Supporting Information for

Cyan-Green Phosphor $(Lu_2M)(Al_4Si)O_{12}:Ce^{3+}$ for High Quality LED Lamp: Tunable Photoluminescence Properties and Enhanced Thermal Stability

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Table S1. Final refined results of $(Lu_2M)(Al_4Si)O_{12}:Ce^{3+}$.

Compound	M=Mg	M=Ca	M=Sr	M=Ba
space group		$Ia\bar{3}d$		
Z		8		
$\alpha = \beta = \gamma$ (deg)		90		
a = b = c (Å)	11.866(0)	11.911(8)	11.913(8)	11.913(6)
V ($Å^3$)	1670.764	1690.182	1691.009	1690.944
R_{wp} (%)	13.81	9.73	12.81	8.98
R_p (%)	9.83	7.44	9.87	7.35
χ^2	8.51	4.37	7.72	4.85

Table S2. Spectroscopic parameters of $(Lu_2M)(Al_4Si)O_{12}:Ce^{3+}$.

M type	M=Mg	M=Ca	M=Sr	M=Ba
λ_{ex} ($5d_2$)/nm	346	342	348	348
λ_{ex} ($5d_1$)/nm	434	438	445	445
λ_{em} /nm	533	527	511	511
Stokes shift/cm^{-1}	3395	3068	2670	2670
FWHM/cm^{-1}	4280	3855	2902	2902
Fit band1: peak; FWHM/nm	509 69	506 50	505 39	505 41
Fit band2: peak; FWHM/nm	555 114	552 102	550 93	550 93
Internal QE	47%	68%	78%	81%
External QE	31%	46%	62%	65%
CIE (x,y)	(0.363,0.542)	(0.337,0.558)	(0.327,0.568)	(0.327,0.568)

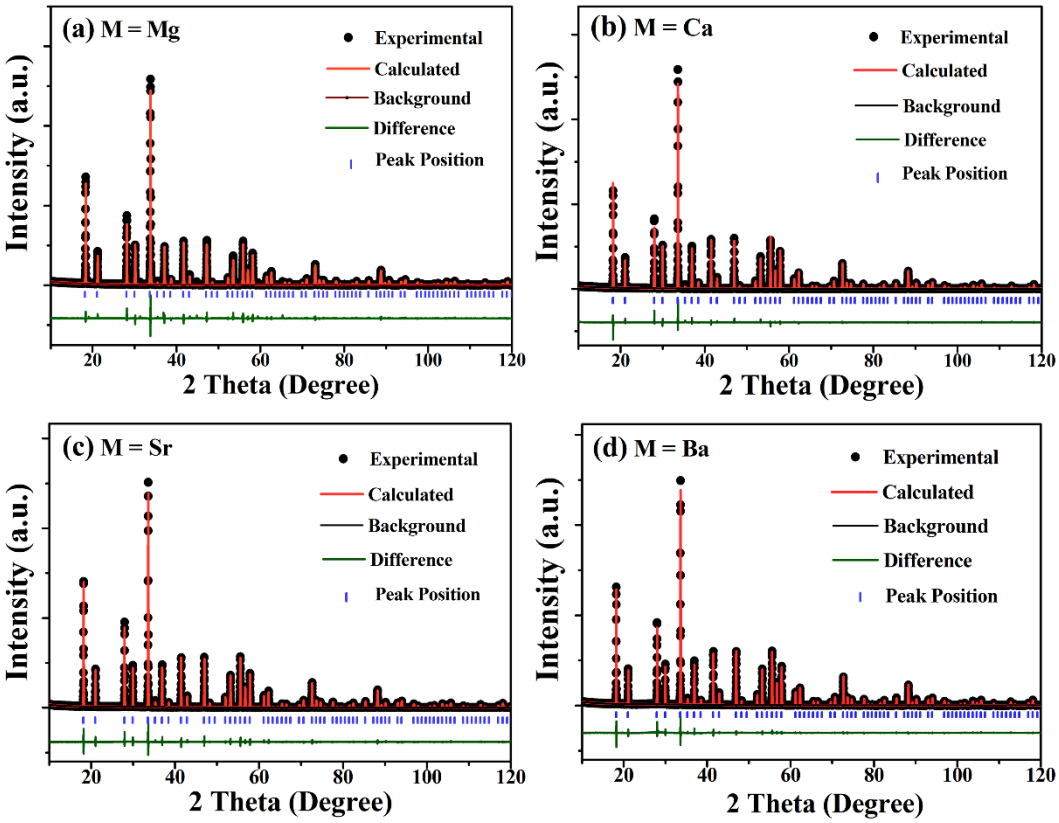

Figure S1. Rietveld refinement of XRD patterns of $(Lu_2M)(Al_4Si)O_{12}:Ce^{3+}$ for M=Mg (a), M=Ca (b), M=Sr (c) and M=Ba (d).

