Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Dual-functional α-NaYb(Mn)F_4:Er^{3+}@$NaLuF_4$ nanocrystals with highly enhanced red upconversion luminescence

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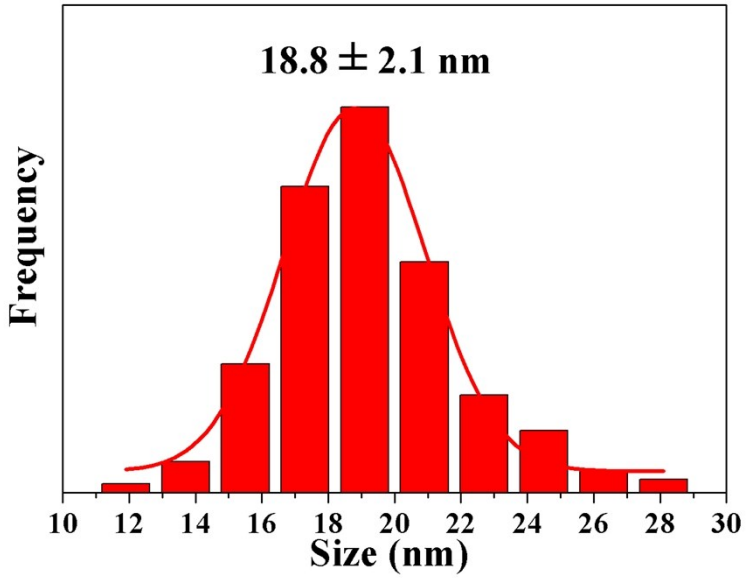

Fig. S1 Size distribution of α-NaYb(Mn)F_4:Er^{3+} core nanoparticles.

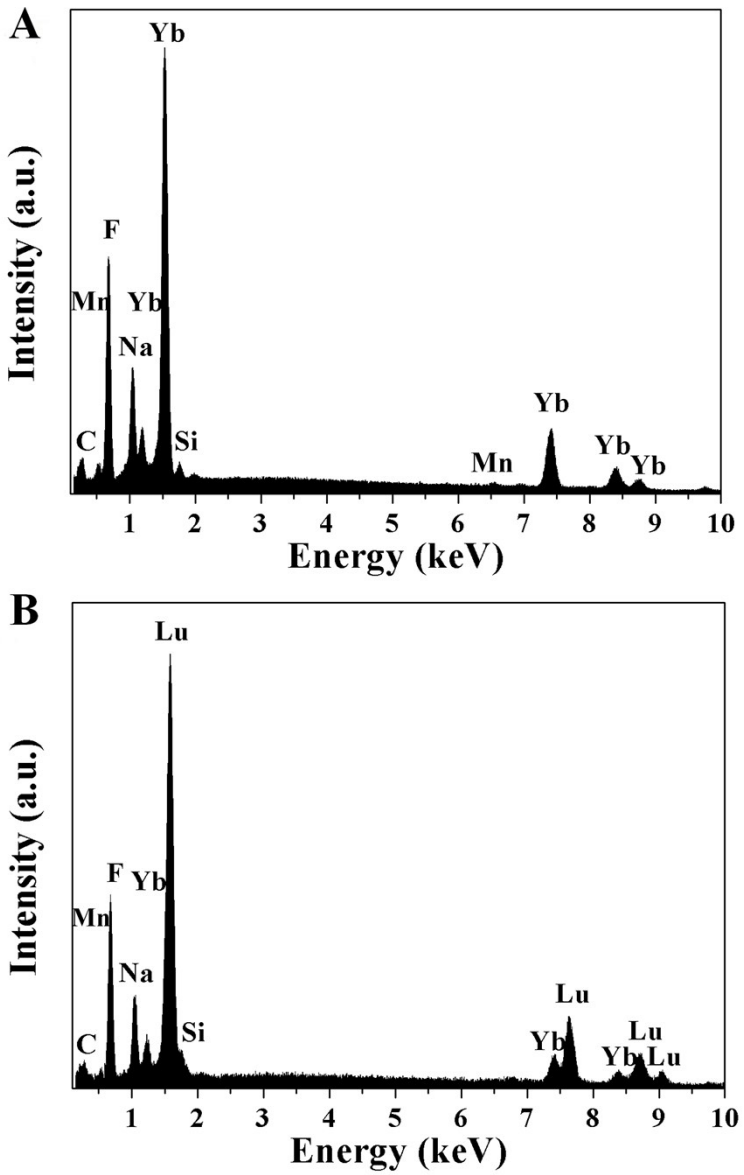

Fig. S2 EDS patterns of (A) α-NaYb(Mn)F_4:Er^{3+} core UCNPs and (B) α-NaYb(Mn)F_4:Er^{3+}@$NaLuF_4$ core-shell UCNPs.

