Supporting Information

Novel highly efficient single-component multi-peak emitting aluminosilicate phosphors co-activated with Ce^{3+}, Tb^{3+} and Eu^{2+}: luminescence properties, tunable color, and thermal properties

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TableS1 Atomic coordinates and site occupancy fraction (SOF) for CMAS and CMAS:5%Ce^{3+}.								
	CMAS				CMAS:5%Ce^{3+}			
Atom	**x**	**y**	**z**	**SOF**	**x**	**y**	**z**	**SOF**
Ca	0.33354	0.16646	0.50704	1.00	0.33354	0.16646	0.50619	0.901
Li	-	-	-	-	0.33354	0.16646	0.50619	0.049
Ce	-	-	-	-	0.33354	0.16646	0.50619	0.050
Al1	0.00000	0.00000	0.00000	0.250	0.00000	0.00000	0.00000	0.250
Mg1	0.00000	0.00000	0.00000	0.750	0.00000	0.00000	0.00000	0.750
Si2	0.14115	0.35885	0.93953	0.875	0.14065	0.35935	0.93924	0.875
Al2	0.14115	0.35885	0.93953	0.125	0.14065	0.35935	0.93924	0.125
O1	0.50000	0.00000	0.18315	1.00	0.50000	0.00000	0.17245	1.000
O2	0.14147	0.35853	0.25331	1.00	0.14389	0.35611	0.25156	1.000
O3	0.08314	0.18329	0.79543	1.00	0.08249	0.18017	0.79500	1.000
Symmetry: tetragonal, space group: P-421m(113), Z = 2, a = b = 7.8040 Å, c = 5.0304 Å, V = 306.37 Å^3, α = β = γ = 90°, Rp = 5.94%, Rwp = 9.11%, and χ^2 = 1.68.					**Symmetry: tetragonal, space group: P-421m(113), Z = 2, a = b = 7.7932 Å, c = 5.0234 Å, V = 305.09 Å^3, α = β = γ = 90°, Rp = 6.25%, Rwp = 8.67%, and χ^2 = 3.41.**			

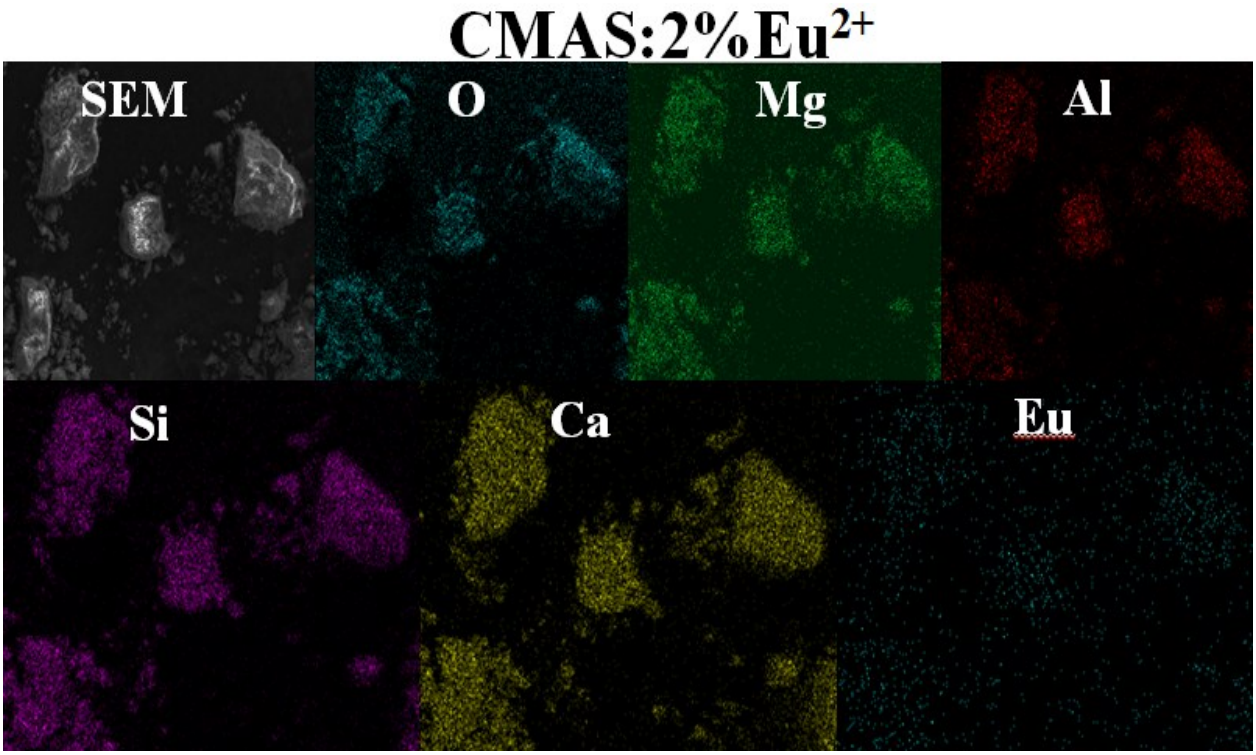


Fig.S1 The analysis of SEM and mapping for each element in CMAS:2%Eu^{2+}.

