Electronic Supplementary Material (ESI) for RSC Advances.

Fe^{3+}-codoped Ultra-small $NaGdF_4$:Nd^{3+} Nanophosphors:Enhanced Near-infrared Luminescence, Reduced Particle Size and Bioimaging Applications

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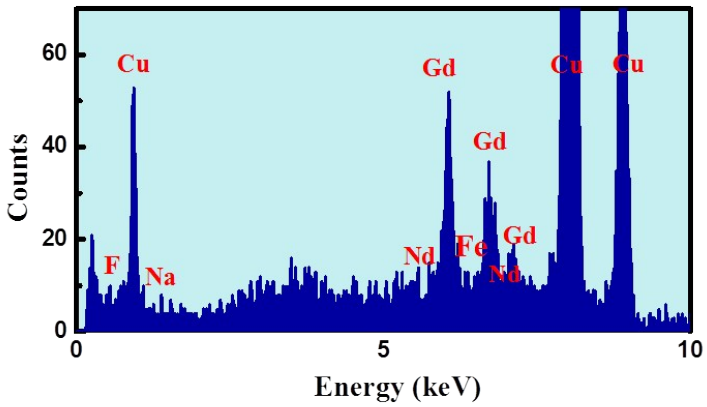

Figure S1 EDS spectrum of the $NaGdF_4:Nd^{3+},Fe^{3+}$ NPs (20 mol% of Fe^{3+}).

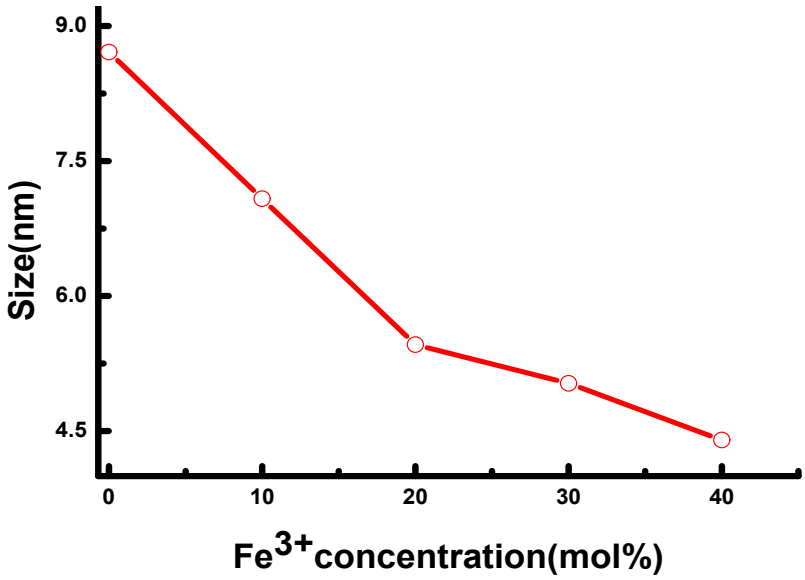

Figure S2 Change of particle size of $NaGdF_4:Nd^{3+},Fe^{3+}$ NPs with varying Fe^{3+} concentration.

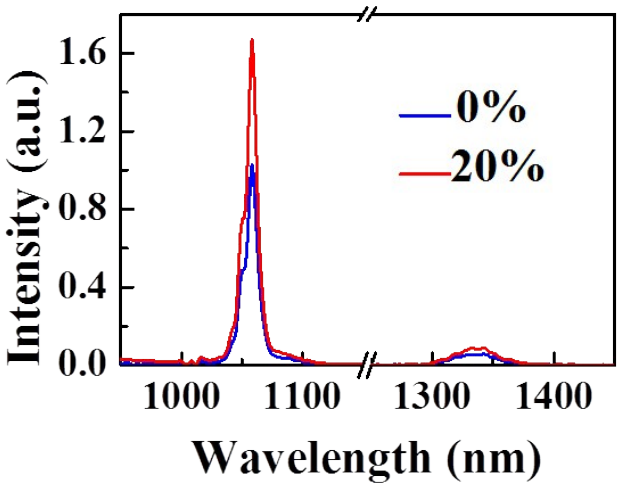

Figure S3 Comparison of NIR luminescence intensity of the $NaGdF_4$:Nd^{3+} NPs before and after being doped by 20 mol% of Fe^{3+}.

