Supporting Information

Enhanced Upconversion Luminescence in $NaGdF_4$:Yb,Er Nanocrystals by Fe^{3+} Doping and their Application for Bioimaging

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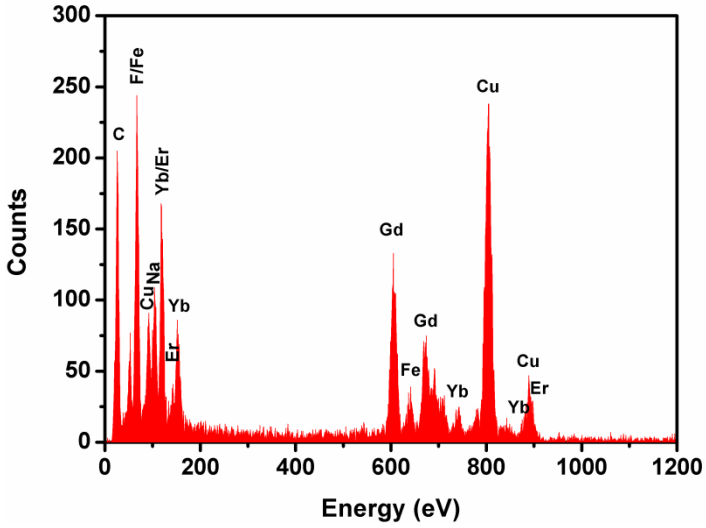

Fig. S1 EDS spectrum of $NaGdF_4$:Yb,Er NPs doped with 30 mol% Fe^{3+}.

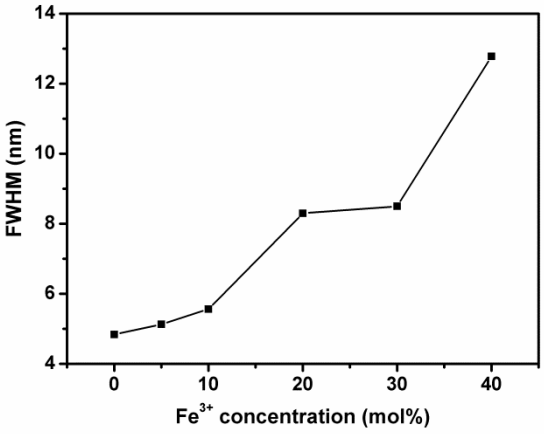

Fig. S2 FWHM of the 543 nm emission ($^4S_{3/2}$ to $^4I_{15/2}$) peak in $NaGdF_4$:Yb/Er/Fe^{3+} (0–40 mol%) nanoparticles.

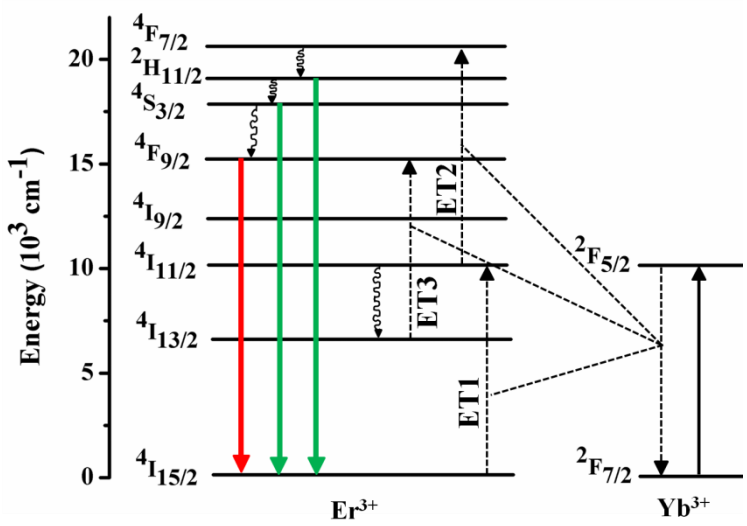

Fig. S3 Energy level diagrams of Yb^{3+}, Er^{3+} ions co-doped with Fe^{3+} ions and proposed upconversion mechanism for the green and enhanced red emissions of $NaGdF_4$.