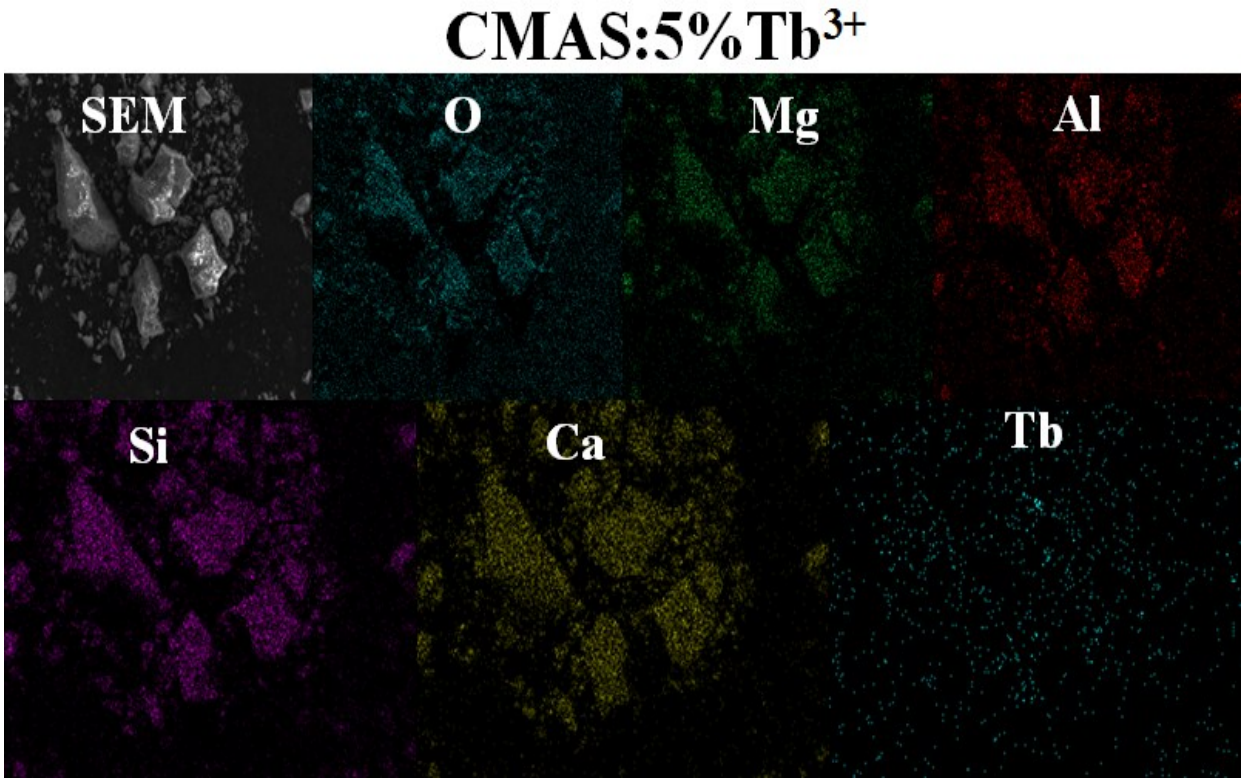


Fig.S2 The analysis of SEM and mapping for each element in CMAS:5%Tb^{3+}.

