Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supplementary Information

Luminescence property improvement and controllable color regulation of novel Bi^{3+} doped $Ca_2Ta_2O_7$ green phosphor through charge compensation engineering and energy transfer

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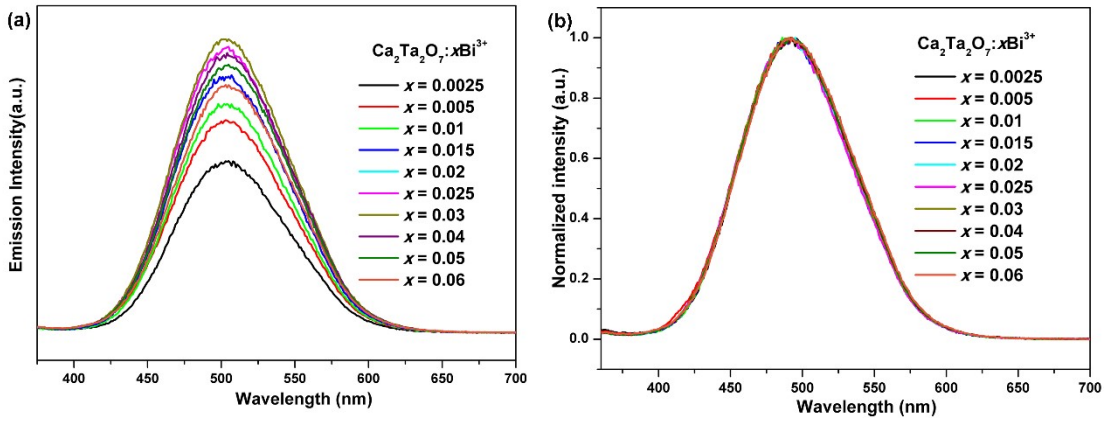

Figure S1. (a) Emission spectra and (b) normalized emission spectra of $Ca_2Ta_2O_7$:$x$$Bi^{3+}$ (x = 0.0025-0.06) phosphors.

