Electronic Supplementary Material (ESI) for Journal of Materials Chemistry
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Supporting Information

Title: **Tunable luminescence and energy transfer properties in $KCaGd(PO_4)_2$: Ln^{3+}/Mn^{2+} (Ln = Tb, Dy, Eu, Tm; Ce, Tb/Dy) phosphors with high quantum efficiencies**

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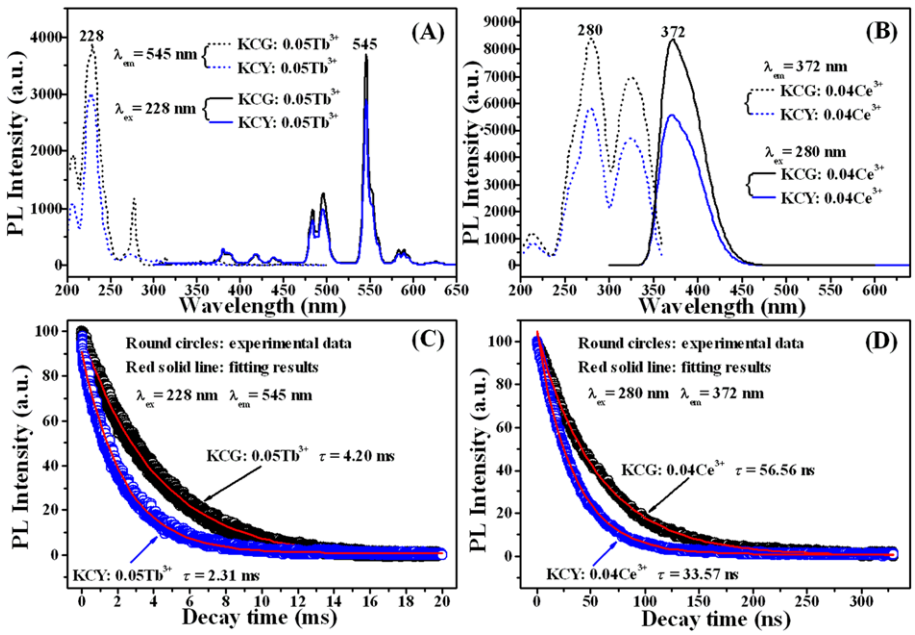

Fig. S1 PL excitation and emission spectra (A and B) along with the decay curves and lifetimes (C and D) of Tb^{3+}/Ce^{3+} in KCG and KCY host.

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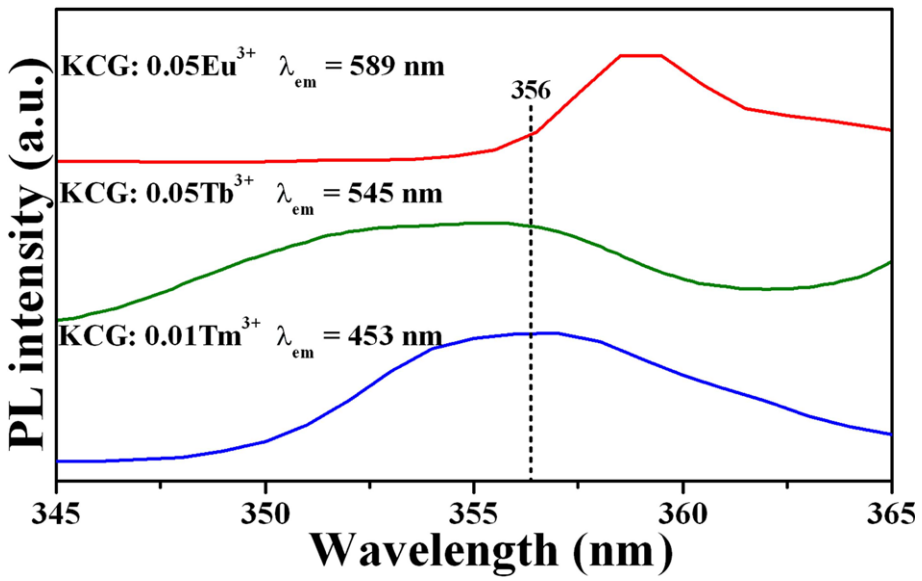

Fig. S2 The excitation spectra of KCG: Eu^{3+}/Tb^{3+}/Tm^{3+} phosphors monitoring with the characteristic emission of Eu^{3+}/Tb^{3+}/Tm^{3+}.

