Supporting Information

Layer-structure-suppressed concentration quenching of Dy^{3+} luminescence and the realization of a single phase white light-emitting phosphor cooperated with Tm^{3+}

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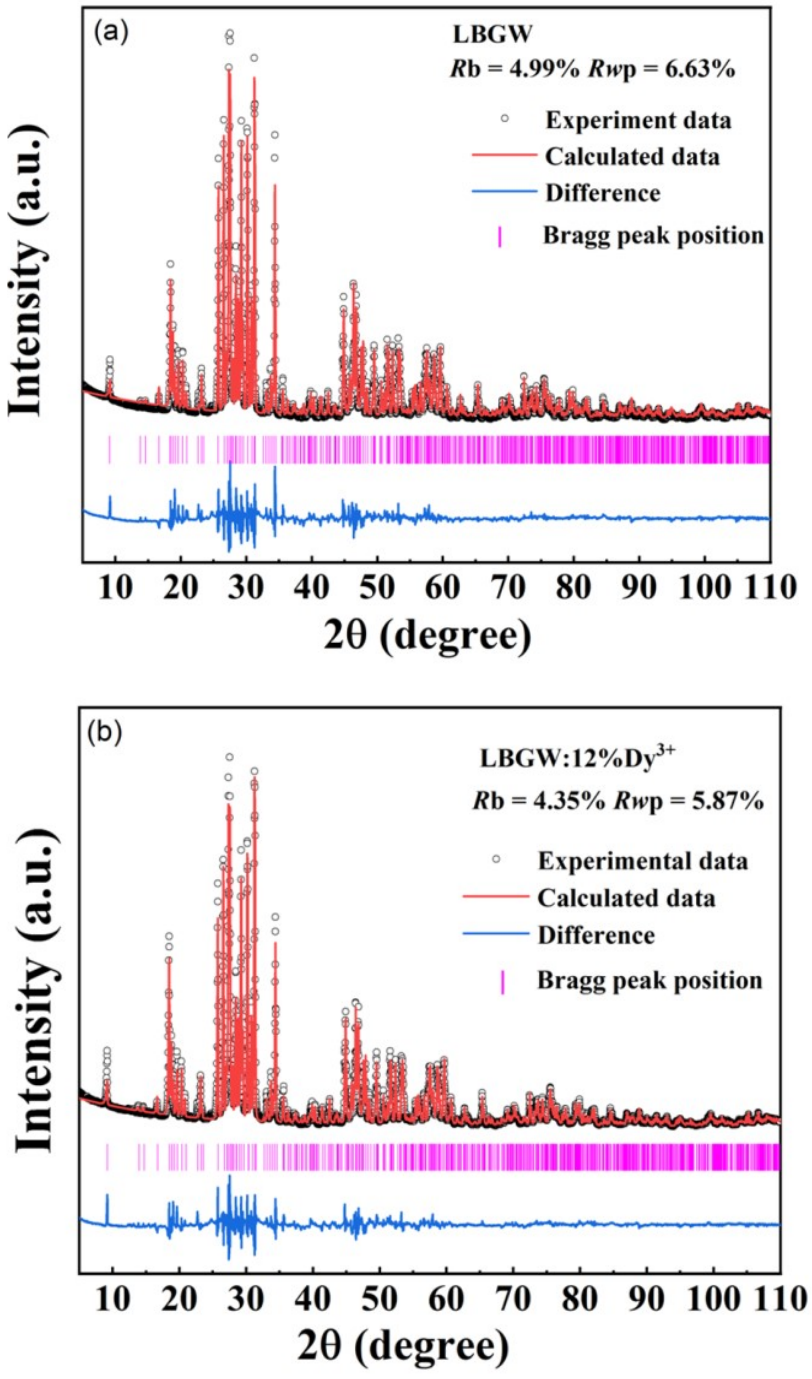

Fig. S1 The Rietveld XRD refinement of LBGW and LBGW:12%Dy^{3+} phosphor powder X-ray patterns.

