# Supporting Information

## Effect of the nanoparticles size on thermometric properties of Single-Band Ratiometric Luminescent Thermometer in $NaYF_4:Nd^{3+}$

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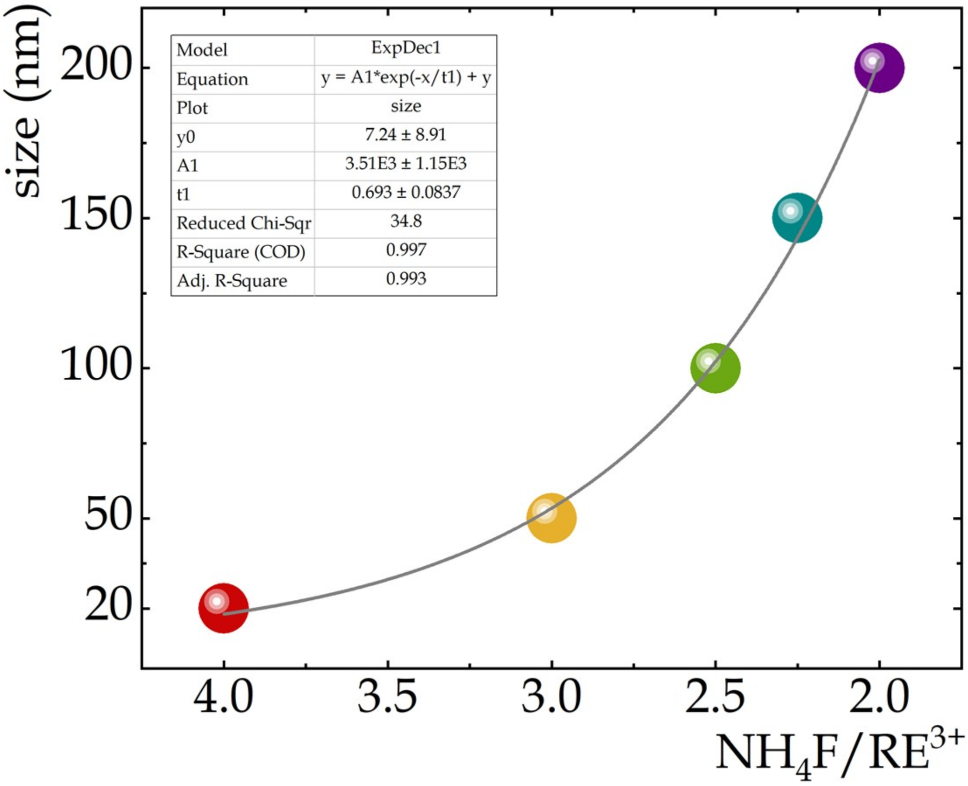


Figure S1. The influence of variations in $NH_4F$ to $RE^{3+}$ concentration on nanocrystal size. The gray line indicates the fit of the change trend with an exponential function.

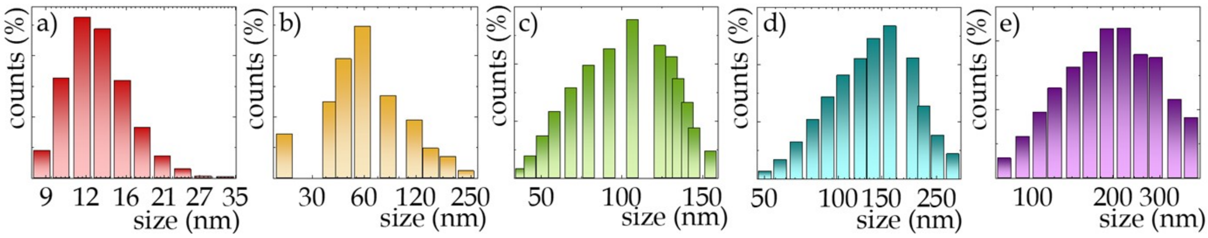


Figure S2 Impact of changing the $NH_4F$ to $RE^{3+}$ ratio on hydrodynamic size distribution of $NaYF_4$:2%$Nd^{3+}$ nanocrystals. Nanocrystals synthesized with $NH_4F/RE^{3+}$ ratios of 4, 3, 2.5, 2.25, 2 are seen in a), b), c), d) and e), respectively.