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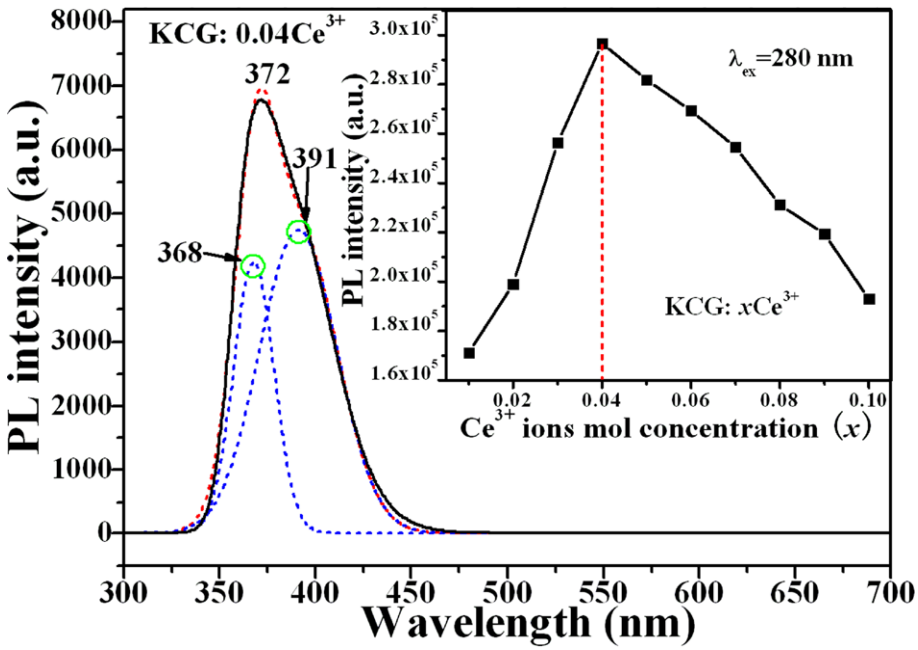

Fig. S3 The emission spectra of KCG: $0.04Ce^{3+}$ sample (λ_{ex} = 280 nm) and the deconvoluted emission spectrum of the emission band as a sum of two Gaussian bands. The inset shows the PL intensity of KCG: xCe^{3+} samples as a function of Ce^{3+} doping concentration under the excitation of 280 nm UV.

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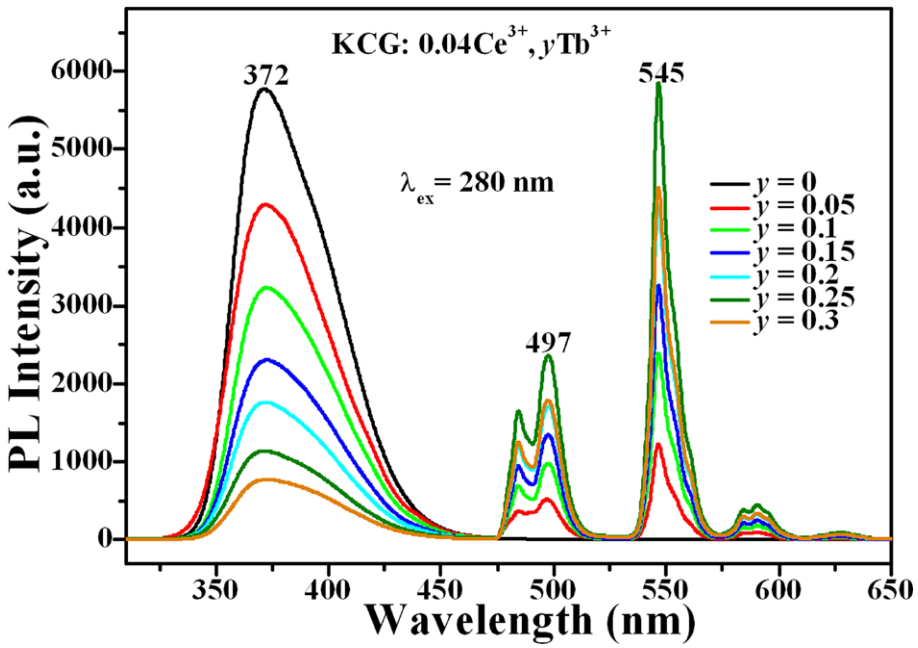