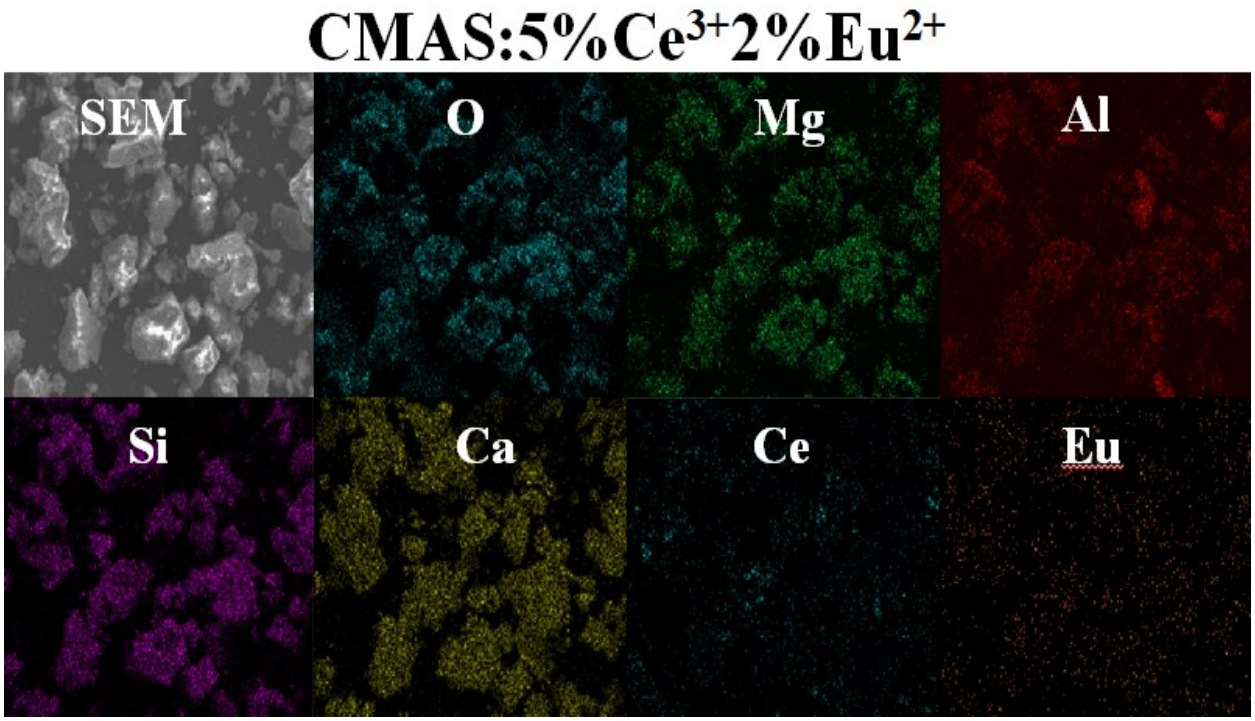


Fig.S3 The analysis of SEM and mapping for each element in CMAS:5%Ce^{3+},2%Eu^{2+}.