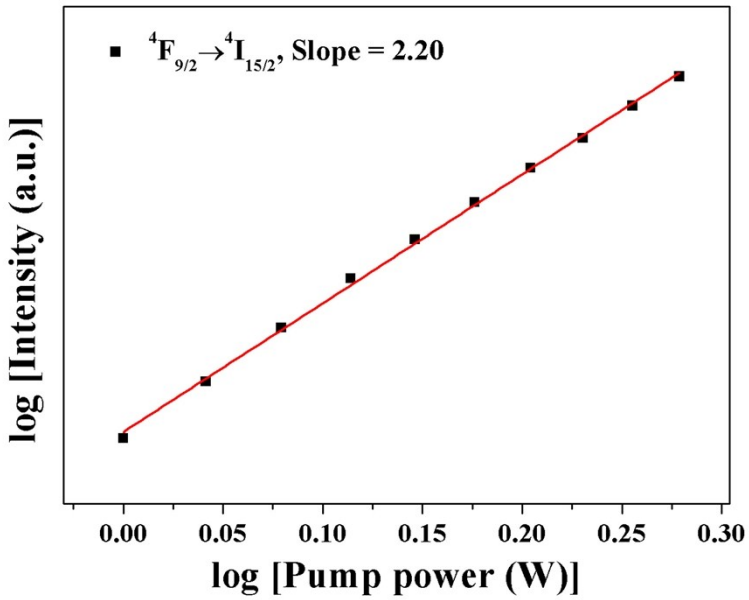

Fig. S3 Log-log plot of the UCL intensity of α-NaYb(Mn)F_4:Er^{3+}@$NaLuF_4$ UCNPs peaked at 651 nm as a function of 980 nm pump power.

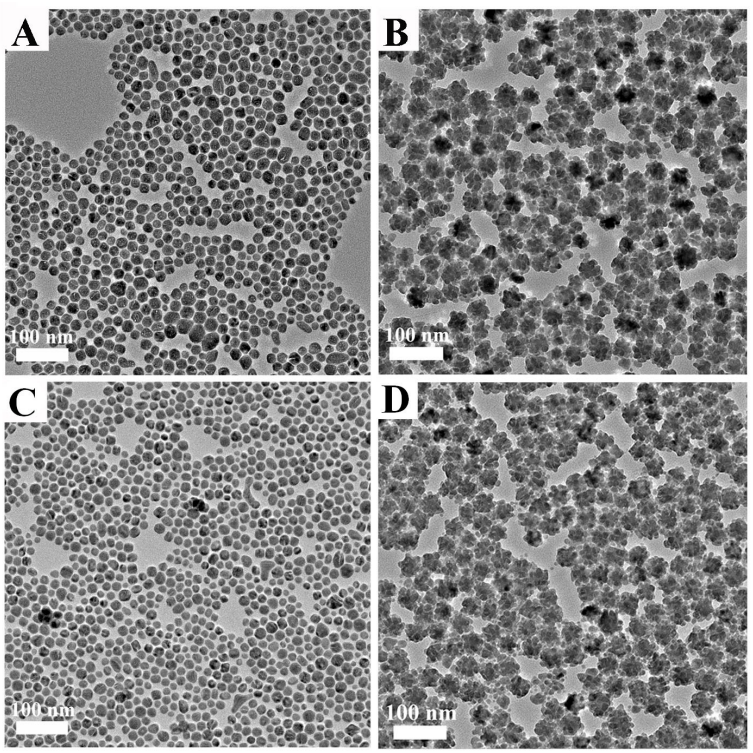

Fig. S4 TEM images of (A) α-NaLu(Mn)F_4:Yb^{3+}(18%),Er^{3+}, (B) α-NaLu(Mn)F_4:Yb^{3+}(18%),Er^{3+}@$NaLuF_4$, (C) α-NaLu(Mn)F_4:Yb^{3+}(48%),Er^{3+} and (D) α-NaLu(Mn)F_4:Yb^{3+}(48%),Er^{3+}@$NaLuF_4$.

