

Supporting Information

Constructing a tetraphenylethene (TPE) derivative decorated polyvinyl alcohol (PVA)/ lanthanide nanoparticles composite system for tunable luminescence

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Captions

Table S1 Experimental details about the preparation of TPEBA-Ln1 and TPEBA-Ln2

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Fig. S1 AIE behavior (a) and plots of the fluorescence intensity at 460 nm (b) of TPEBA dissolved in DMSO/water mixtures with different water fractions ($\lambda_{\text{ex}}=340$ nm).

Fig. S2 Fluorescence of the frozen diluted TPEBA solution (1.0×10^{-4} mol/L) dissolved in DMSO (black line) and TPEBA modified PVA with low amount of TPEBA dispersed in DMSO (red line) respectively.

Fig. S3 XPS survey (a) and B1s XPS (b) spectra of TPEBA decorated NaTbF₄ nanoparticles.

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Fig. S5 Excitation spectrum of the TPEBA-Tb1 and TPEBA-Tb2 ($\lambda_{\text{em}}=540$ nm) (a); Excitation spectrum of the TPEBA-Eu1 and TPEBA-Eu2 ($\lambda_{\text{em}}=613$ nm) (b).

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Fig. S7 Schematic representation of the energy transfer process between ligand to Ln³⁺.

Fig. S8 Powder XRD patterns and TEM images of TPEBA-decorated lanthanide nanoparticles with different mole ratio of TPEBA, Tb³⁺ and Eu³⁺.

Fig. S9 Hydrodynamic radius distributions of PVA-1(a) and PVA-2(b) in DMSO (4mg/mL).

Fig. S10 The changes in the intensity of the emission peak assigned to the TPEBA (maximum peak from 400nm to 470 nm), and the luminescence belonged to Eu³⁺ located at 591.8 nm and 616.2 nm when the increasing concentration of PVA-1 was added into the TPEBA-decorated lanthanide nanoparticles (a); The linear relationship between $I_{\text{TPEBA}}/I_{\text{Eu}^{3+}}$ and the increasing concentration of PVA-1 (b).

Fig. S11 The decreasing intensity of the emission peak located at 460.6 nm, 591.8 nm and 616.2 nm when the increasing concentration of PVA-2 was added into the TPEBA-decorated lanthanide nanoparticles (a); Stern-Volmer plots of the quenching (460.6 nm) by PVA-2 (b).

Table S1 Experimental details about the preparation of TPEBA-Ln1 and TPEBA-Ln2

	TPEBA-Gd1	TPEBA-Tb1	TPEBA-Eu1	TPEBA-Gd2	TPEBA-Tb2	TPEBA-Eu2
Ligand (0.012 mol/L)	1.0 mL	1.0 mL	1.0 mL	0	0	0
Ligand (0.001 mol/L)	0	0	0	0.5 mL	0.5 mL	0.5 mL
Gb(NO ₃) ₃ (0.1mol/L)	1.0 mL	0	0	1.0 mL	0	0
Tb(NO ₃) ₃ (0.1mol/L)	0	1.0 mL	0	0	1.0 mL	0
Eu(NO ₃) ₃ (0.1mol/L)	0	0	1.0 mL	0	0	1.0 mL
NaF (0.4 mol/L)	1.0 mL	1.0 mL	1.0 mL	1.0 mL	1.0 mL	1.0 mL
DMSO	2.0 mL	2.0 mL	2.0 mL	2.5 mL	2.5 mL	2.5 mL

Table S2 Experimental details about the preparation of TPEBA-Tb-Eu composite materials

	TPEBA-Tb-Eu-A	TPEBA-Tb-Eu-B	TPEBA-Tb-Eu-C
Ligand (0.010 mol/L)	1.0 mL	0	0
Ligand (0.005 mol/L)	0	0.4 mL	0
Ligand (0.001 mol/L)	0	0	0.4 mL
Tb(NO ₃) ₃ (0.1 mol/L)	980 μL	970 μL	950 μL
Eu(NO ₃) ₃ (0.1 mol/L)	20 μL	30 μL	50 μL
NaF (0.4 mol/L)	1.0 mL	1.0 mL	1.0 mL
DMSO	2.0 mL	2.6 mL	2.6 mL