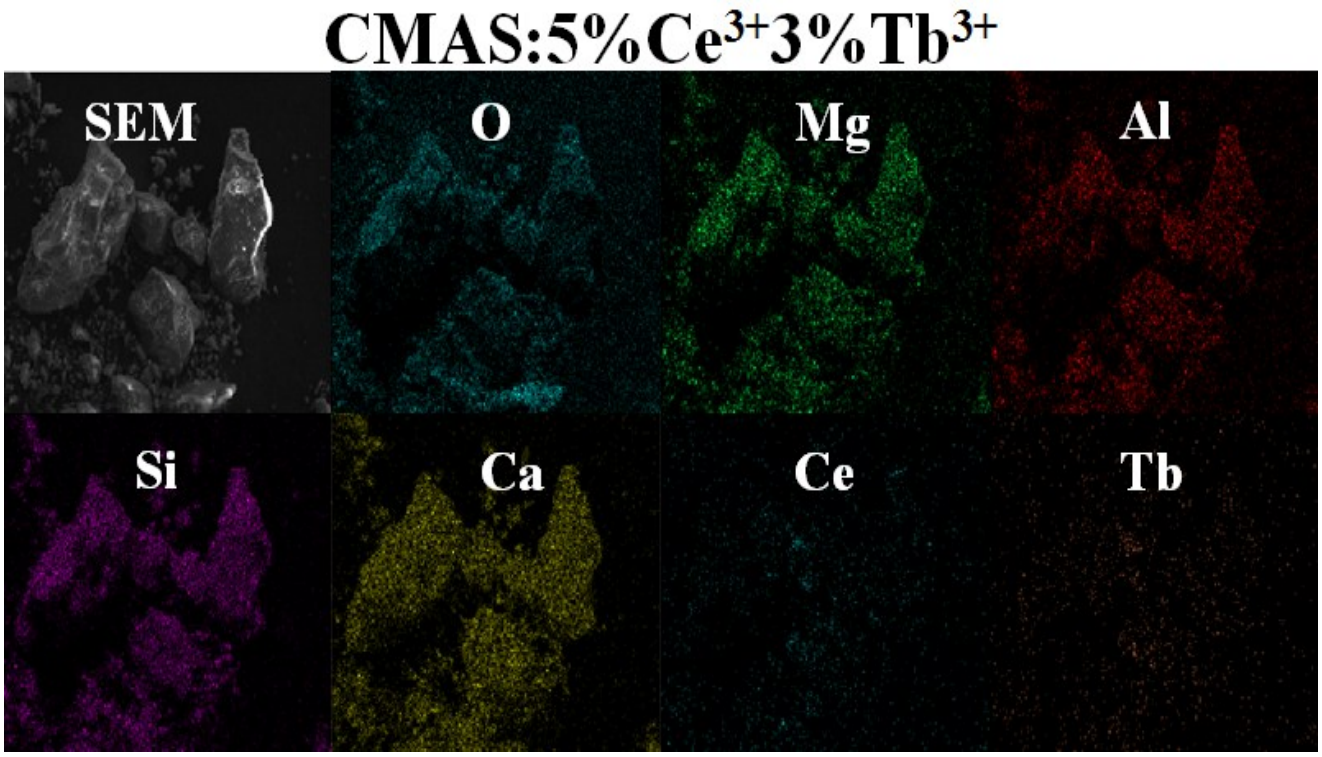


Fig.S4 The analysis of SEM and mapping for each element in CMAS:1.5%Ce^{3+},5%Tb^{3+}.

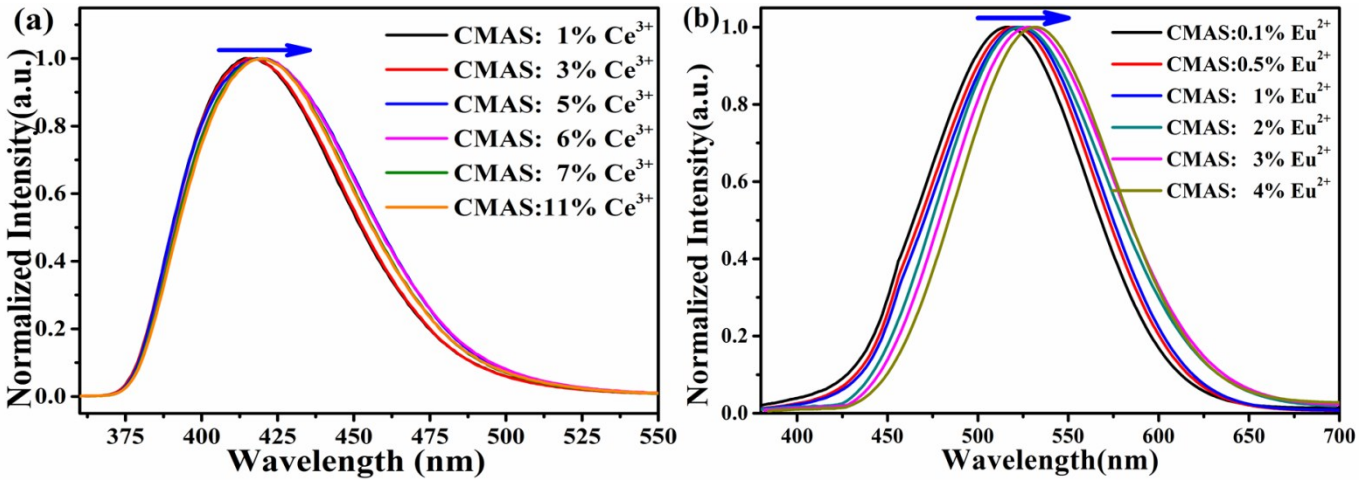


Fig.S5 The normalized emission spectra of CMAS:xCe^{3+} and CMAS:yEu^{2+}.

