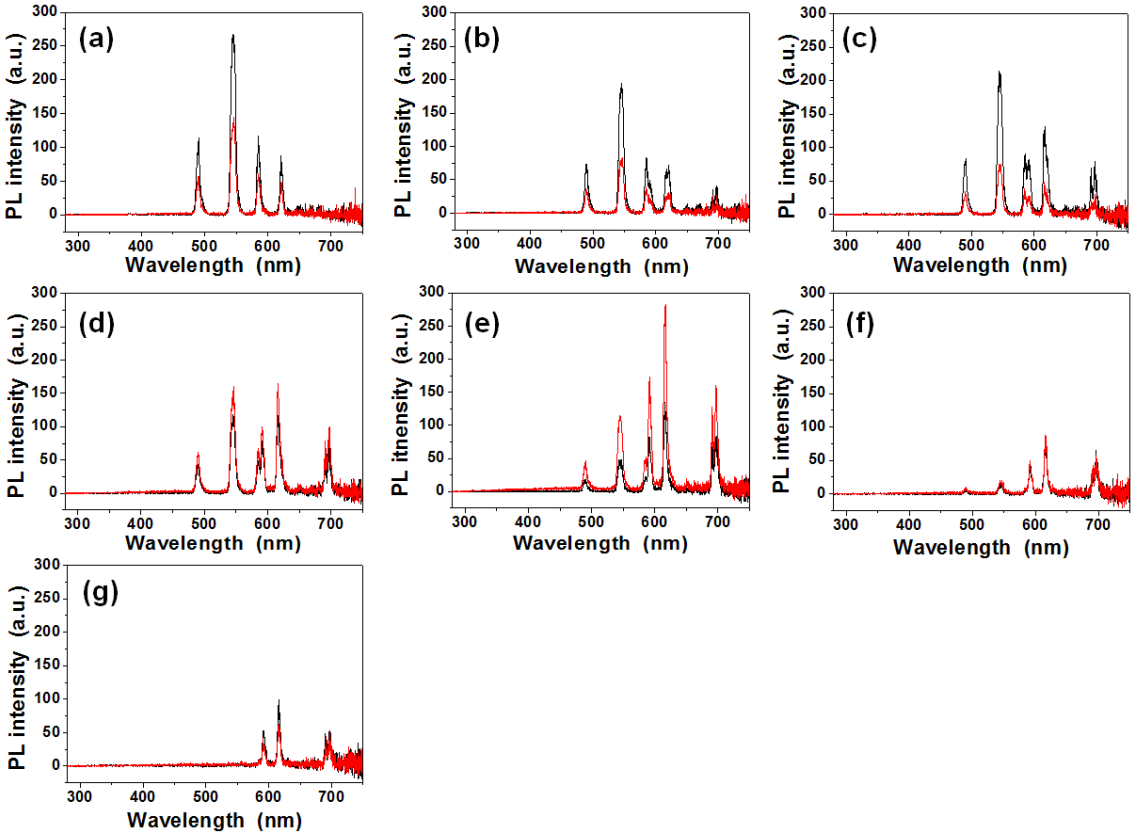

Figure S7. PL spectra of ultrasmall β-Na(Y,Gd)F_4:Ce(10%),Tb,Eu core (black line) and β-Na(Y,Gd)F_4:Ce(10%),Tb,Eu/β-$NaGdF_4$ core/shell (red line) NPs under the excitation of 254 nm UV light. [(Tb, Eu) = a: (15%, 0%), b: (15%, 0.5%), c: (15%, 1%), d: (15%, 2%), e: (15%, 5%), f: (15%, 10%), and g: (0%, 5%)]