Experimental procedure

Lanthanum diacetate hydroxide (LDAH) modified with europium and trifluorocetate ions was precipitated in methanolic solutions of pertinent RE acetates and trifluoroacetic acid at 60°C. A molar ratio of La:Eu was fixed to 10:1. The precipitated LDAH powders were then dried at room temperature and subsequently heated at 600°C for 1 h to be converted into LaOF:Eu^{3+} nanoparticles.

Na_{2}SnO_{3}·3H_{2}O was dissolved in an aqueous NaOH solution (pH = 10.5). The LaOF:Eu^{3+} powders were added to the resultant Na_{2}SnO_{3} solution and ultrasonicated for 10 min. The mixture was then heated at 60°C for 1 h under reflux. After cooling to room temperature, the powders were centrifuged, washed with ethanol, and dried. Final heat treatments were performed typically at 1000°C for 1 h in air to obtain the core-shell-structured nanoparticles.

Crystal structure identification was made by X-ray diffraction (XRD) with a Rigaku model RAD-C diffractometer using Cu Kα radiation. Particle morphology was observed by transmission electron microscopy (TEM) with a Philips model TECNAI F20 microscope. Photoluminescence (PL) spectra were measured at room temperature with a Shimadzu model RF-5700PC using a Xe lamp (150 W) as an ultraviolet (UV) light source. Emission scans were performed with a 1.5 nm bandpass emission slit. An optical filter, which eliminated light having wavelengths smaller than 390 nm, was used to remove a second-order peak of the excitation light.
**Fig. S1** PL spectra of (a) the La$_2$O$_3$:Eu$^{3+}$/La$_2$Sn$_2$O$_7$ powder and (b) the non-coated La$_2$O$_3$:Eu$^{3+}$ powder, aged under ambient atmosphere over 5 days. The non-coated powder was actually converted into La(OH)$_3$ according to the XRD analysis, and exhibited very weak PL intensities.