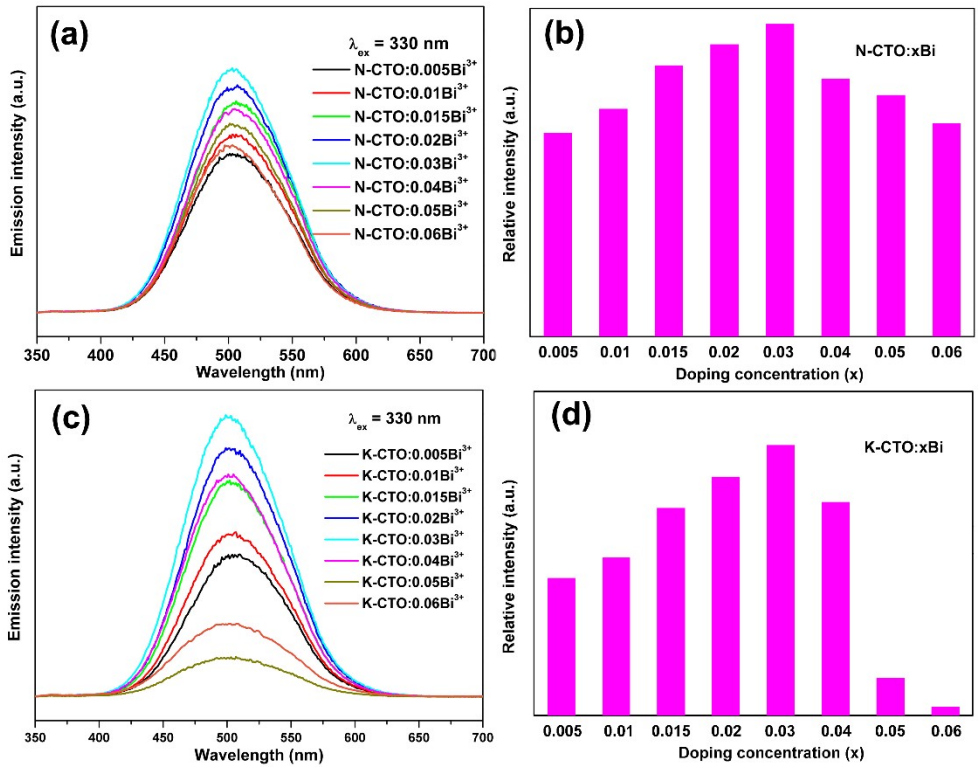

Figure S2. Emission spectra of (a) N-CTO:$x$$Bi^{3+}$ and (c) K-CTO:$x$$Bi^{3+}$ phosphors. Relative emission intensity of (b) N-CTO:$x$$Bi^{3+}$ and (d) K-CTO:$x$$Bi^{3+}$ phosphors.

