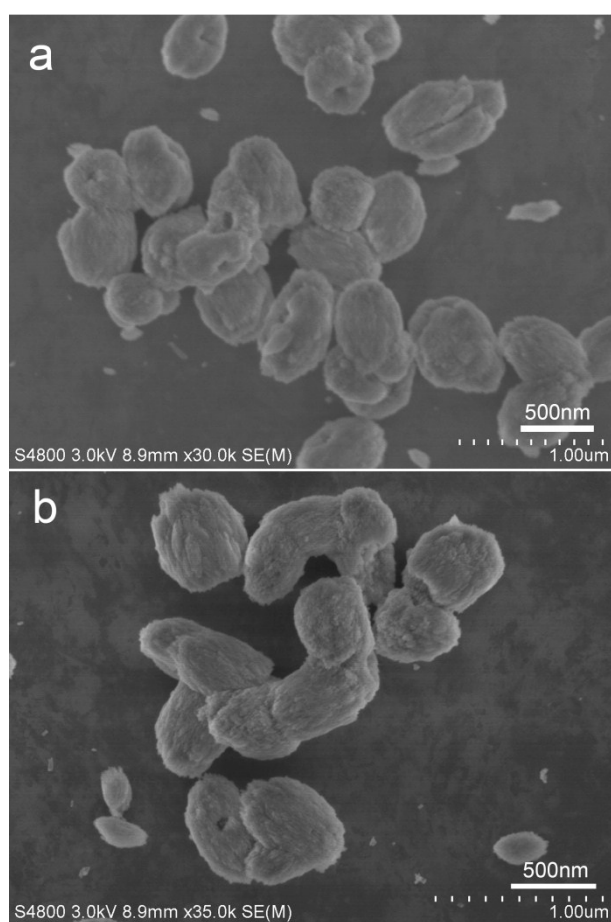
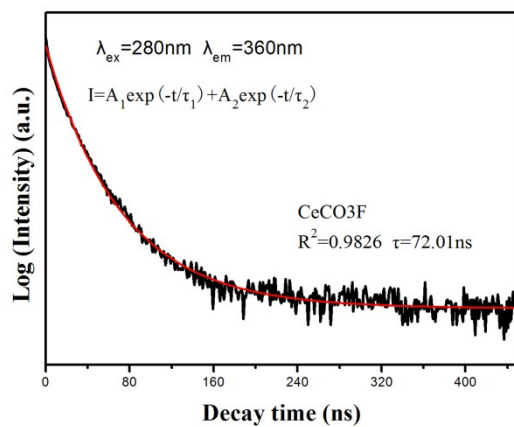




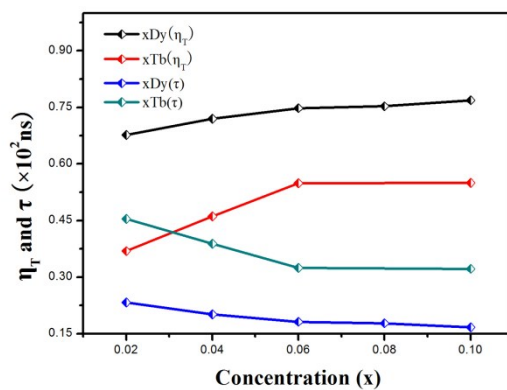
**Fig. S1** SEM image of the  $\text{LaCO}_3\text{F}$  sample.



**Fig. S2** SEM images of the  $\text{CeCO}_3\text{F}:\text{x}0.06\text{Tb}^{3+}$  (a),  $\text{CeCO}_3\text{F}:0.08\text{Eu}^{3+}$  (b) samples.



**Fig. S3** Representative decay curves for the luminescence of Ce<sup>3+</sup> in CeCO<sub>3</sub>F.



**Fig. S4** Scatter plot of decay time of Ce<sup>3+</sup> and energy transfer efficiency from Ce<sup>3+</sup> to Dy<sup>3+</sup> and Tb<sup>3+</sup>.