

## Supporting Information

### **Enhancing upconversion emissions and temperature sensing properties by incorporating Mn<sup>2+</sup> for KLu<sub>2</sub>F<sub>7</sub>:Yb<sup>3+</sup>/Er<sup>3+</sup> nanocrystals based on thermally and non-thermally coupled levels**

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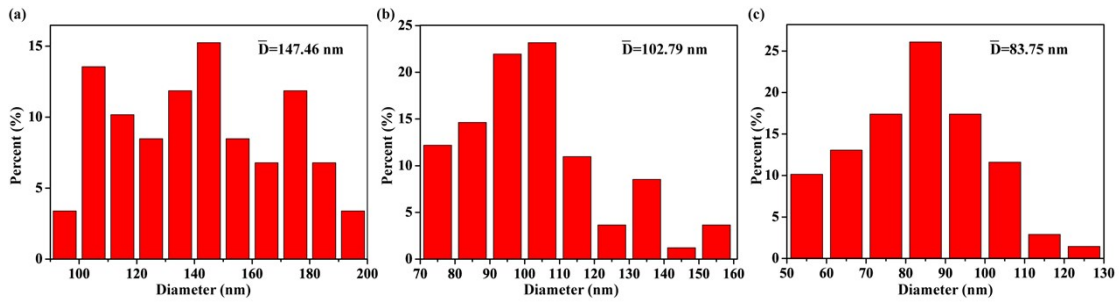
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**Table S1.** Crystal plan and size for the most intense plans of the  $\text{KLu}_2\text{F}_7:\text{Yb}^{3+}/\text{Er}^{3+}/\text{X}\%$   $\text{Mn}^{2+}$  ( $\text{X}=0, 8, 20$ ) nanocrystals.

$2\theta$ ( $^\circ$ )	Plan	size/nm (Undoped)	size/nm (8% Mn)	size/nm (20% Mn)
15.1	(2 0 0)	245.13	228.18	197.14
27.7	(2 3 1)	299.32	276.40	251.24
30.8	(2 2 2)	267.51	242.30	259.76
47.4	(4 1 3)	306.11	245.50	217.61



**Fig. S1.** The size distribution of (a)  $\text{KLu}_2\text{F}_7:\text{Yb}^{3+}/\text{Er}^{3+}$ , (b)  $\text{KLu}_2\text{F}_7:\text{Yb}^{3+}/\text{Er}^{3+}/8\%$   $\text{Mn}^{2+}$  and (c)  $\text{KLu}_2\text{F}_7:\text{Yb}^{3+}/\text{Er}^{3+}/20\%$   $\text{Mn}^{2+}$  nanocrystals.

**Table S2.** The Quantitative EDS analysis data of  $\text{KLu}_2\text{F}_7:\text{Yb}^{3+}/\text{Er}^{3+}/8\%$   $\text{Mn}^{2+}$  nanocrystals.

Element	Wt%	At%
F	26.66	73.28
Lu	50.27	15.01
Yb	14.29	4.31
K	3.11	4.17
Mn	2.31	2.19
Er	3.36	1.05