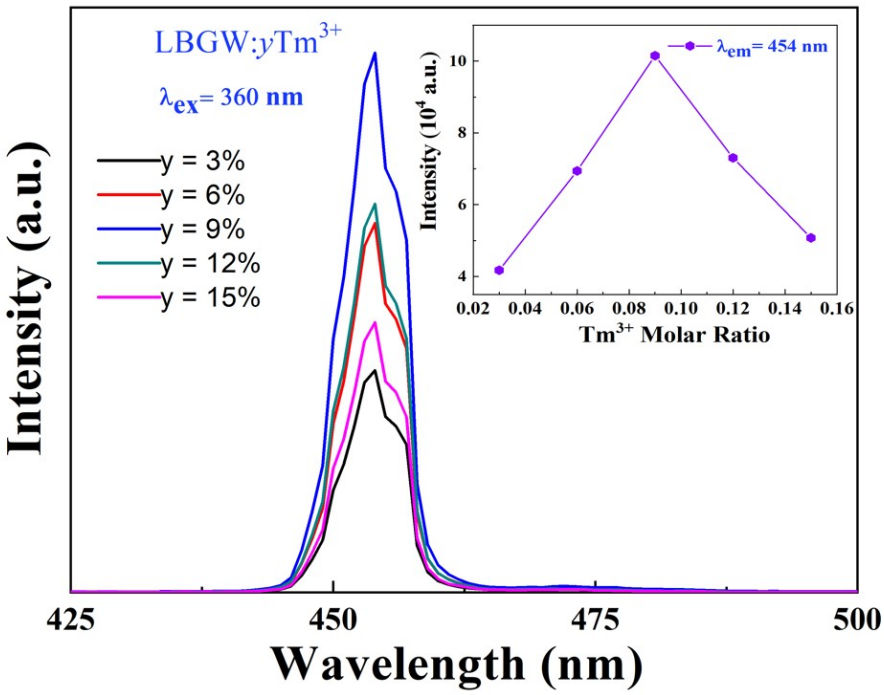

Fig.S2 The PL spectra of LBGW:yTm^{3+}. The inset shows the relationship between Tm^{3+} doping concentration and luminescence intensity.

It can be seen in Fig.S2 that with the increase of Tm^{3+} doping concentration, the luminescence intensity of LBGW:Tm^{3+} increases continuously. When the concentration of Tm^{3+} reaches 9%, the luminescence intensity reaches the maximum value, and then the luminescence intensity begins to decrease. Similar to the doping of Dy^{3+}, Tm^{3+} has a relatively high doping concentration in this matrix.

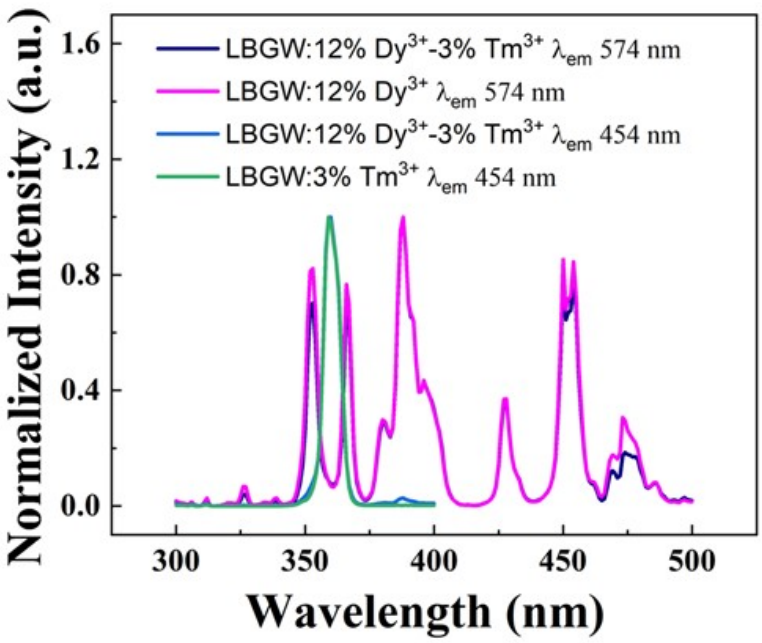

Fig.S3 PLE spectra of LBGW:12%Dy^{3+}, LBGW:12%Dy^{3+},3%$Tm^{3+}$and LBGW:3%Tm^{3+}, LBGW:12% Dy^{3+},3%Tm^{3+} were monitored at 574 nm and 454 nm emission wavelengths, respectively.