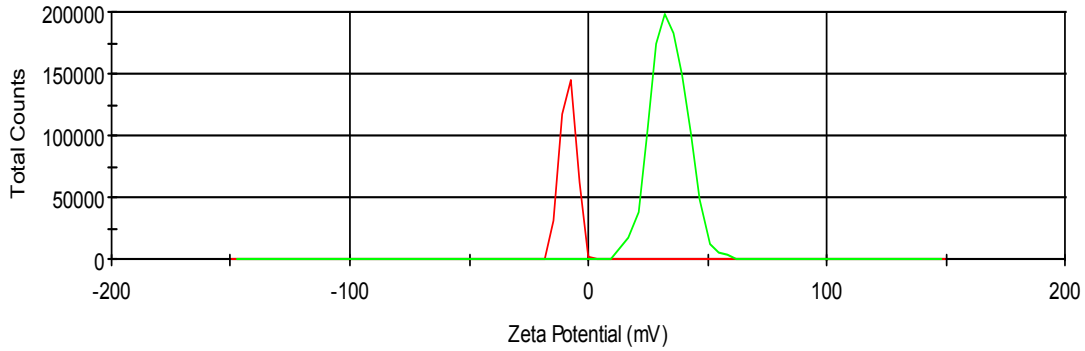

Figure S4 Zeta potential distributions of PEG-NPs (green line) and PEG-NPs-FA (red line) in aqueous solution.

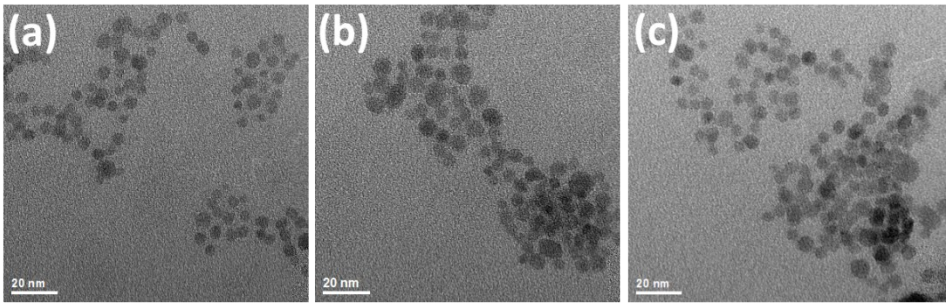

Figure S5 TEM images of PEG-NPs stored in PBS buffer solution for different time, (a) 1 day, (b) four days, (c) seven days.

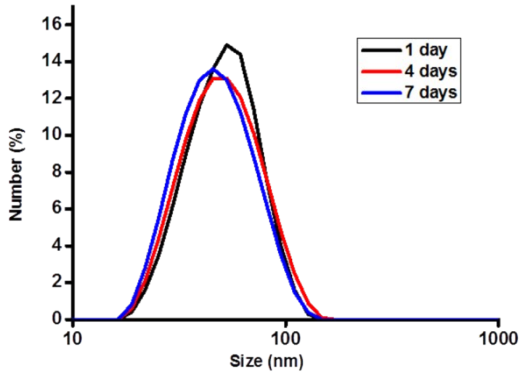

Figure S6 DLS of PEG-NPs in PBS buffer solution at different time points.