Fig. S4 The variation of PL spectra of KCG: $0.04Ce^{3+}$, yTb^{3+} samples with changing Tb^{3+} and fixed Ce^{3+}.

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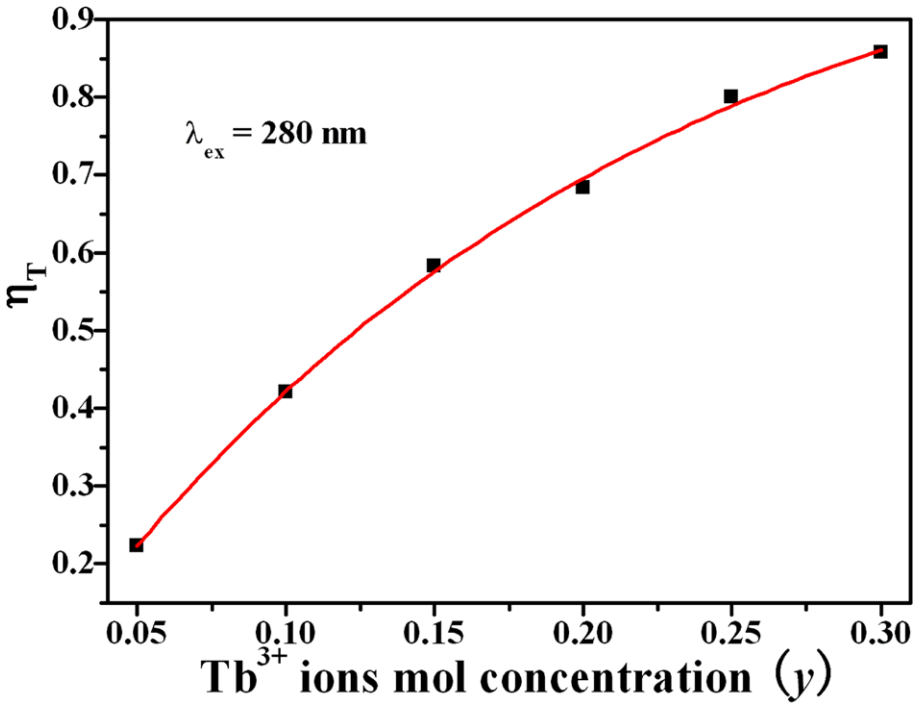

Fig. S5 Energy transfer efficiency from Ce^{3+} to Tb^{3+} in KCG: Ce^{3+}, *y*Tb^{3+} samples (λ_{ex} = 280 nm).

