Supporting Information

Host Composition Dependent Tunable Multicolor Emission in the Single-Phase Ba$_2$(Ln$_{1-z}$Tb$_z$)(BO$_3$)$_2$Cl:Eu Phosphors

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Figure S1 XRD patterns of Ba$_2$(Y$_{0.97-z}$Tb$_z$)(BO$_3$)$_2$Cl:0.03Eu (a) and Ba$_2$(Gd$_{0.97-z}$Tb$_z$)(BO$_3$)$_2$Cl:0.03Eu phosphors with different Tb content ($z$ values).

Figure S2 Emission spectra excited by 377 nm of Ba$_{1.97}$Y(BO$_3$)$_2$Cl:0.03Eu, Ba$_2$(Y$_{0.97-z}$Tb$_z$)(BO$_3$)$_2$Cl:0.03Eu phosphors (a) and Ba$_{1.97}$Gd(BO$_3$)$_2$Cl:0.03Eu, Ba$_2$(Gd$_{0.97-z}$Tb$_z$)(BO$_3$)$_2$Cl:0.03Eu phosphors.
**Figure S3** Excitation spectra excited by 594 nm of Ba$_2$Lu$_{0.97}$Tb$_z$(BO$_3$)$_2$Cl:0.03Eu and Ba$_2$(Lu$_{0.97}$-$z$Tb$_z$)(BO$_3$)$_2$Cl:0.03Eu phosphors with different Tb content ($z$ values).

**Figure S4** UV-vis diffuse reflectance spectra of Ba$_{1.97}$Lu(BO$_3$)$_2$Cl:0.03Eu and Ba$_2$(Lu$_{0.97}$-$z$Tb$_z$)(BO$_3$)$_2$Cl:0.03Eu phosphors with different Tb content ($z$ values).

**Figure S5.** ESR spectra of Ba$_{1.97}$Lu(BO$_3$)$_2$Cl:0.03Eu and Ba$_2$(Lu$_{0.97}$-$z$Tb$_z$)(BO$_3$)$_2$Cl:Eu phosphors with different Tb content ($z$ values).
Figure S6 The decay curves of Eu$^{2+}$ (4f-$5d$) (a), Tb$^{3+}$ ($^5D_{4}$-$^7F_5$) (b) and Eu$^{3+}$ ($^5D_0$-$^7F_2$) (c) transitions for Ba$_2$(Y$_{0.97-z}$Tb$_z$)(BO$_3$)$_2$Cl:0.03Eu phosphors with different Tb content ($z$ values), and the variation of the lifetimes of Eu$^{2+}$, Tb$^{3+}$ and Eu$^{3+}$ as a function of Tb content is also given (d).

Figure S7 The decay curves of Eu$^{2+}$ (4f-$5d$) (a), Tb$^{3+}$ ($^5D_{4}$-$^7F_5$) (b) and Eu$^{3+}$ ($^5D_0$-$^7F_2$) (c) transitions for Ba$_2$(Gd$_{0.97-z}$Tb$_z$)(BO$_3$)$_2$Cl:0.03Eu phosphors with different Tb content ($z$ values), and the variation of the lifetimes of Eu$^{2+}$, Tb$^{3+}$ and Eu$^{3+}$ as a function of Tb content is also given (d).