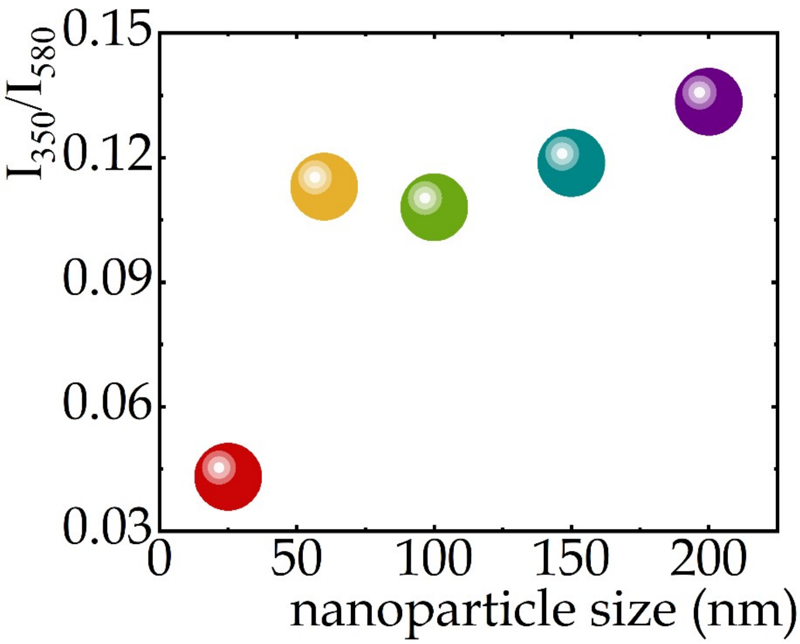


Figure S3. Effect of size on the intensity ratio of the 350 nm excitation band relative to the 580 nm excitation band.

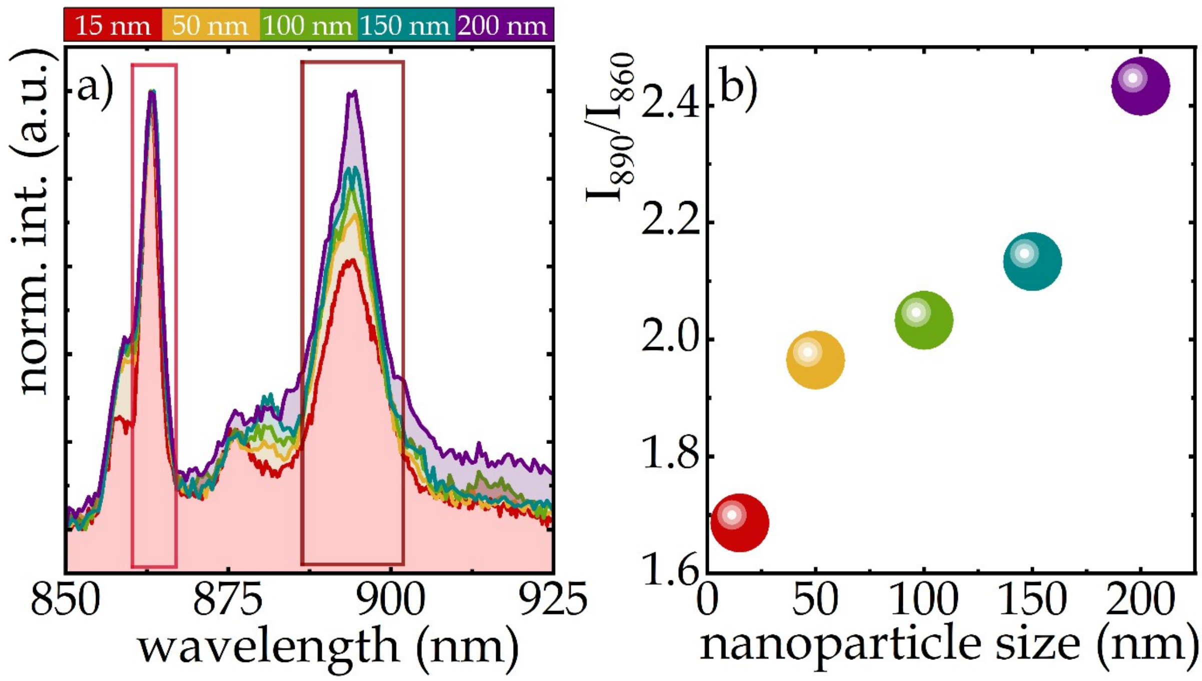


Figure S4. Changes in the intensity of the particular components of the emission band at 880 nm associated with electronic transition from $R_1$ and $R_2$ Stark sublevels of $^4F_{3/2}$ state to the $Z_1$ Stark sublevel of the $^4I_{9/2}$ state due to size changes (a); variation of the intensity ratio of the components at 863 nm versus 890 nm for increasing sizes of $NaYF_4$:2%$Nd^{3+}$ nanocrystals.

