Electronic Supplementary Information

Self-doped Ce^{3+} enhanced CeO_2 host matrix for energy transfer from Ce^{3+} to Tb^{3+}

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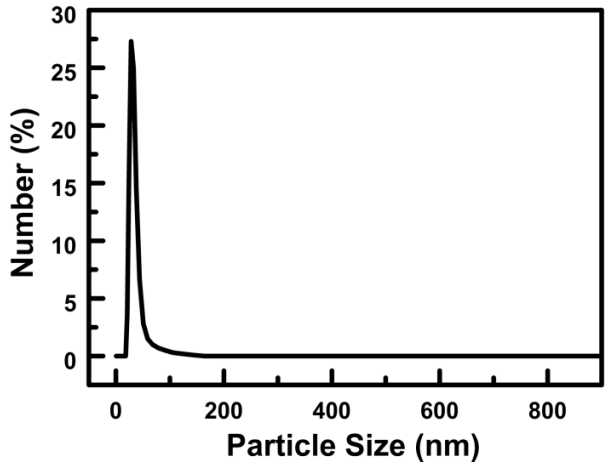

Fig. S1. DLS measurement of CeO_2:Tb^{3+},Ce^{3+} nanoparticles.

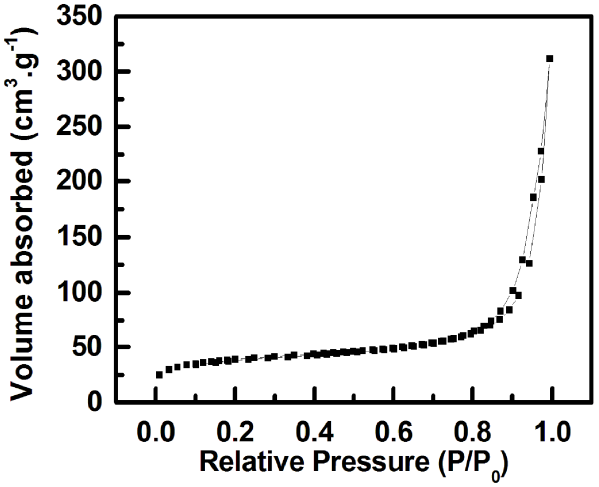

Fig. S2. N_2 adsorption-desorption isotherms of CeO_2:Tb^{3+},Ce^{3+} nanoparticles.

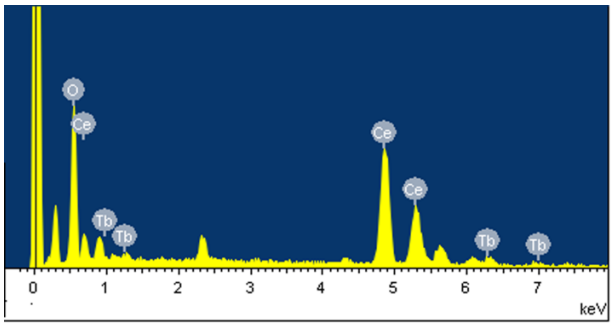

Fig. S3. EDX spectrum for CeO_2:Tb^{3+},Ce^{3+} nanoparticles.

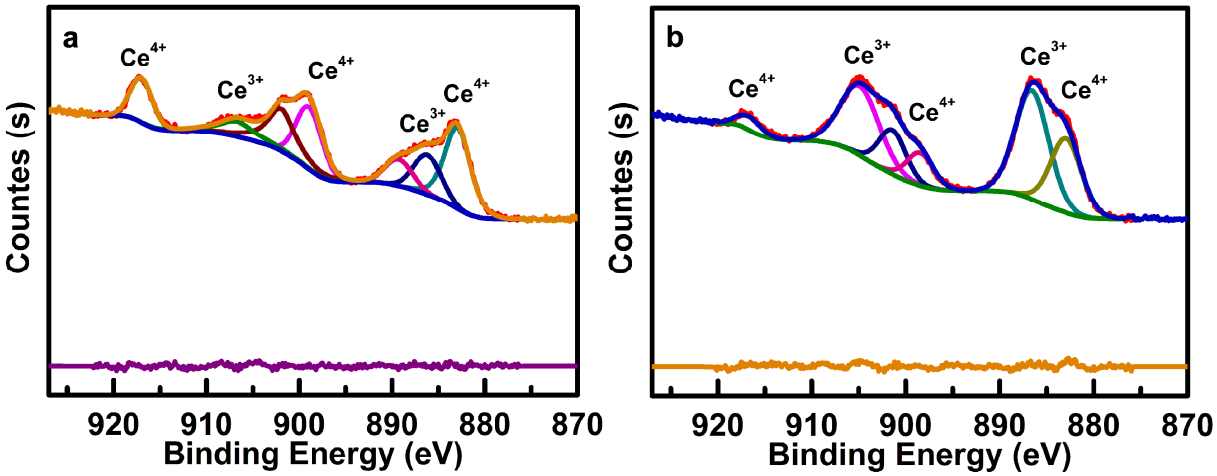

Fig. S4. XPS fitting curves for (a) CeO_2:Tb^{3+} nanoparticles and (b) CeO_2:Tb^{3+},Ce^{3+} nanoparticles.