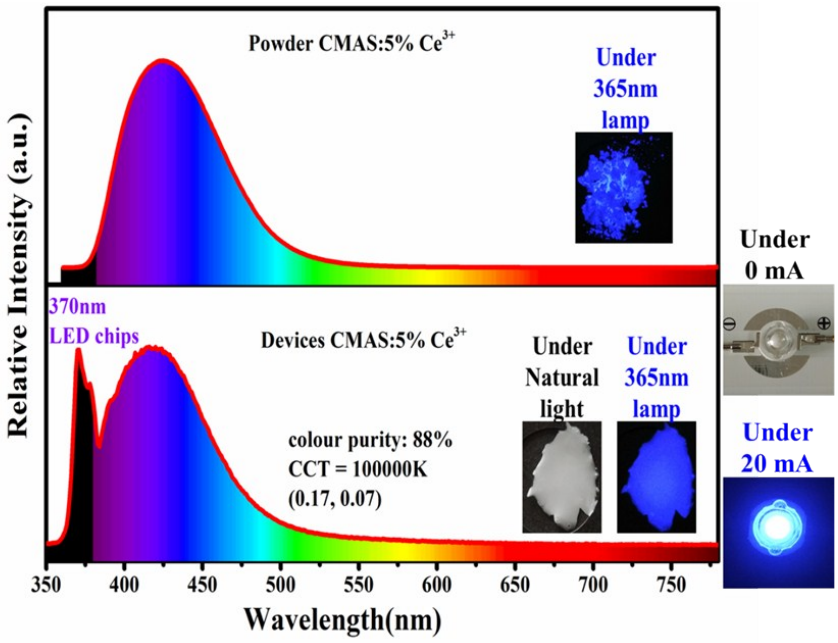


Fig. S6 The emission spectra and parameter of the CMAS:5%Ce^{3+} powder and the corresponding device; insets showed the photographs of the corresponding samples under 365 nm lamp or 20 mA current drive.

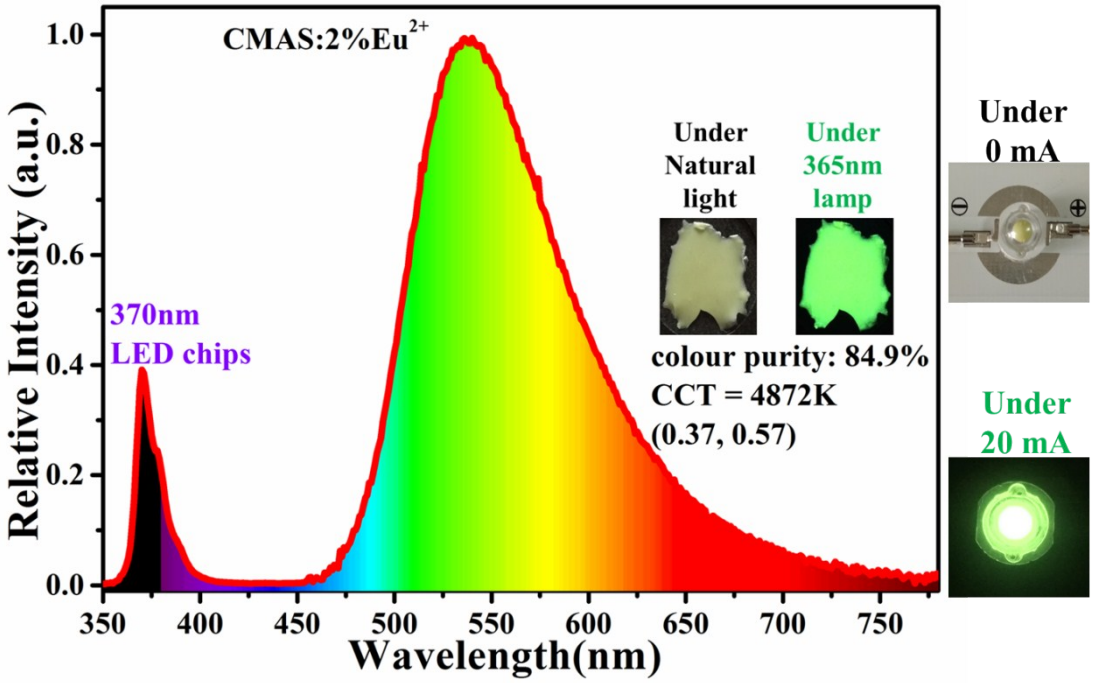


Fig.S7 The emission spectra and parameter of the CMAS:2%Eu^{2+} device; insets showed the photographs of the corresponding samples under 365 nm lamp or 20 mA current drive.

