Electronic Supporting Information

Luminescence Properties and Energy Transfer of $YGa_{1.5}Al_{1.5}(BO_3)_4$: Tb^{3+},Eu^{3+} as a Multi-colour Emitting Phosphor for WLEDs†

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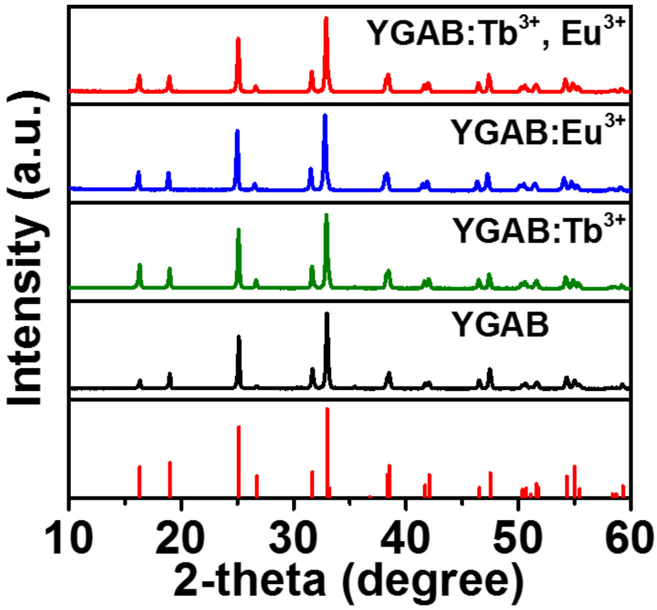

Fig. S1. Powder XRD patterns for pristine, Eu^{3+}- or Tb^{3+}-doped and co-doped $YGa_{1.5}Al_{1.5}(BO_3)_4$ (COD ID 1526006).

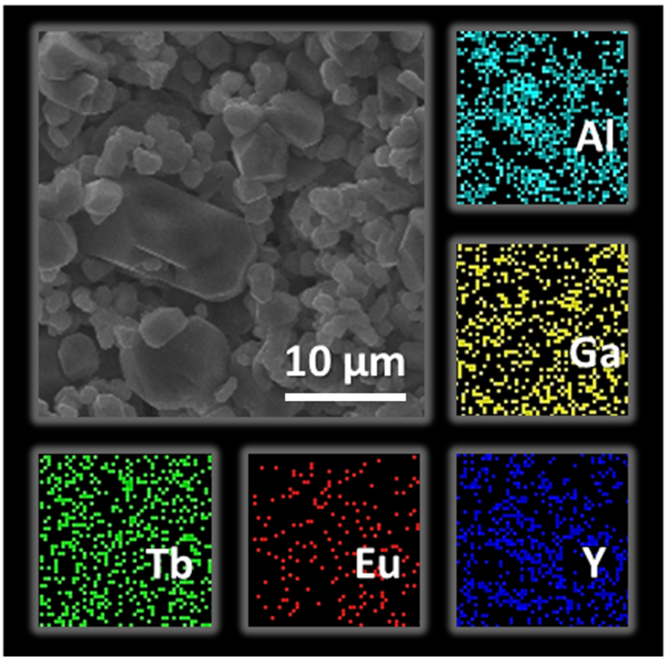

Fig. S2. SEM elemental mapping of $YGa_{1.5}Al_{1.5}(BO_3)_4$: $0.50Tb^{3+}$,$0.04Eu^{3+}$