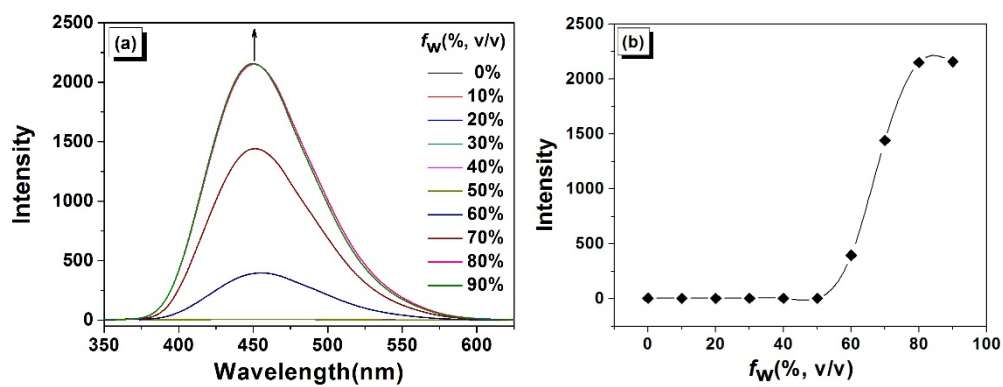


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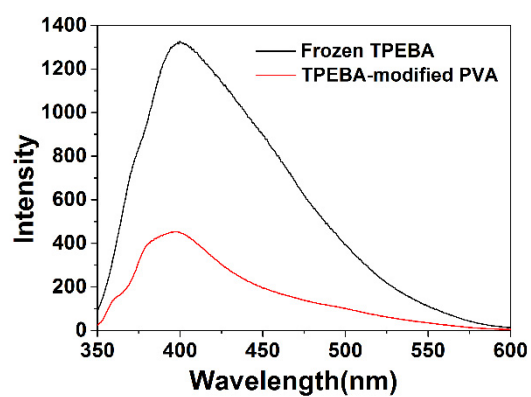


Fig. S2 Fluorescence of the frozen diluted TPEBA solution (1.0×10^{-4} mol/L) dissolved in DMSO (black line) and TPEBA modified PVA with low amount of TPEBA dispersed in DMSO (red line) respectively.

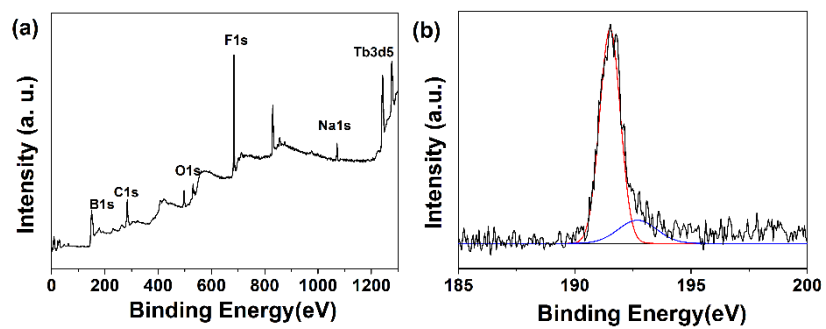


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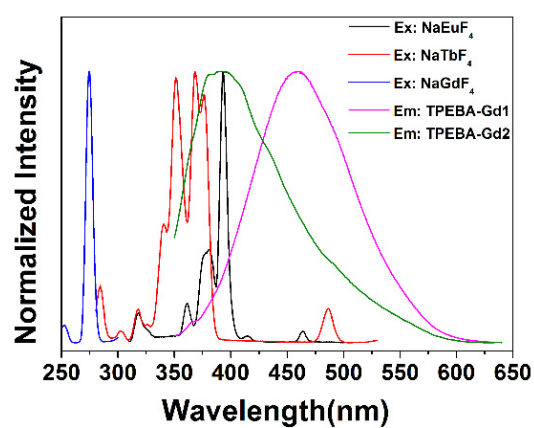