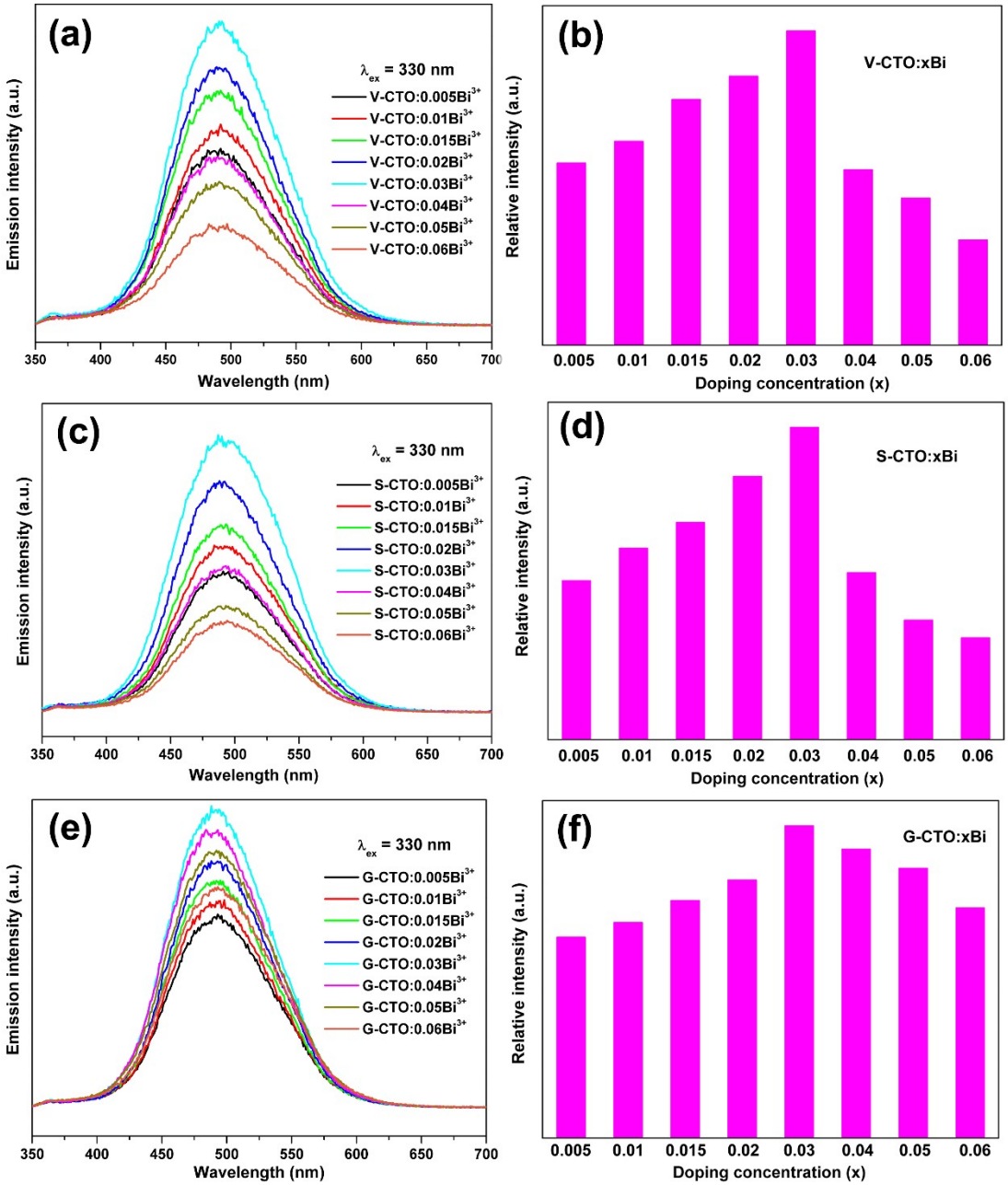

Figure S3. Emission spectra of (a) V-CTO:xBi^{3+}, (c) S-CTO:xBi^{3+} and (e) G-CTO:xBi^{3+} phosphors with different doping content. Relative emission intensity of (b) V-CTO:xBi^{3+}, (d) S-CTO:xBi^{3+} and (f) G-CTO:xBi^{3+} phosphors.

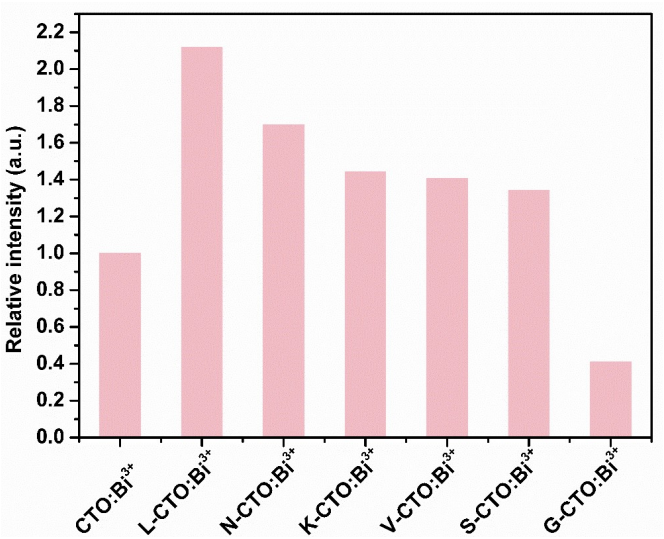

Figure S4. Relative emission intensity of phosphors obtained under different conditions with fixed doping content of Bi^{3+}.

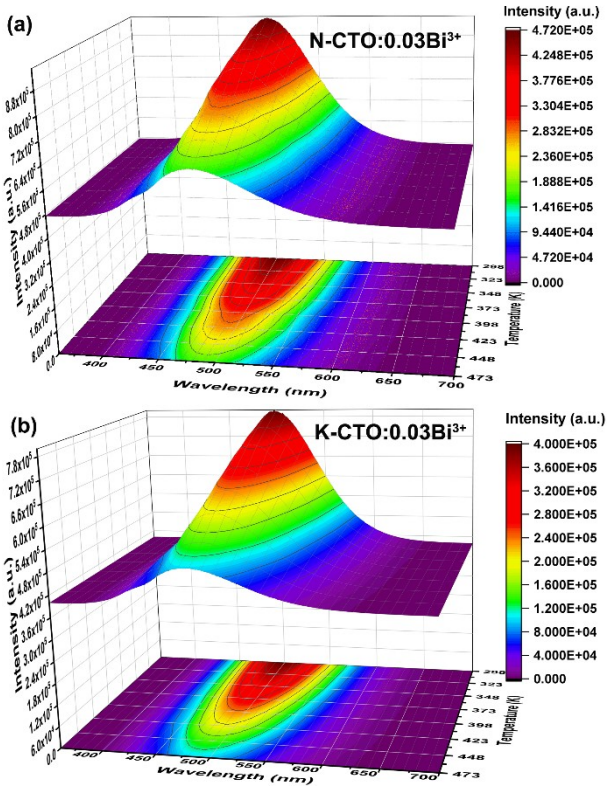

Figure S5. Three dimensional emission spectra of (a) N-CTO:0.03Bi^{3+} and (b) K-CTO:0.03Bi^{3+} under different tempratures.