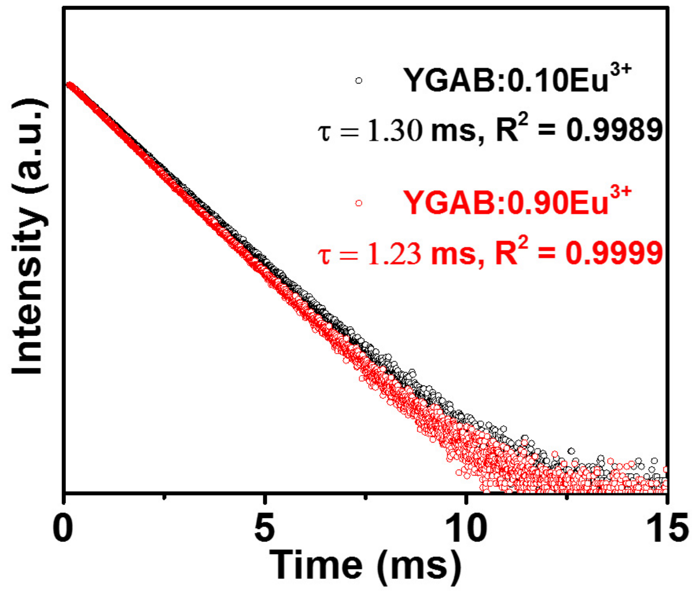

Fig. S3. The decay curves of Eu^{3+} in YGAB: $0.10Eu^{3+}$ and YGAB: $0.90Eu^{3+}$ with the excitation at 393 nm and emission at 611 nm.

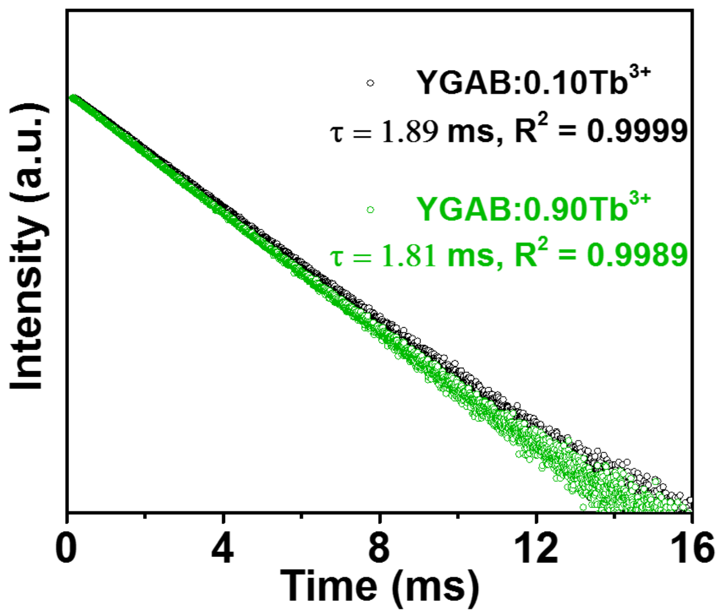

Fig. S4. The decay curves of Tb^{3+} in YGAB: $0.10Tb^{3+}$ and YGAB: $0.90Tb^{3+}$ with the excitation at 374 nm and emission at 539 nm.

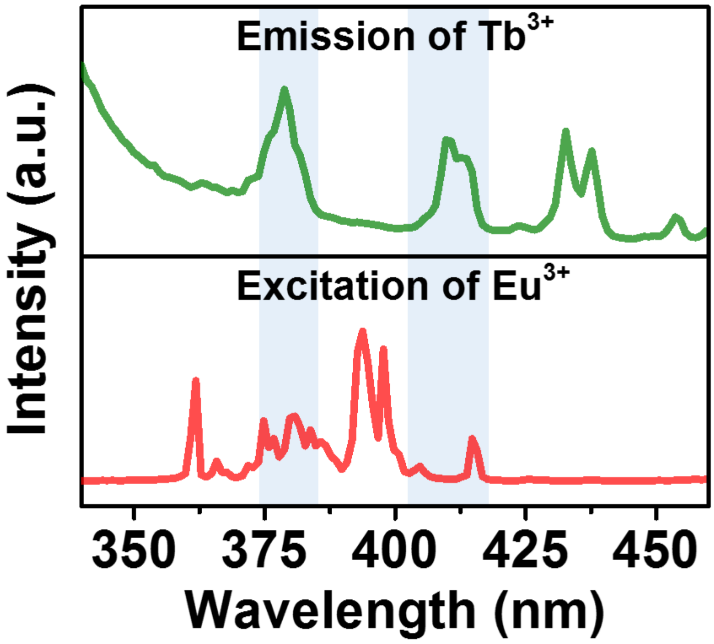

Fig. S5 Theoretical spectral overlapping of PL spectrum of Tb^{3+} and the PLE spectrum of Eu^{3+}

Emission of $^5D_3 \rightarrow ^7F_6$ (Tb^{3+}) ~ 380 nm overlaps the excitation of $^7F_0 \rightarrow ^5G_{2,3,4,5,}$, $^5L_8$ (Eu^{3+}) and emission of $^5D_3 \rightarrow ^7F_5$ (Tb^{3+}) ~ 416 nm overlaps the excitation of $^7F_0 \rightarrow ^5D_3$, $^5L_6$ (Eu^{3+}), which is the foundation of energy transfer.