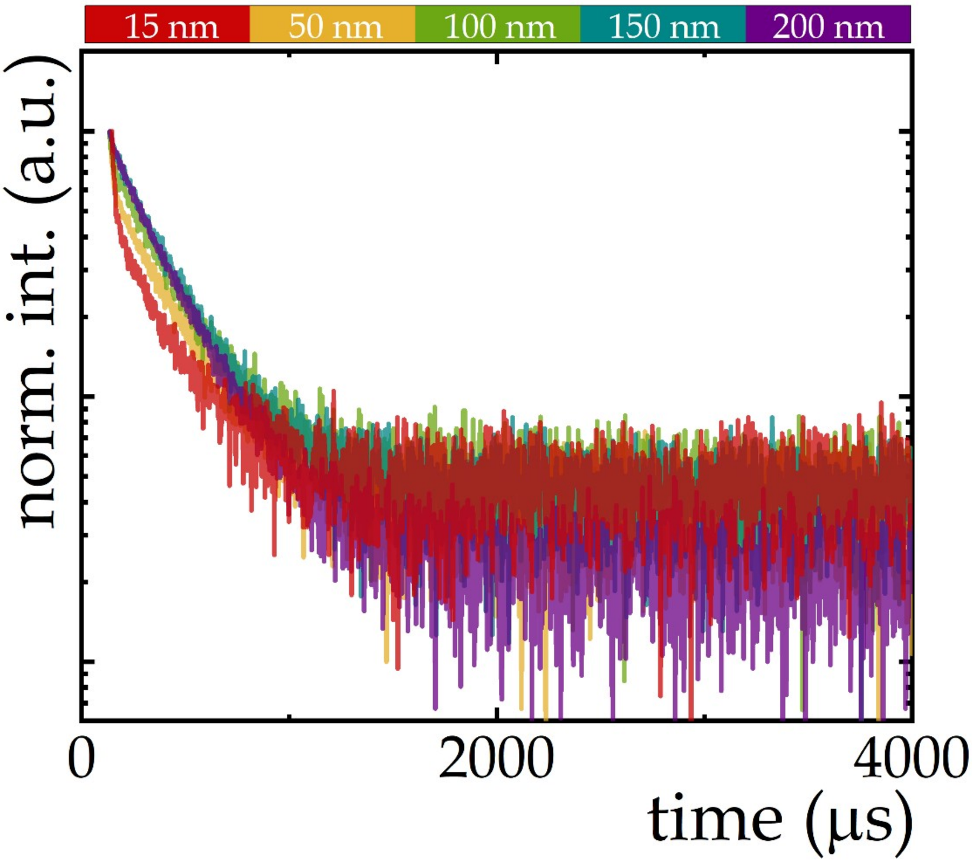


Figure S5. Impact of nanocrystal size on decay curves.

Average luminescence lifetimes presented in inset of Fig. 3d were calculated using the following equation:

$$\tau_{avr} = \frac{A_1\tau_1^2 + A_2\tau_2^2}{A_1\tau_1 + A_2\tau_2} \quad \text{(eq.S1)}$$

Where all the parameters are obtained from the fitting of the experimental decay profile with double exponential function:

$$y = A_1 \cdot e^{-x/t_1} + A_2 \cdot e^{-x/t_2} + y_0 \quad \text{(eq.S2)}$$

$A_i$ (i=1,2) are the amplitudes of the respective components, $\tau_i$ are the individual lifetime determined as $\tau_i=t_i*\ln(2)$, when $t_i$ means time constant (see Fig. S2).