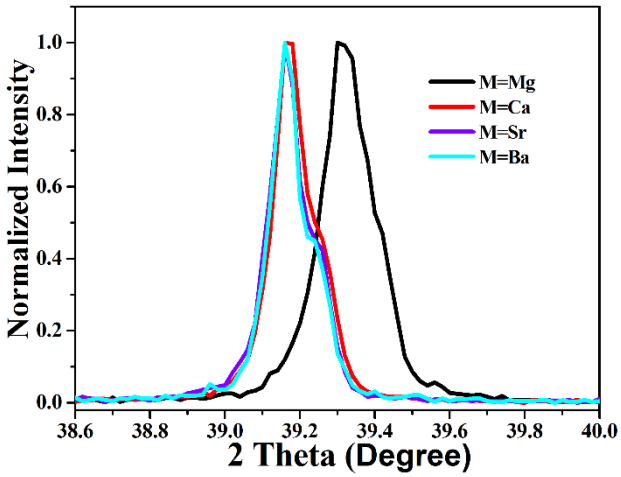

Figure S2. Normalized magnified XRD patterns of $(Lu_2M)(Al_4Si)O_{12}:Ce^{3+}$ around 39°.

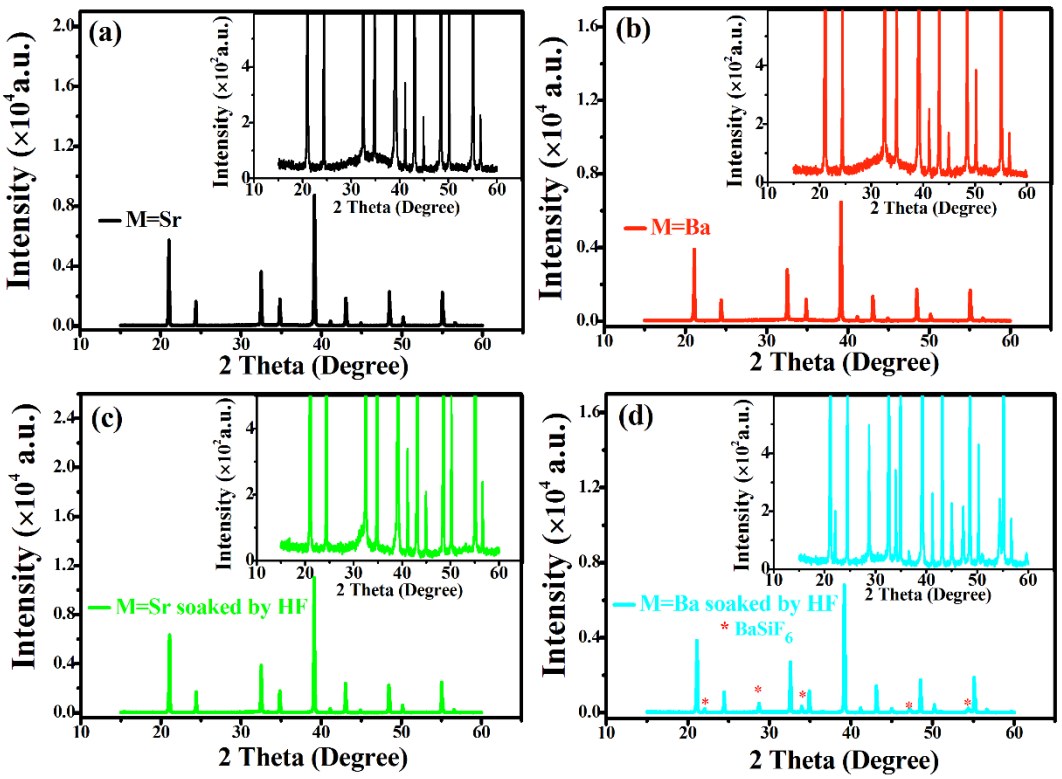

Figure S3. XRD patterns of $(Lu_2M)(Al_4Si)O_{12}:Ce^{3+}$ before and after soakage by HF solution for M=Sr (a&c) and Ba (b&d) (the insets are the intensified ones).