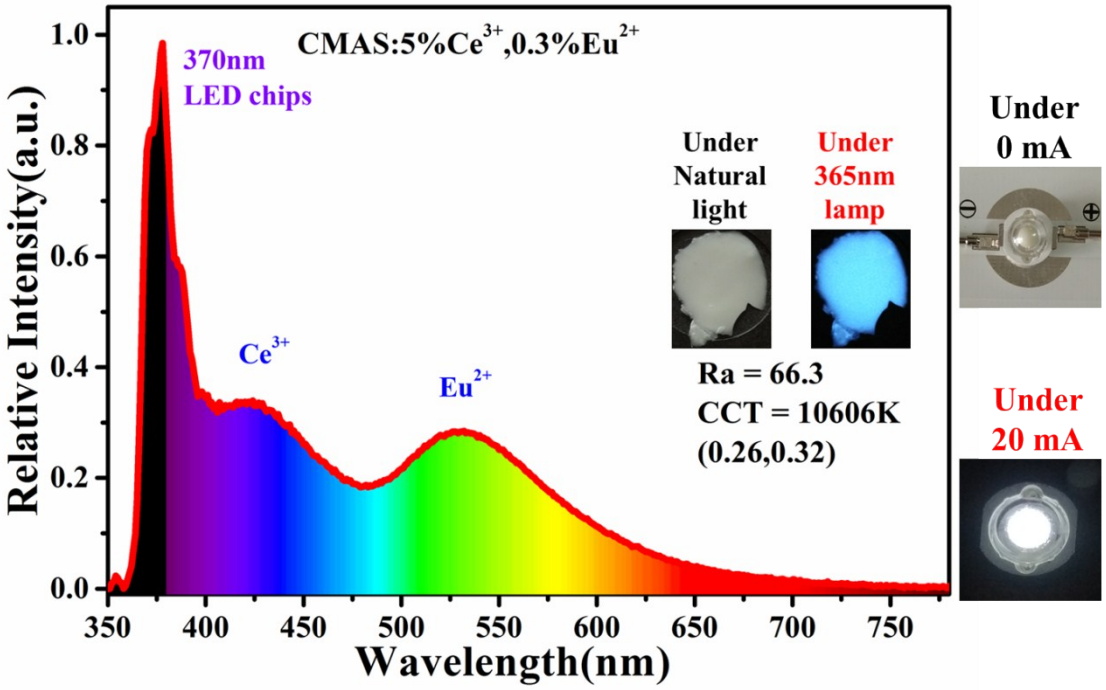


Fig.S8 The emission spectra and parameter of the CMAS:5%Ce^{3+},0.3Eu^{2+} device; insets showed the photographs of the corresponding samples under 365 nm lamp or 20 mA current drive.

