Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

Realizing red/orange emission of Eu^{2+}/Ce^{3+} in $La_{26-x}Sr_xSi_{41}O_{x+1}N_{80-x}$: ($x$ = 12.72-12.90) phosphors for high color rendition white LEDs

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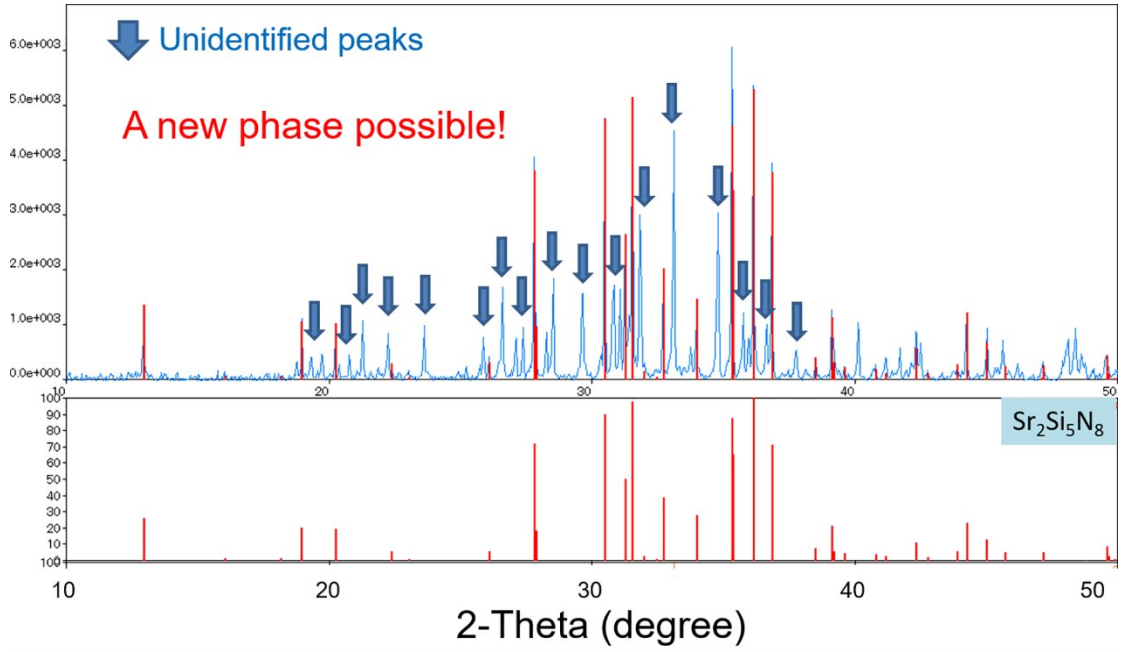


Figure S1. XRD comparison patterns of synthesized powder and $Sr_2Si_5N_8$ phase.