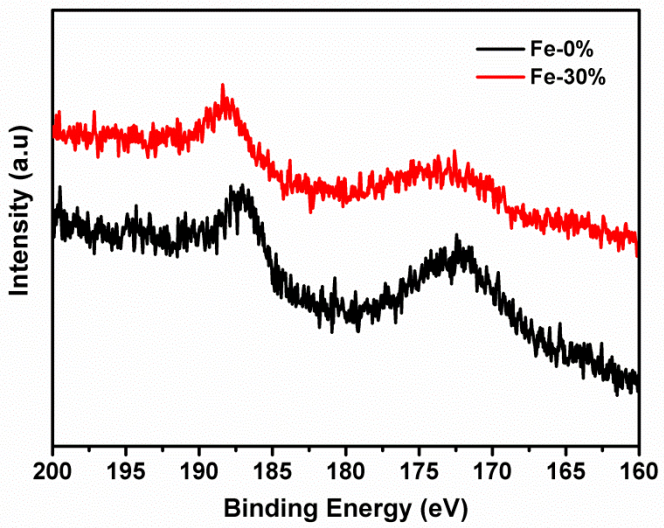

Fig. S4 XPS spectra of Yb and Er in $NaGdF_4$:Yb,Er NPs doped with 0 and 30 mol % Fe^{3+}.

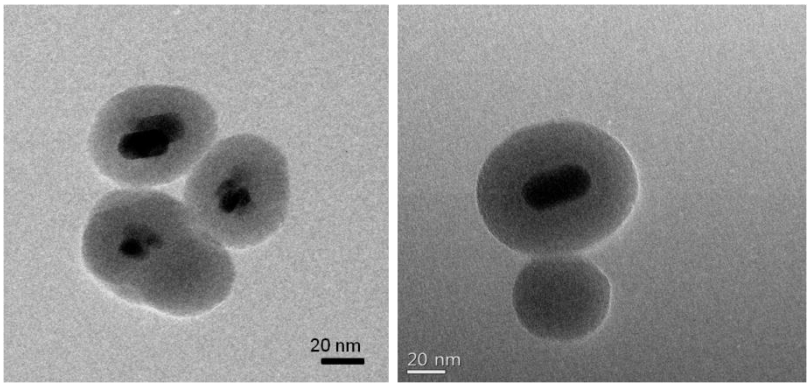

Fig. S5 TEM images of UCNPs@SiO_2 nanoparticles.

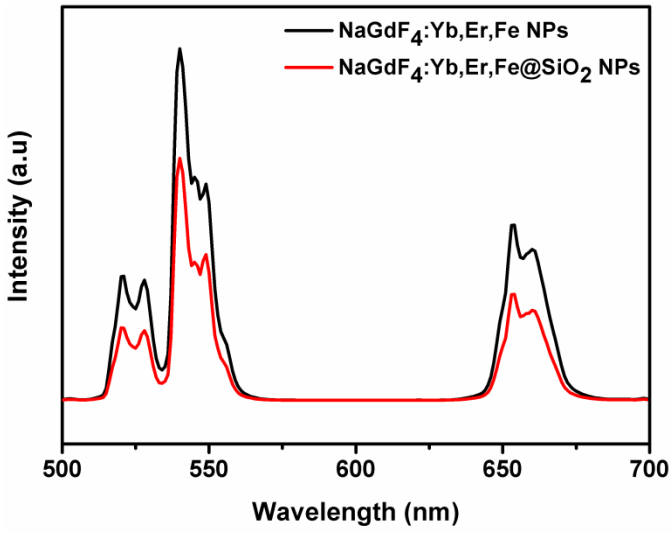

Fig. S6 UC luminescence spectra of $NaGdF_4$:Yb,Er,Fe and $NaGdF_4$:Yb,Er,Fe@SiO_2 nanoparticles.