Supporting Information

Size-tunable synthesis of lanthanide-doped Gd$_2$O$_3$ nanoparticles and their applications for optical and magnetic resonance imaging

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Figure S1. XRD patterns of Gd$_2$O$_3$: Yb, Er nanoparticles with different sizes.
Figure S2. TEM images (a-c) of Gd$_2$O$_3$ nanoparticles coated with different thickness of silica layer. (d) The EDX spectrum obtained from Gd$_2$O$_3$: Yb, Er NPs coated with silica. Si signal comes from the silica layer and Cu signal comes from the Cu support substrate.
Figure S3. White Kunming mice were used to test the toxicity in vivo of Gd$_2$O$_3$: Yb, Er NPs. 100μL of these nanoparticles dispersed in physiological saline (1 mg·mL$^{-1}$) were injected into both male and female mice very day (the number of mice in each group is 6) and the weights of mice are recorded at several time-points as shown in Figure S3.

Inductively coupled plasma mass spectrometry (ICP-MS, Thermo element X7) was used to determine the actual mole ratio of the lanthanide doped Gd$_2$O$_3$ nanoparticles. From the ICP-MS data, the actual mole ratio of Gd$^{3+}$: Yb$^{3+}$: Er$^{3+}$ is determined to be about 88.7:9.7:1 for the Gd$_2$O$_3$:10%Yb,1%Er sample, which is in good agreement with the designed nominal composition. Similar results have also been obtained for Gd$_2$O$_3$:1%Er and Gd$_2$O$_3$:10%Yb, 0.2%Tm samples. The actual mole ratio of Gd$^{3+}$: Er$^{3+}$ for Gd$_2$O$_3$:1%Er sample and Gd$^{3+}$: Yb$^{3+}$: Tm$^{3+}$ for Gd$_2$O$_3$:10%Yb, 0.2%Tm is 98.7: 1 and 88.6:10:0.022, respectively.