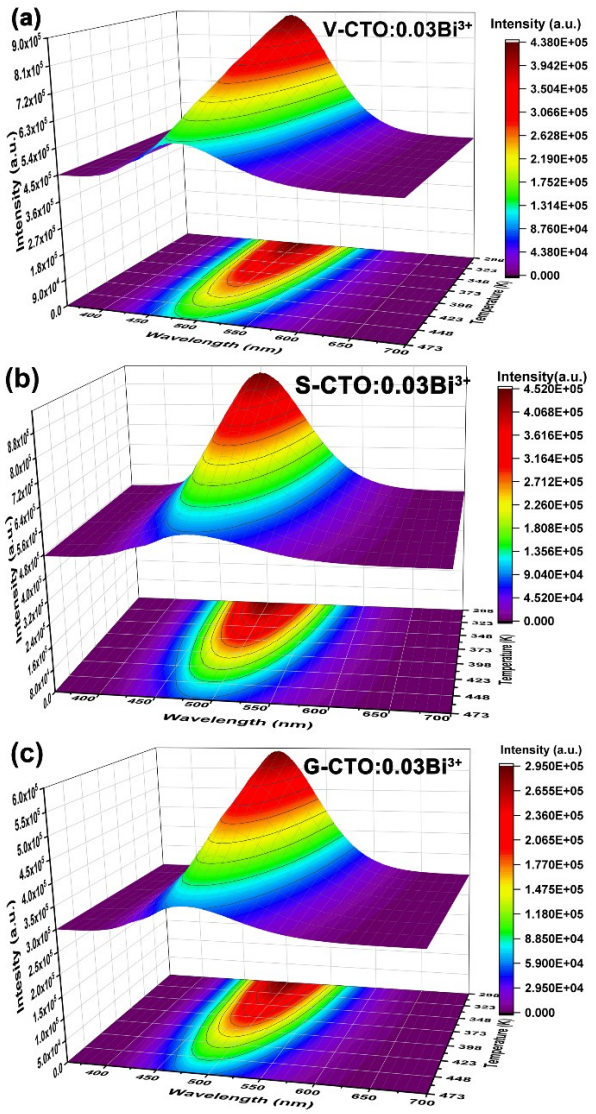

Figure S6. Three dimensional emission spectra of (a) V-CTO:0.03Bi^{3+}, (b) S-CTO:0.03Bi^{3+}, and (c) G-CTO:0.03Bi^{3+} under different tempratures.

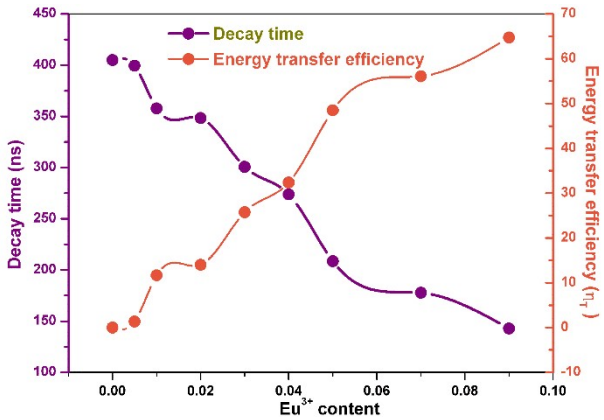

Figure S7. Dependence of decay time of Bi^{3+} ions and Bi^{3+}→Eu^{3+} energy transfer efficiency on Eu^{3+} doping content.