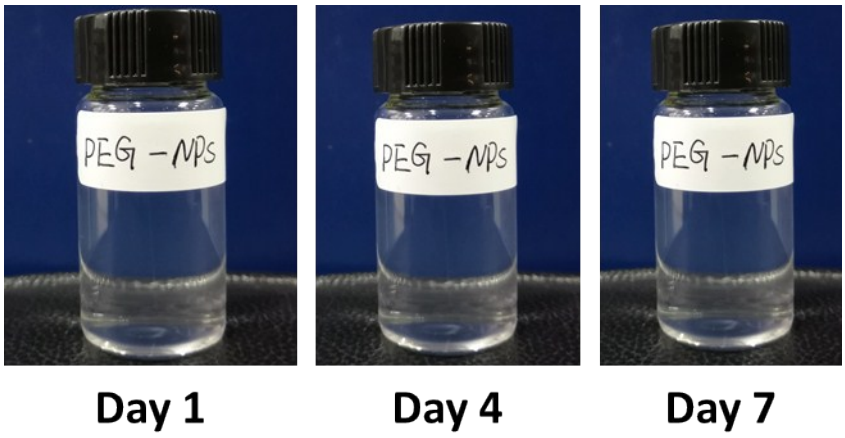

Figure S7 The photographs of PBS buffer solution of PEG-NPs at different storing time: (a) 1 day, (b) four days, and (c) seven days.

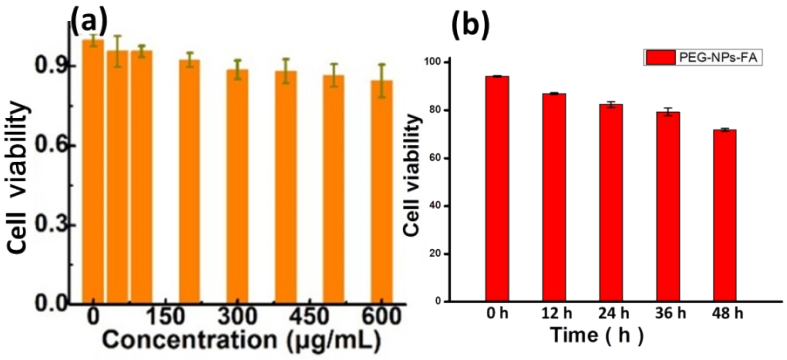

Figure S8 The cytotoxicity of the NPs assessed by cell viability based on the MTT assay: (a) HeLa cell viabilities upon incubation with various concentrations of PEG-NPs-FA (0, 20, 50, 100, 200, 300, 400, 500, and 600 μg mL^{-1}, respectively) for 24 h, (b) HeLa cell viabilities after incubating for 0, 12, 24, 36 and 48 h with 300 μg mL^{-1} of PEG-NPs-FA.

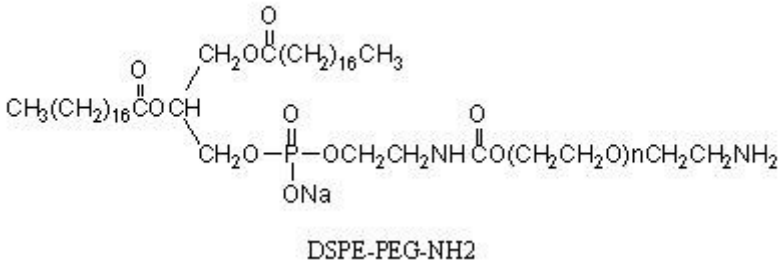

Figure S9 The molecular structure of DSPE-PEG-NH2.

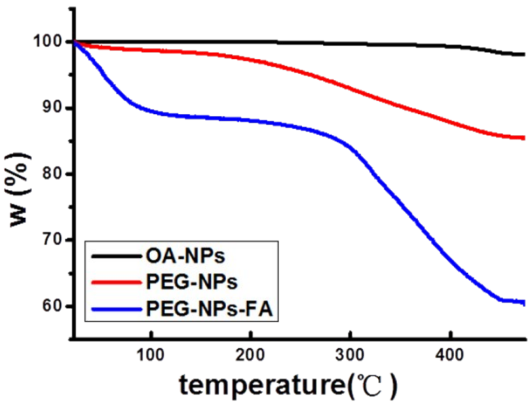

Figure S10 The TGA curves of OA-NPs, PEG-NPs and PEG-NPs-FA.