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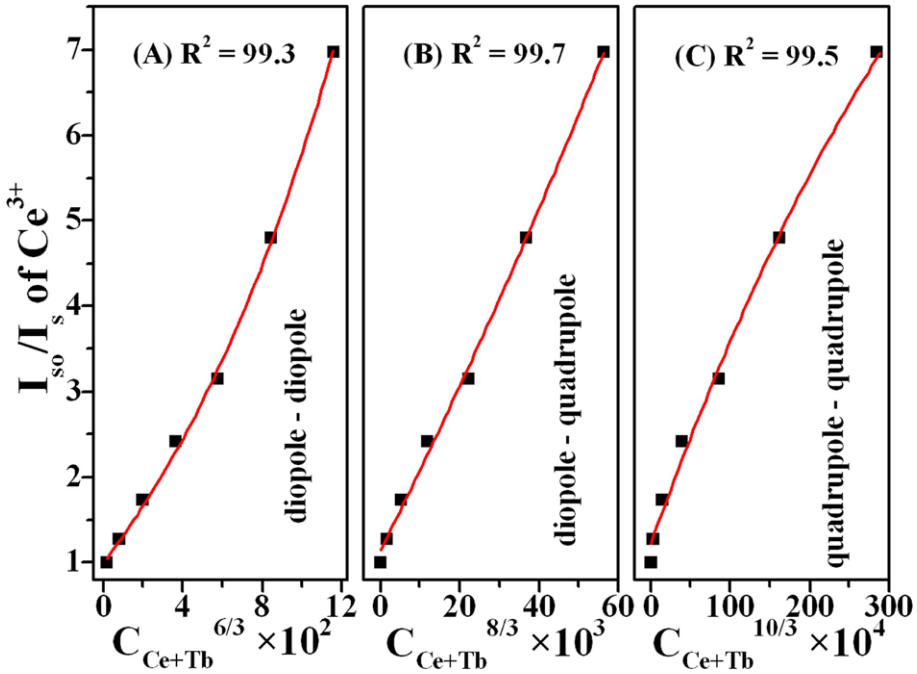

Fig. S6 Dependence of I_{so}/I_s of Ce^{3+} on (A) $C_{Ce+Tb}^{6/3}$ (B) $C_{Ce+Tb}^{8/3}$ (C) $C_{Ce+Tb}^{10/3}$.

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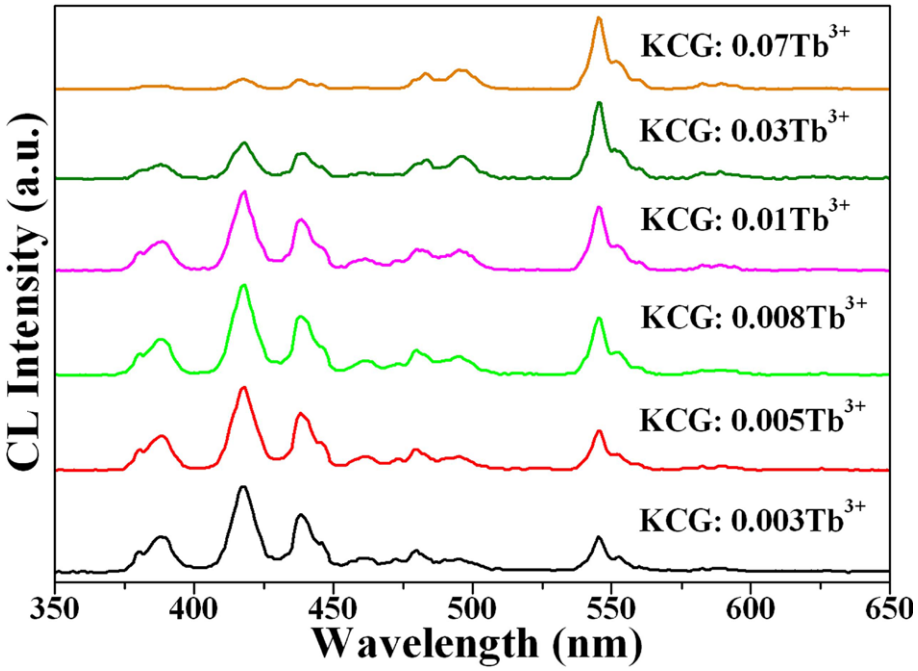

Fig. S7 The CL spectra of KCG: yTb^{3+} with different Tb^{3+} ions concentrations.