Table S1. Final refined structure parameters of $Ca_2Ta_2O_7$ derived from the Rietveld refinement of X-ray diffraction data

Atom	Wyckoff position	x	Y	z	Frac	Uiso
Ca1	3a	0.85690(0)	0.00000	0.33333(3)	1.00	0.01
Ca2	3b	0.80410(0)	0.00000	0.83333(3)	1.00	0.01
Ca3	6c	0.68007(1)	0.18147(1)	0.00577(6)	1.00	0.01
Ta1	3a	0.31697(6)	0.00000	0.33333(3)	1.00	0.00307
Ta2	3b	0.33195(6)	0.00000	0.83333(3)	1.00	0.00771
Ta3	6c	0.49426(6)	0.33230(5)	0.16467(4)	1.00	0.01
O1	6c	0.10645(9)	0.09766(0)	0.11015(4)	1.00	0.32505
O2	6c	0.56330(0)	0.60840(0)	0.19750(0)	1.00	0.01
O3	6c	0.19550(0)	0.64040(0)	0.14640(0)	1.00	0.01
O4	6c	-0.06488(9)	0.27688(8)	0.05883(4)	1.00	0.01
O5	6c	-0.03357(0)	0.80878(7)	0.04830(3)	1.00	0.01
O6	6c	0.48712(7)	0.37771(8)	0.04273(7)	1.00	0.01
O7	6c	0.45532(1)	0.78548(8)	0.04611(3)	1.00	0.01
Cell parameters: $a = b = 7.3608(2)$ Å, $c = 18.0955(5)$ Å, $\alpha = \beta = 90°$, $\gamma = 120°$ $V = 849.08(3)$ Å^3; $Z = 6$; space group: $P3_121$ (152); Reliability factors: $\chi^2 = 5.897$, $R_{wp} = 12.66\%$, $R_p = 9.63\%$						

Table S2. Detailed bond Lengths of Ca-O in $Ca_2Ta_2O_7$ host derived from the structure refinement

Bond	Length (Å)	Bond	Length (Å)	Bond	Length (Å)
Ca1-O1	2.02	Ca2-O1	2.15	Ca3-O2	2.82
Ca1-O1	2.02	Ca2-O1	2.15	Ca3-O3	2.78
Ca1-O4	2.44	Ca2-O2	2.84	Ca3-O4	1.90
Ca1-O4	2.44	Ca2-O2	2.84	Ca3-O4	2.84
Ca1-O5	2.30	Ca2-O3	2.32	Ca3-O5	2.42
Ca1-O5	2.30	Ca2-O3	2.32	Ca3-O6	2.57
Ca1-O6	2.37	Ca2-O5	2.16	Ca3-O7	2.64
Ca1-O6	2.37	Ca2-O5	2.16	Ca3-O7	2.00
Average bond length: {Ca1-O}:2.28 Å; {Ca2-O}:2.37 Å; {Ca3-O}:2.50 Å					

Table S3. Detailed bond Lengths of Ta-O in $Ca_2Ta_2O_7$ host derived from the structure refinement

Bond	Length (Å)	Bond	Length (Å)	Bond	Length (Å)
Ta1-O5	2.01	Ta2-O1	2.45	Ta3-O1	2.68
Ta1-O5	2.01	Ta2-O1	2.45	Ta3-O2	1.93
Ta1-O6	2.12	Ta2-O3	2.02	Ta3-O2	2.01
Ta1-O6	2.12	Ta2-O3	2.02	Ta3-O3	2.04
Ta1-O7	2.31	Ta2-O4	2.00	Ta3-O6	2.24
Ta1-O7	2.31	Ta2-O4	2.00	Ta3-O7	2.25
Average bond length: {Ta1-O}:2.15 Å; {Ta2-O}:2.16 Å; {Ta3-O}:2.20 Å					