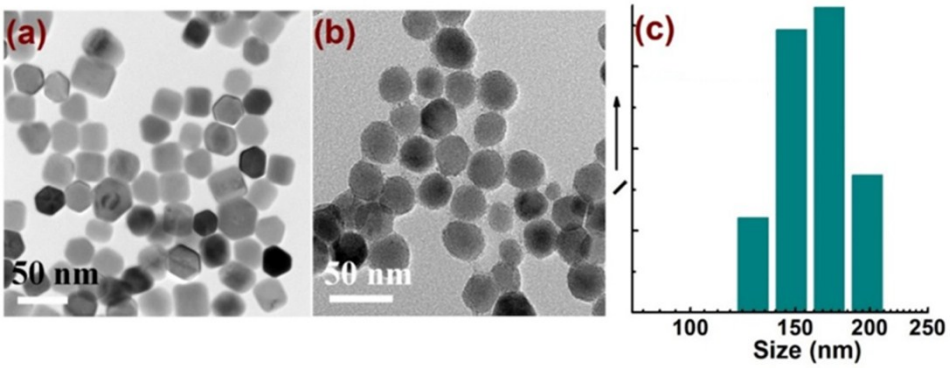

Figure S11 TEM images of $NaYF_4$:Nd (a) before and (b) after targeted modification, and (c) DLS of $NaYF_4$:Nd after FA modification.

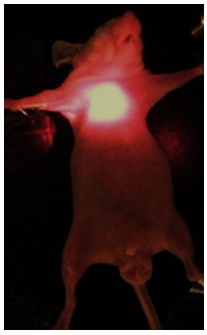

Figure S12 Near-infrared living imaging using the targeting PEG- NPs-FA.

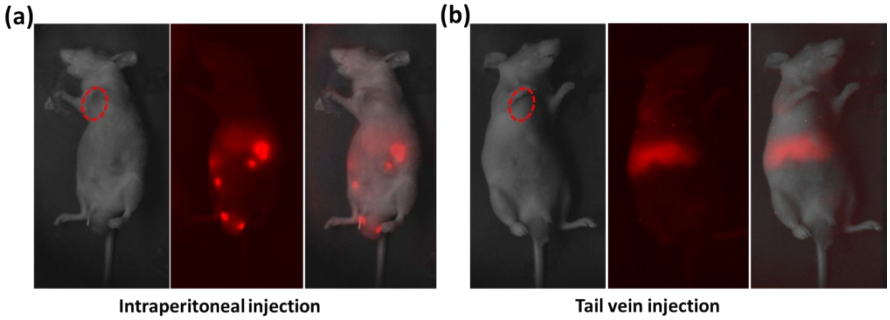

Figure S13 Near-infrared living imaging using the non-targeting PEG-NPs: (a) intraperitoneal injection and (b) tail vein injection. The red circle in the figure marks the location of the tumor

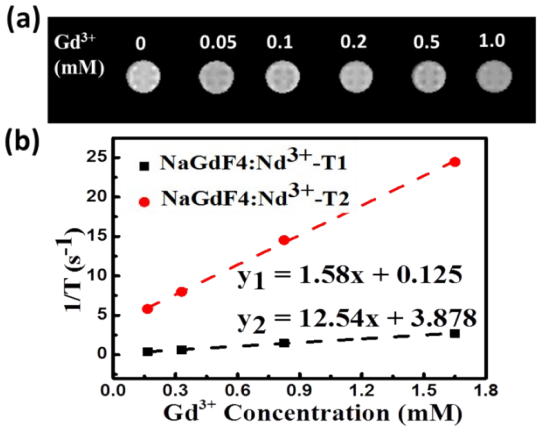

Figure S14 (a) T2-weighted MR image of $NaGdF_4:Nd^{3+}$ NPs without doping of Fe^{3+}. (b) plots of 1/T1 (black) and 1/T2 (red) as a function of the Gd^{3+} concentration for $NaGdF_4:Nd^{3+}$ NPs.