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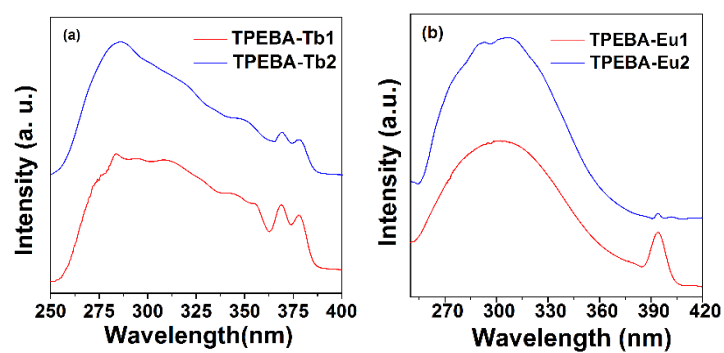


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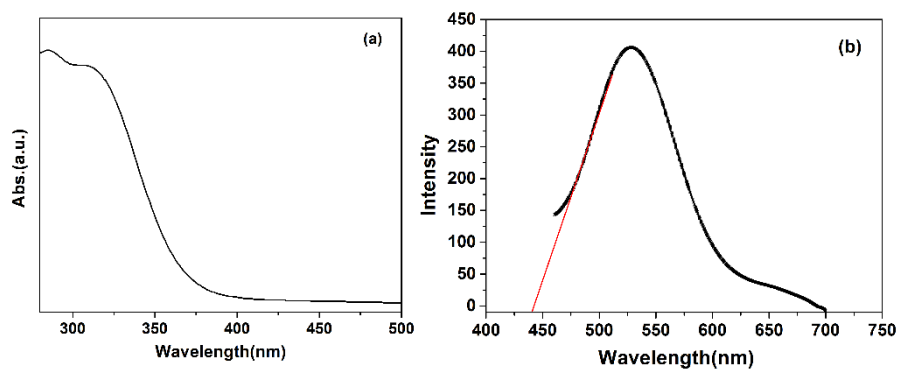


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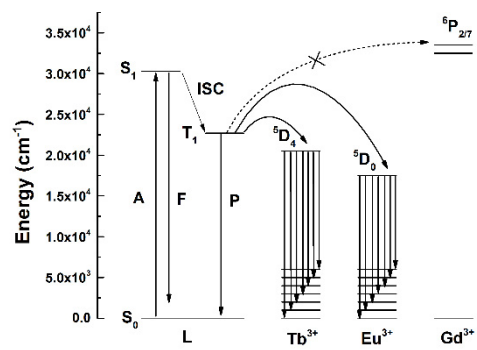


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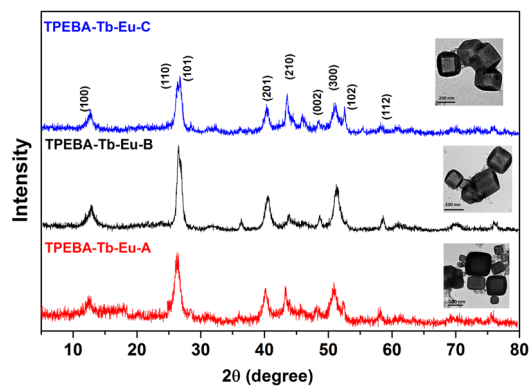