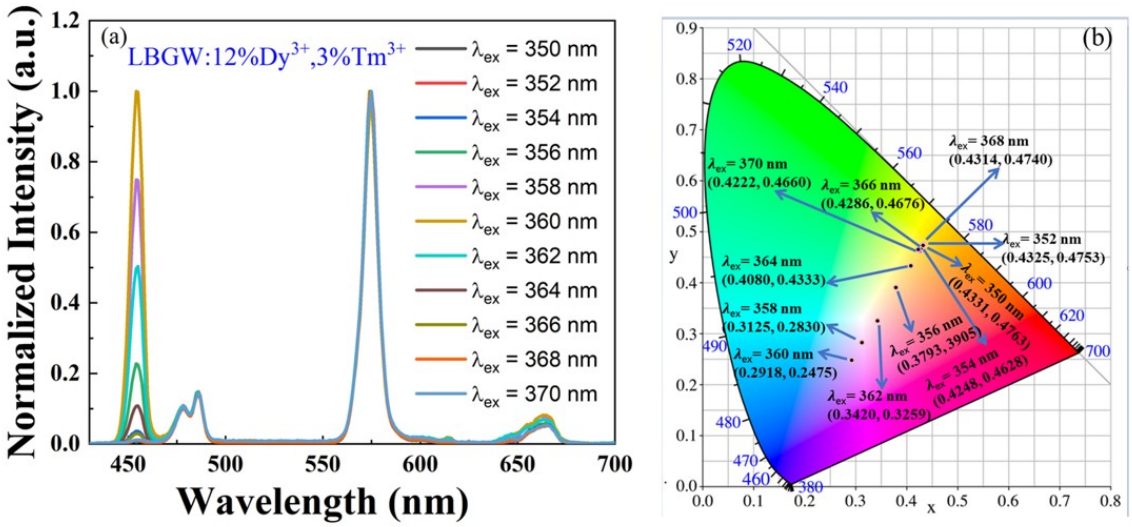

Fig.S4 (a) PL spectra and (b) Chromaticity diagram of the LBGW:12%Dy^{3+},3%Tm^{3+} phosphor at different excitation wavelengths.

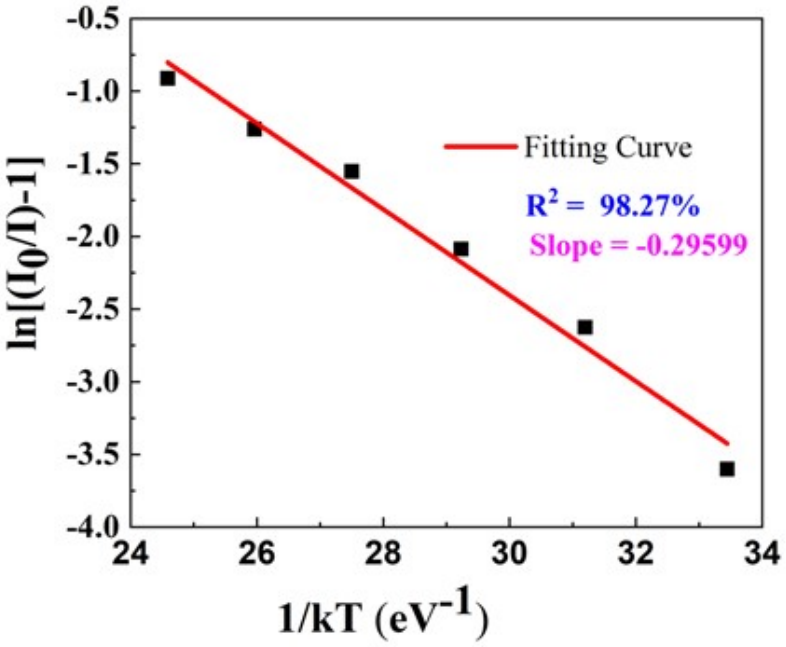

Fig.S5 The graph of $\ln[(I/I_0) -1]$ verses 1/KT for LBGW:12%Dy^{3+},3%Tm^{3+}.

Table S1. Fractional atomic coordinates and isotropic displacement parameters (Å^2) of LBGW.