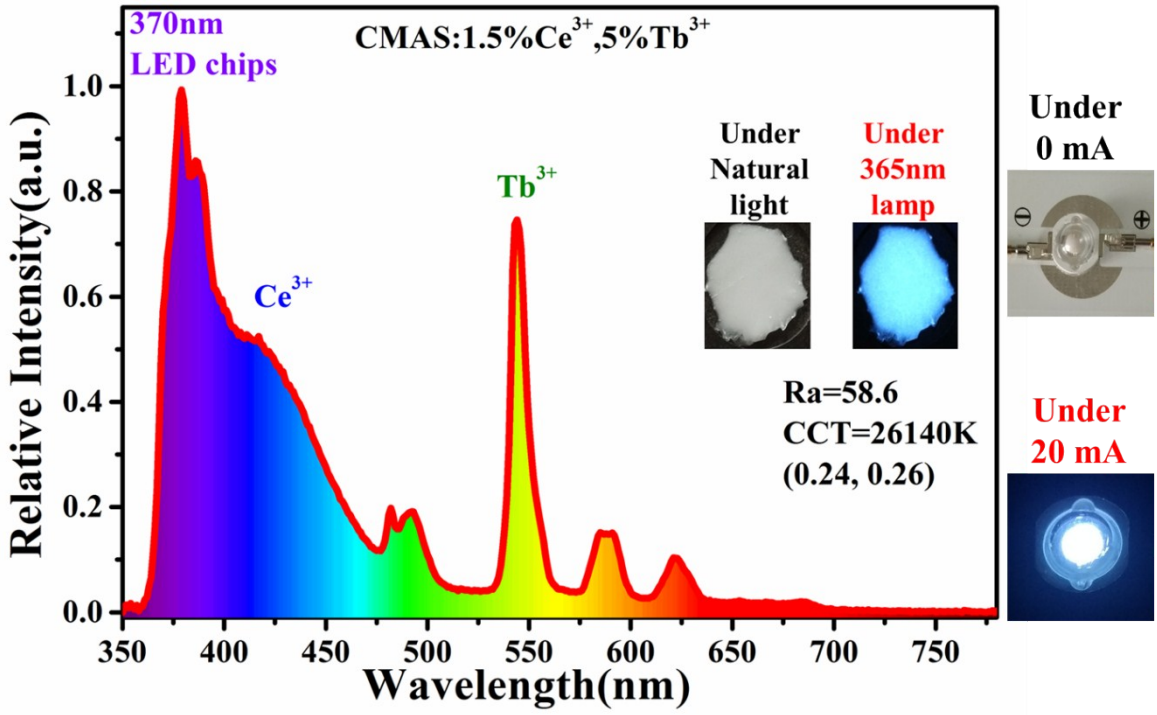
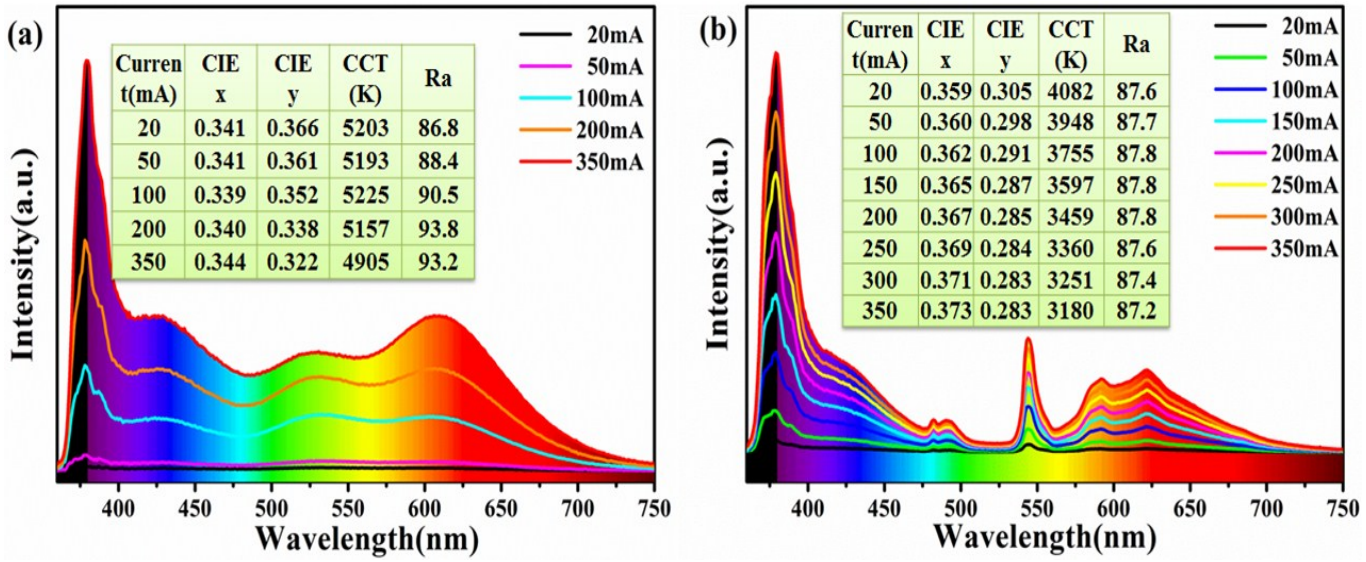


Fig.S9 The emission spectra and parameter of the CMAS:1.5%Ce^{3+},5%Tb^{3+} device; insets showed the photographs of the corresponding samples under 365 nm lamp or 20 mA current drive.



Current(mA)	CIE x	CIE y	CCT (K)	Ra
20	0.341	0.366	5203	86.8
50	0.341	0.361	5193	88.4
100	0.339	0.352	5225	90.5
200	0.340	0.338	5157	93.8
350	0.344	0.322	4905	93.2

Current(mA)	CIE x	CIE y	CCT (K)	Ra
20	0.359	0.305	4082	87.6
50	0.360	0.298	3948	87.7
100	0.362	0.291	3755	87.8
150	0.365	0.287	3597	87.8
200	0.367	0.285	3459	87.8
250	0.369	0.284	3360	87.6
300	0.371	0.283	3251	87.4
350	0.373	0.283	3180	87.2

Fig.S10 The emission spectra and parameter of the CER (a) and CTR (b) devices under different current drive.