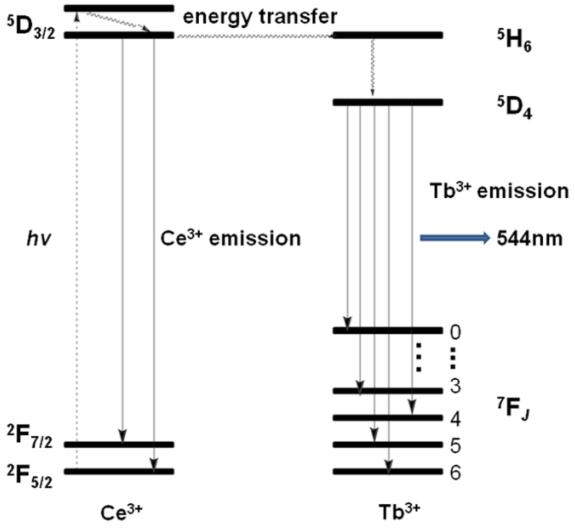

Fig. S5. The energy transfer process from Ce^{3+} to Tb^{3+} in CeO_2:Tb^{3+},Ce^{3+} nanoparticles.

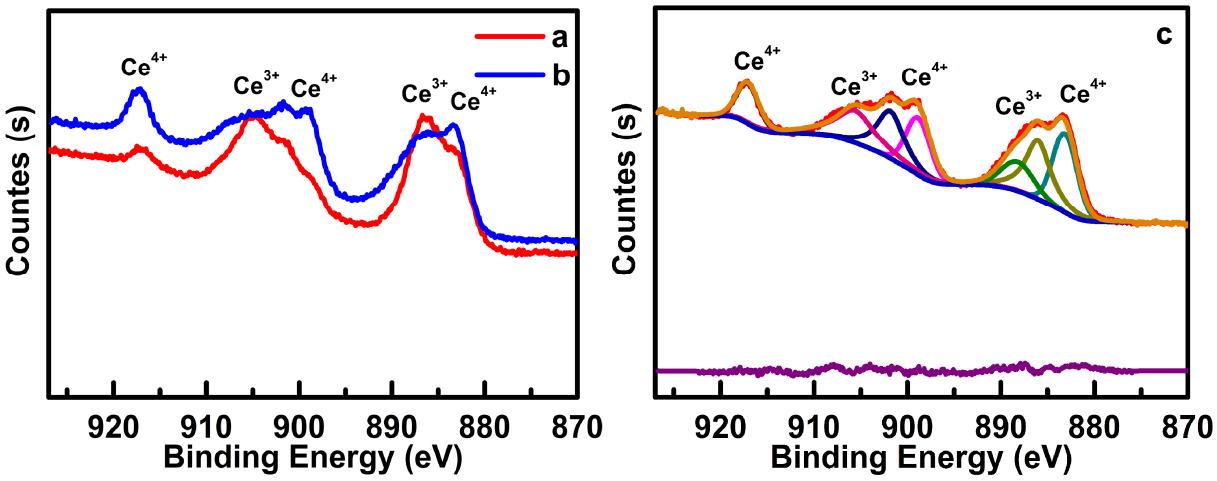

Fig. S6. XPS for (a) CeO_2:Tb^{3+},Ce^{3+} nanoparticles and (b) CeO_2:Tb^{3+},Ce^{3+} nanoparticles treated with 2 mL 10 M H_2O_2, XPS fitting curves (c) for CeO_2:Tb^{3+},Ce^{3+} nanoparticles treated with 2 mL 10 M H_2O_2.

Crystallize size is estimated by XRD according to Sherrer equation

$$d=K\lambda /(\beta\cos\theta)$$

with the help of MDI Jade 6.0, the correction in full width at half-maximum (FWHM) is done to compensate for the broadening in peaks due to instrument. A standard quartz sample is used to correct the instrumental broadening in the pattern of the sample. Influence of the size and strain of the particles are considered when pattern is fitted.[1]

The luminescence spectra can be greatly altered by agglomeration in many cases. We run a test to clarify that agglomeration has no affection on our luminescence spectra. C1 are the samples in solid state, and they are agglomeration. C2 are samples dispersed in water by ultrasound, and they are dispersed in water according to DLS measurement. Both the luminescence spectra of C1 and C2 are measured at the same condition. No shift can be observed in the spectra.

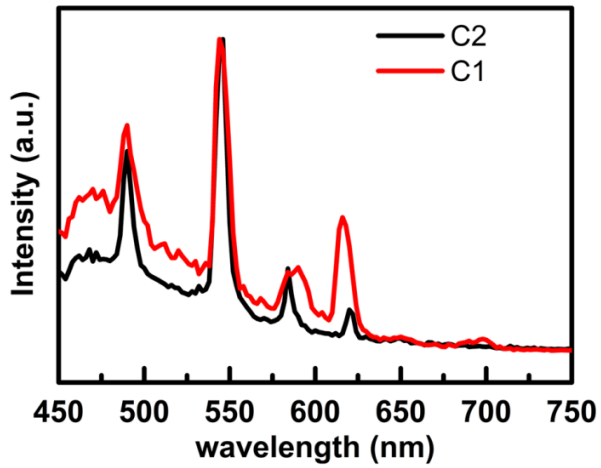

Fig. S7 Luminescence spectra of C1 (the samples in solid state) and C2 (samples dispersed in water by ultrasound)

Reference

1.A. Kumar, S. Babu, A. S. Karakoti, A. Schulte and S. Seal, *Langmuir*, 2009, **25**, 10998-11007.