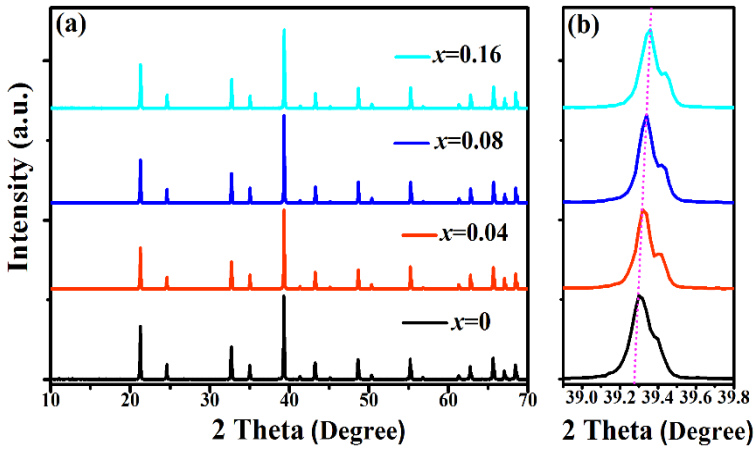

Figure S4. XRD patterns (a) and magnified XRD patterns around 39° (b) of $Lu_3Al_{5-x}Si_xO_{12}:Ce^{3+}$ (x=0, 0.04, 0.08 and 0.16).

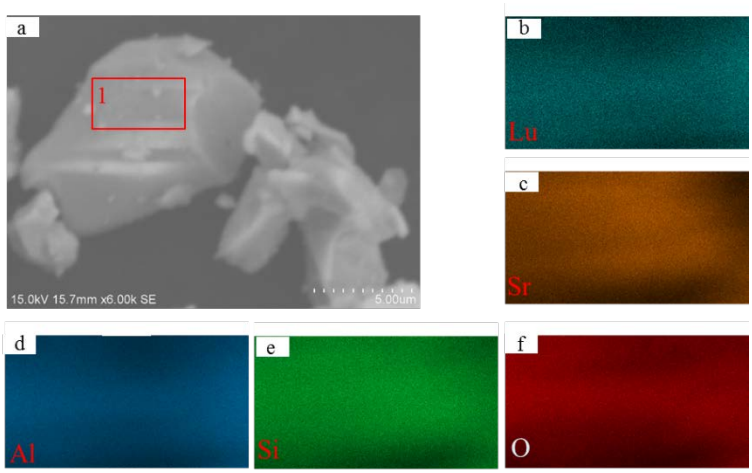

Figure S5. SEM image of $(Lu_2M)(Al_4Si)O_{12}:Ce^{3+}$ (M= Sr) microcrystal particles (a). And EDS elemental mapping images of Lu (b), Sr (c), Al (d), Si (e) and O (f) for the selected $(Lu_2M)(Al_4Si)O_{12}:Ce^{3+}$ (M= Sr).

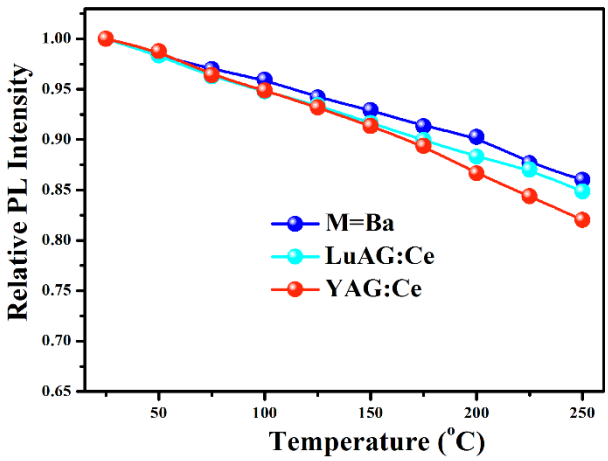

Figure S6. Thermal quenching properties of $(Lu_2M)(Al_4Si)O_{12}:Ce^{3+}$ (M=Ba), LuAG:Ce and YAG:Ce.