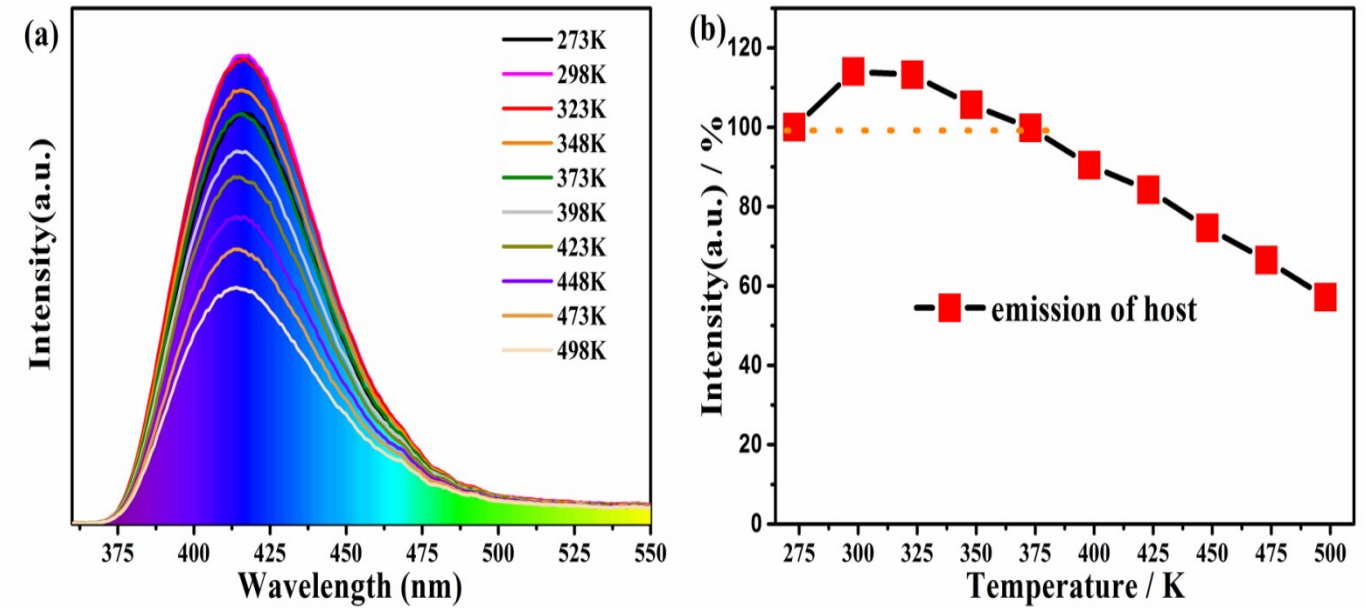
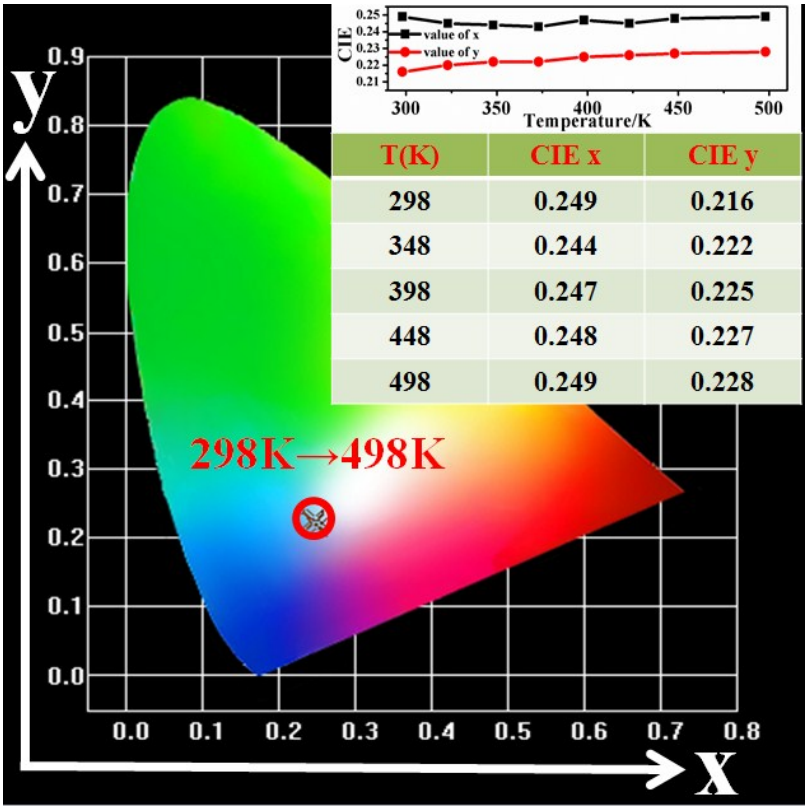


Fig. S11 Photoluminescence spectra of (a) CMAS host at various temperatures; (b) the dependence of the normalized photoluminescence intensities of host on temperature.



T(K)	CIE x	CIE y
298	0.249	0.216
348	0.244	0.222
398	0.247	0.225
448	0.248	0.227
498	0.249	0.228

Fig. S12 the relevant CIE data of CMAS:1.5%Ce^{3+},5%Tb^{3+} phosphor at different temperatures.