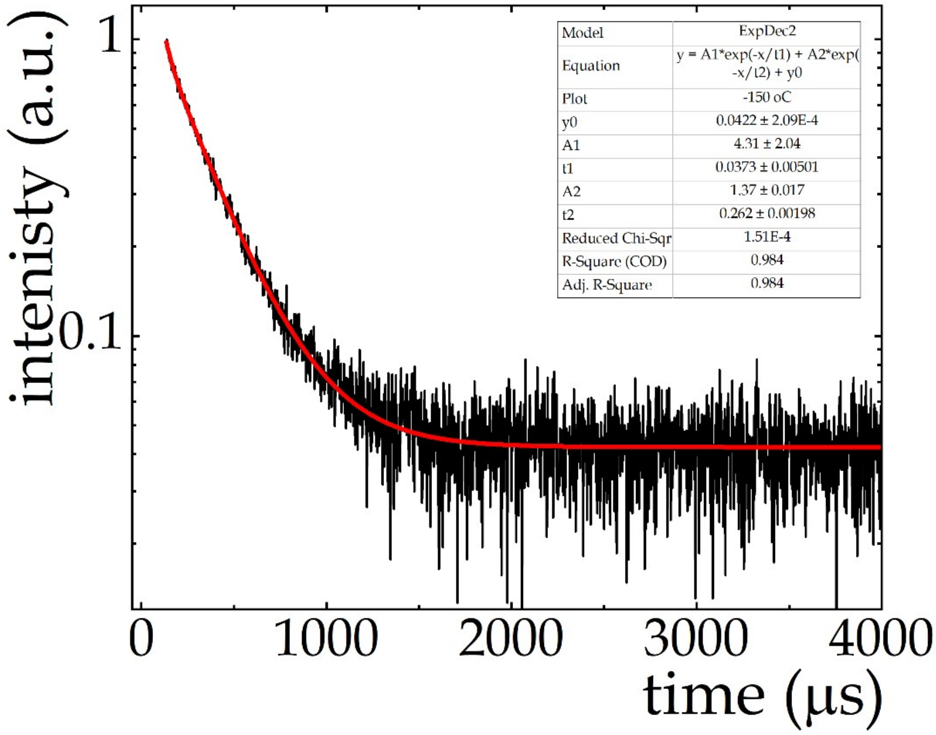


Figure S6. Decay curve and fit curve of the ExpDec2 function of an example 100 nm $NaYF_4$:2%$Nd^{3+}$ sample. The table shows the parameter values used to calculate the average time with the double-exponential function according to Equation S1.

Table S1. The average decay times of analyzed particles.

| NP size | $\tau_{avr}$ |
|---|---|
| 15 | 0.009 |
| 50 | 0.020 |
| 100 | 0.051 |
| 150 | 0.104 |
| 200 | 0.115 |

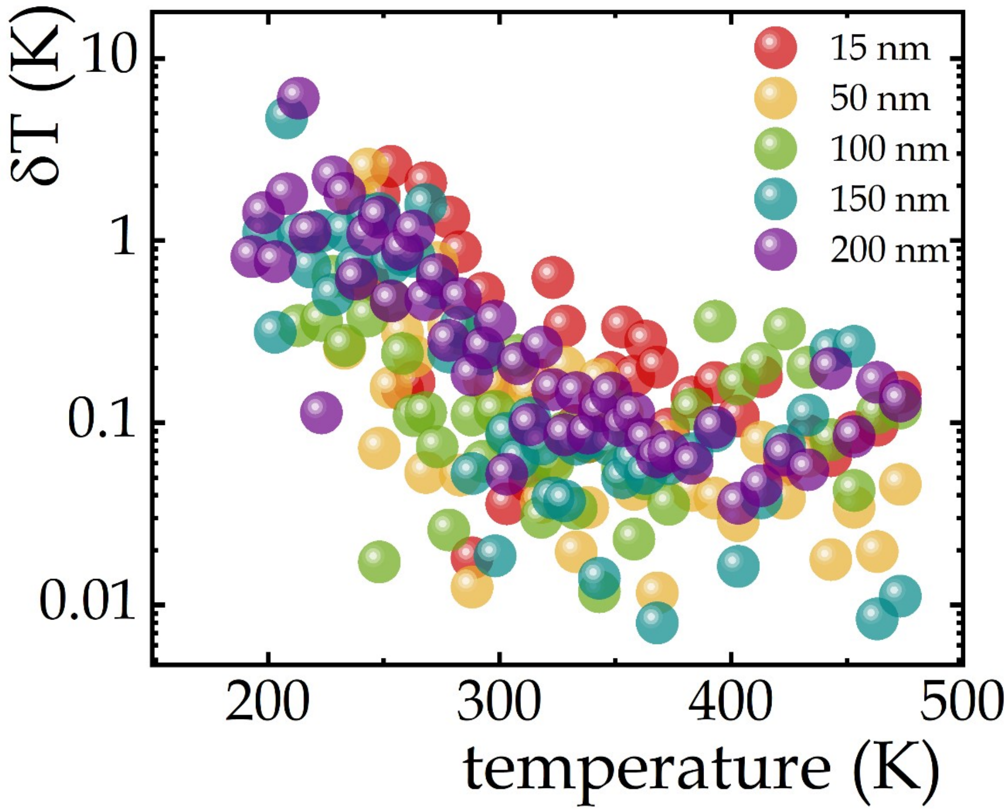


Figure S7. The temperature resolutions of $Nd^{3+}$-doped $NaYF_4$ based SBR LTs.