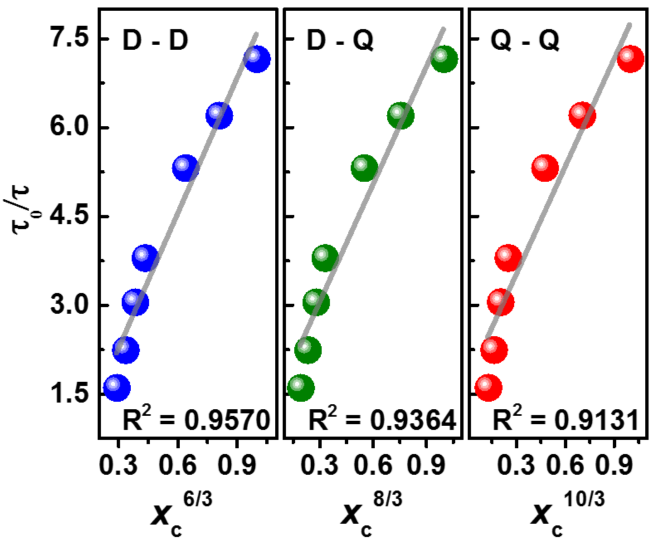

Fig. S6. The dependence of τ_0/τ on the total content of Tb^{3+} and Eu^{3+}

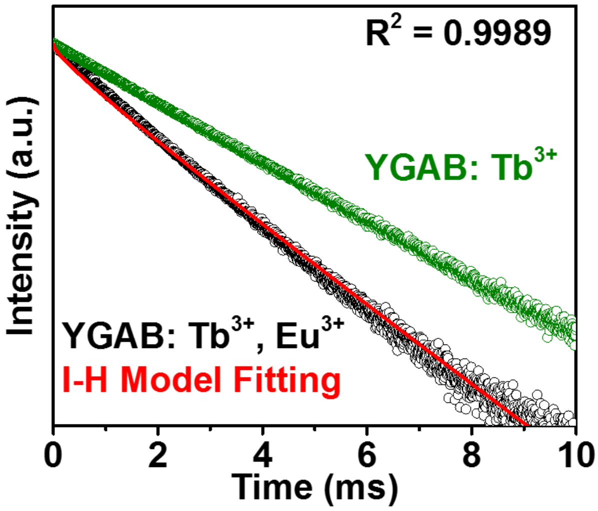

Fig. S7. Inokuti-Hirayama model fitting

Inokuti-Hirayama model is giving as follows:

$$I(t) = I_0 exp\left[-\frac{t}{\tau_0} - \gamma_S\left(\frac{t}{\tau_0}\right)^{3/S}\right]$$

It has been used to fit the decay curve to help prove the rationalization of dipole-dipole type energy transfer (S=6).

Table S1. The refined parameters of YGAB: Tb^{3+},Eu^{3+}

Atom	Wyck.	*x/a*	*y/b*	*z/c*	Occ.	Beq.
Y1	3a	0.000	0.000	0.000	0.460	1.500
Tb1	3a	0.000	0.000	0.000	0.500	1.500
Eu1	3a	0.000	0.000	0.000	0.040	1.500
Al1	9d	0.552	0.000	0.000	0.500	1.211
Ga1	9d	0.552	0.000	0.000	0.500	1.211
O1	9e	0.850	0.000	0.500	1.000	1.000
O2	9e	0.589	0.000	0.500	1.000	1.000
O3	18f	0.449	0.148	0.515	1.000	1.000
B1	3b	0.000	0.000	0.500	1.000	1.000
B2	9e	0.454	0.000	0.500	1.000	1.000

Space group: *R* 32 (155)

Cell parameters: $a = b = 9.3616$ Å, $c = 7.3414$ Å, $\alpha = \beta = 90$ º, $\gamma = 120$ º

$V = 557.19$ Å^3, $Z = 3$

Reliability factor: $R_{wp} = 4.64$ %, $R_p = 3.58$ %