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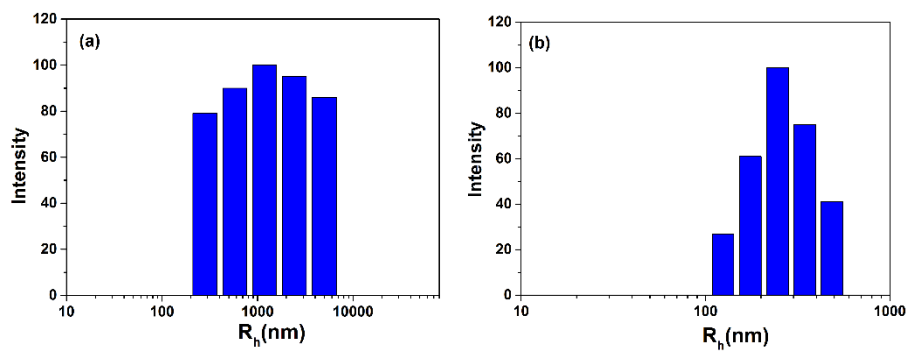


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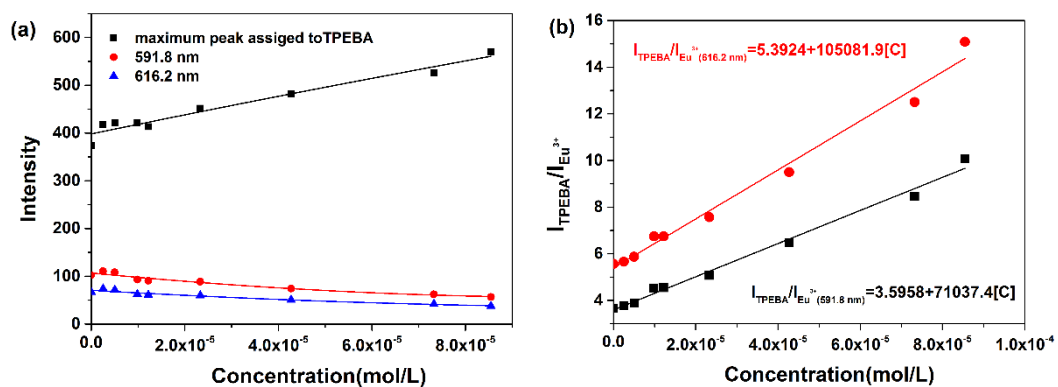


Fig. S10 The changes in the intensity of the emission peak assigned to the TPEBA (maximum peak from 400nm to 470 nm), and the luminescence belonged to Eu³⁺ located at 591.8 nm and 616.2 nm when the increasing concentration of PVA-1 was added into the TPEBA-decorated lanthanide nanoparticles (a); The linear relationship between $I_{TPEBA}/I_{Eu^{3+}}$ and the increasing concentration of PVA-1 (b).

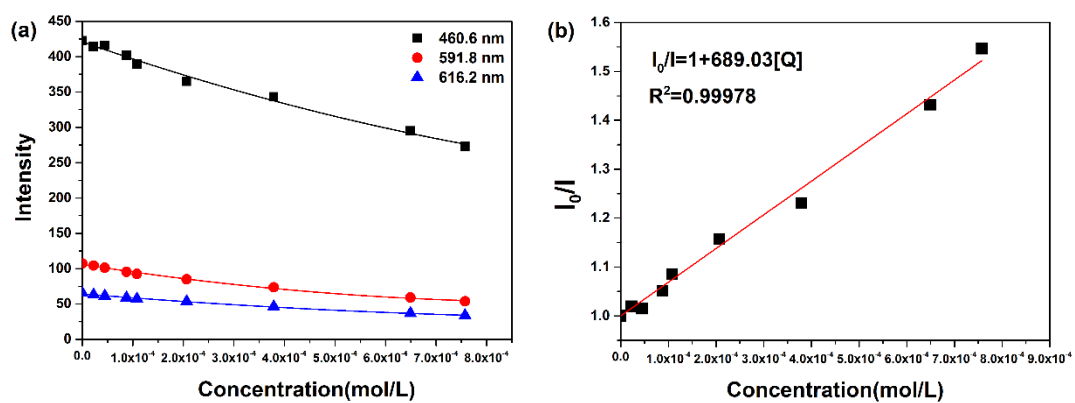


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