Atom	*x*	*y*	*z*	B_{iso}	*Occ.*
W1	0.4060	0.4894(3)	0.4414(1)	0.5488(6)	1
W2	0.3499(2)	0.4997(7)	0.7428(3)	0.5638(4)	1
Ba3	0.2500	1.0000	0.5200(6)	0.5480(3)	1
Y4	0.4684(8)	1.0066(2)	0.6476(9)	0.5267(2)	0.75
Li4	0.4689(6)	1.0052(9)	0.6474(4)	0.3307(3)	0.25
Li5	0.2500	0.5000	0.2520(8)	0.5478(9)	1
O1	0.3234(5)	0.6211	0.4344(2)	0.5483(4)	1
O2	0.4018(6)	0.2645(3)	0.5504(3)	0.5477(6)	1
O3	0.4669(6)	0.7951(9)	0.4967(3)	0.5487(4)	1
O4	0.4515(5)	0.2338(1)	0.3494(9)	0.5496(5)	1
O5	0.2887	0.2512(6)	0.6894(4)	0.5492(6)	1
O6	0.3861(6)	0.7920(8)	0.6444(4)	0.5494	1
O7	0.3221(3)	0.6167(9)	0.8807(1)	0.5468(4)	1
O8	0.5288(7)	0.4879(9)	0.8503(9)	0.5434(7)	1

Table S2. Fractional atomic coordinates and isotropic displacement parameters (Å^2) of LBGW:12% Dy^{3+}.

Atom	*x*	*y*	*z*	B_{iso}	*Occ.*
W1	0.4063(9)	0.4903(5)	0.4415(4)	0.7098	1
W2	0.3504(1)	0.5001(2)	0.7435(9)	0.7098	1
Ba3	0.2500	1.0000	0.5301(8)	0.7098	1
Y4	0.4682(4)	1.0067(3)	0.6458(4)	0.7098	0.75
Li4	0.4682(4)	1.0067(3)	0.6458(4)	0.7098	0.25
Li5	0.2500	0.5000	0.2497	0.7098	1
O1	0.3245(1)	0.6466(2)	0.4337(2)	0.7098	1
O2	0.4021(7)	0.2524(1)	0.5435	0.7098	1
O3	0.4666(8)	0.8001(7)	0.4987(8)	0.7098	1
O4	0.4546(9)	0.2342(5)	0.3511(7)	0.7098	1
O5	0.3171(1)	0.2304(7)	0.6905	0.7098	1
O6	0.3752(1)	0.7708(3)	0.6408(3)	0.7098	1
O7	0.3242(9)	0.6207	0.8868(2)	0.7098	1
O8	0.5272(6)	0.4911(4)	0.8441	0.7098	1

Table S3. Fractional atomic coordinates and isotropic displacement parameters (Å^2) of LBGW:12% Dy^{3+},3% Tm^{3+}.

Atom	*x*	*y*	*z*	B_{iso}	*Occ.*
W1	0.4878(4)	0.4407(3)	0.4057(6)	0.8110(2)	1
W2	0.5015(9)	0.7427(2)	0.3499	0.7536(9)	1
Ba3	1.0000	0.5314(9)	0.2500	0.7250(7)	1
Y4	1.0024(2)	0.6458(8)	0.4677(5)	0.2673(8)	0.75
Li4	1.0024(2)	0.6458(8)	0.4677(5)	0.2673(8)	0.25
Li5	0.5000	0.2794(8)	0.2500	0.7179(6)	1
O1	0.6469(6)	0.4203(3)	0.3272(1)	0.8103(7)	1
O2	0.2650(1)	0.5466(3)	0.3981(6)	0.7041(1)	1
O3	0.7662(3)	0.4876(2)	0.4561(6)	1.0445	1
O4	0.3158(8)	0.3283(1)	0.4444(8)	0.7508(7)	1
O5	0.2862(7)	0.7068(9)	0.2819	1.0667(9)	1
O6	0.7834(1)	0.6596(4)	0.3625(8)	0.6443(7)	1
O7	0.6363(8)	0.8708(4)	0.3267(2)	0.5523(2)	1
O8	0.3258(5)	0.7534(8)	0.4316(15)	0.4434	1