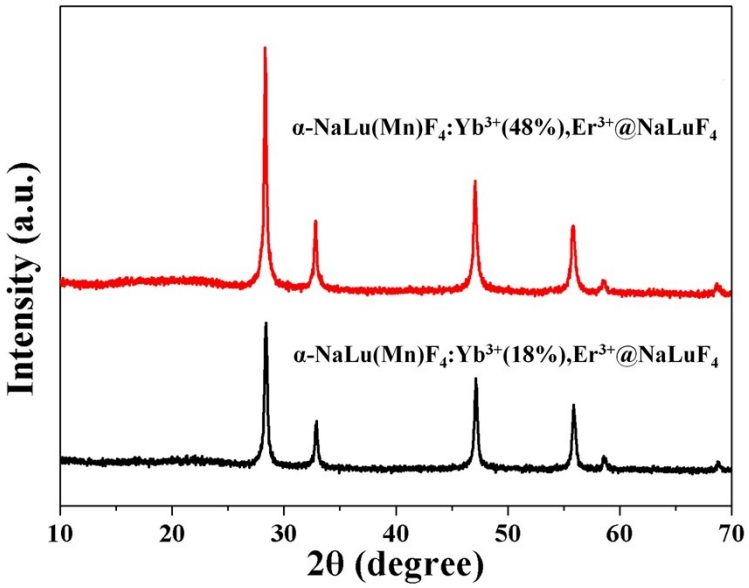

Fig. S5 XRD patterns of α-NaLu(Mn)F_4:Yb^{3+}(18%),Er^{3+}@$NaLuF_4$ and α-NaLu(Mn)F_4:Yb^{3+}(48%),Er^{3+}@$NaLuF_4$.

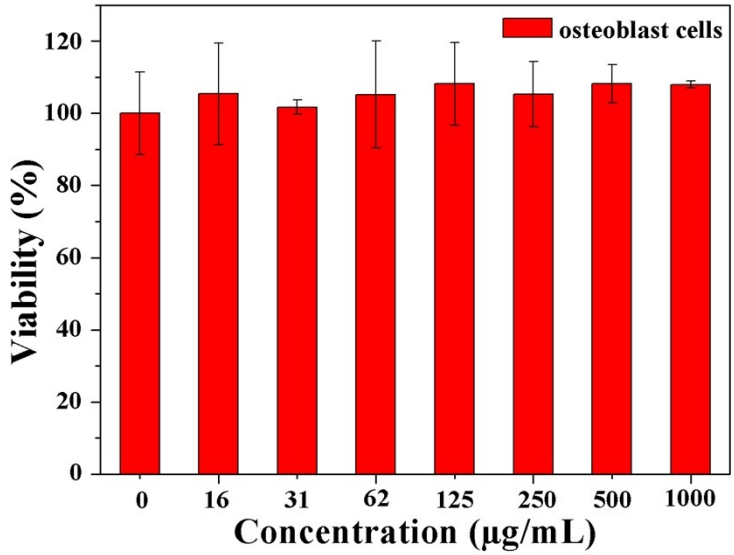

Fig. S6 Cell viability of osteoblast cells after incubation with increased concentration of α-NaYb(Mn)F_4:Er^{3+}@$NaLuF_4$@PEG UCNPs for 6 h.

Table S1 The moles of α-NaYb(Mn)F_4:Er^{3+} core nanocrystals and the shell precursors for preparing α-NaYb(Mn)F_4:Er^{3+}@$NaLuF_4$ core-shell UCNPs with different sizes.

α-NaYb(Mn)F_4:Er^{3+}	$Lu(CF_3COO)_3$	$Na(CF_3COO)$	OA:ODE	Size (nm)
1 mmol	1 mmol	1 mmol	1:1	31
0.5 mmol	1 mmol	1 mmol	1:1	82