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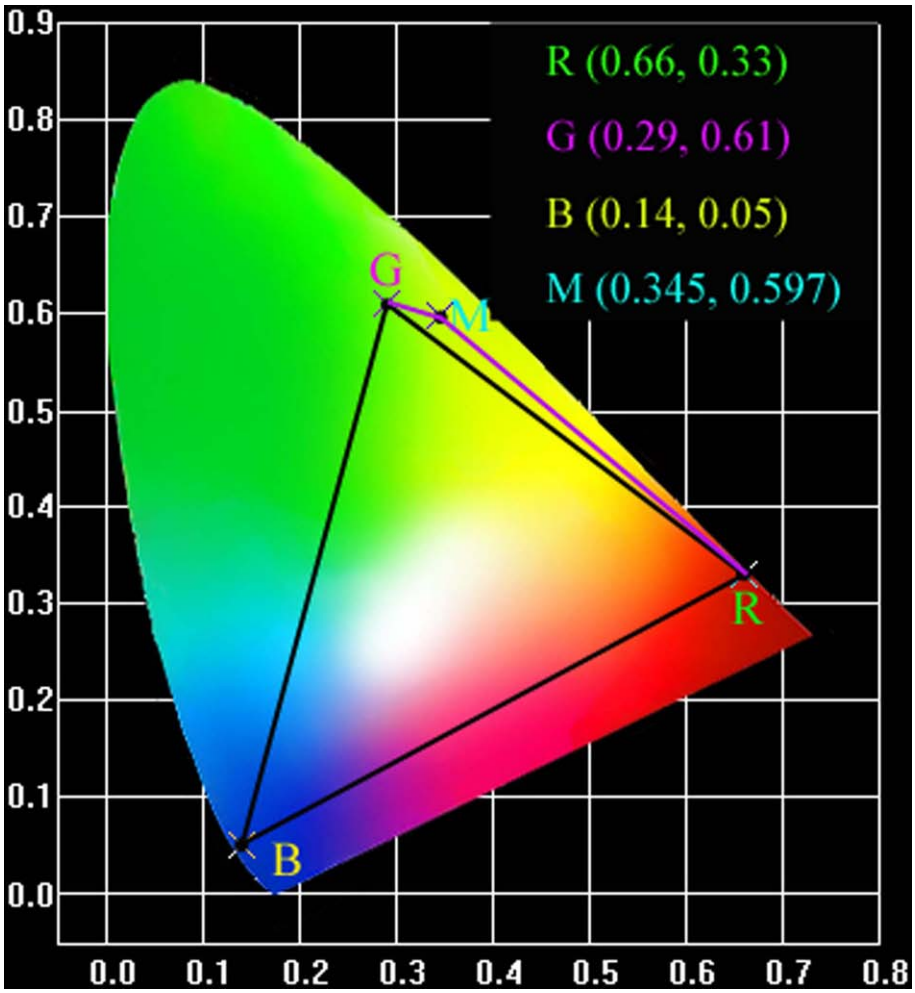

Fig. S8 CIE chromaticity diagram of standard FED phosphors and KCG: 0.12Mn^{2+} sample. R, G, B and M represent the CIE Chromaticity coordinates of $Y_2O_2S:Eu^{3+}$ (P22R), ZnS:Cu:Au:Al (P22G), ZnS:Ag:Cl (P22B) and KCG: 0.12Mn^{2+} phosphors, respectively.

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Table S1 Absolute quantum yields and CIE chromaticity coordinates (x, y) of KCG: 0.04Ce^{3+}, zDy^{3+} and KCG: 0.04Ce^{3+}, nMn^{2+} samples under the excitation of 280 nm UV.

KCG: 0.04Ce^{3+}, zDy^{3+}			KCG: 0.04Ce^{3+}, nMn^{2+}		
z	QYs 330~700 nm	CIE chromaticity coordinates (x, y)	*n*	QYs 330~700 nm	CIE chromaticity coordinates (x, y)
0.01	0.769	(0.247, 0.166)	0.05	0.697	(0.337, 0.437)
0.02	0.728	(0.271, 0.213)	0.10	0.748	(0.350, 0.464)
0.04	0.672	(0.279, 0.238)	0.15	0.781	(0.359, 0.484)
0.06	0.574	(0.283, 0.247)	0.20	0.797	(0.363, 0.489)
0.08	0.485	(0.295, 0.263)	0.25	0.802	(0.389, 0.518)
0.1	0.411	(0.298, 0.280)	0.30	0.777	(0.393, 0.526)
0.15	0.307	(0.305, 0.291)	0.40	0.737	(0.405, 0.532)