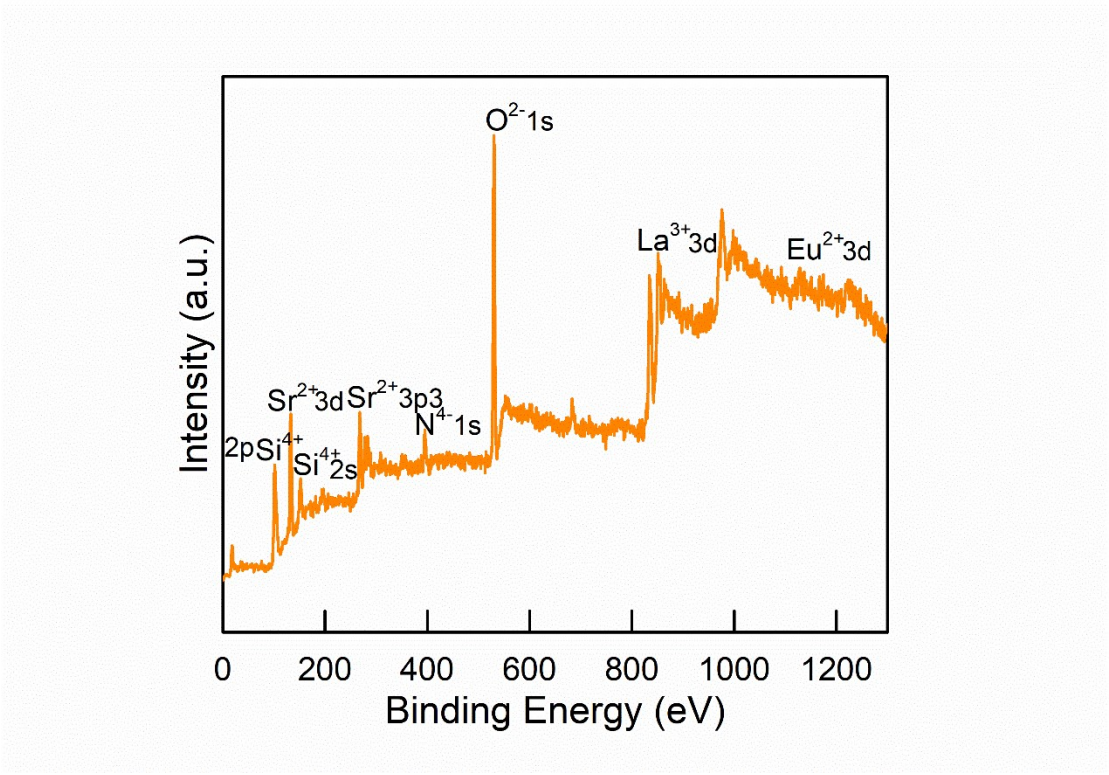


Figure S2. XPS full spectra of all elements (La, Sr, Si, O, N and Eu) regions in LSSON:Eu^{2+} (x = 12.90).

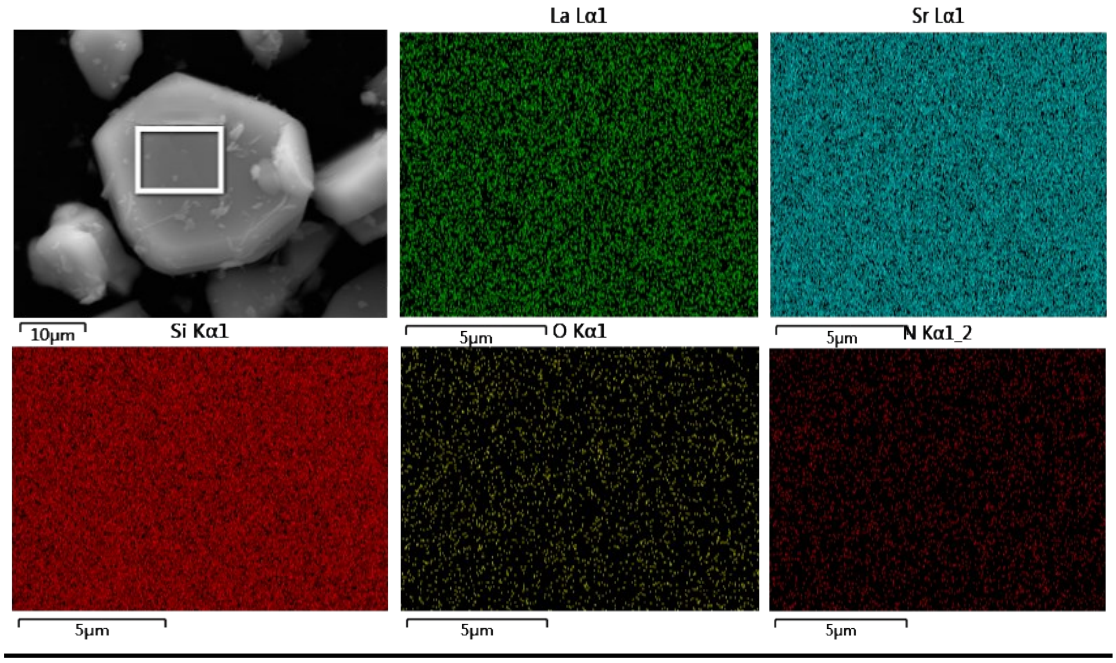


Figure S3. Scanning electron microscopy (SEM) image and EDS mapping of La, Sr, Si, O and N.

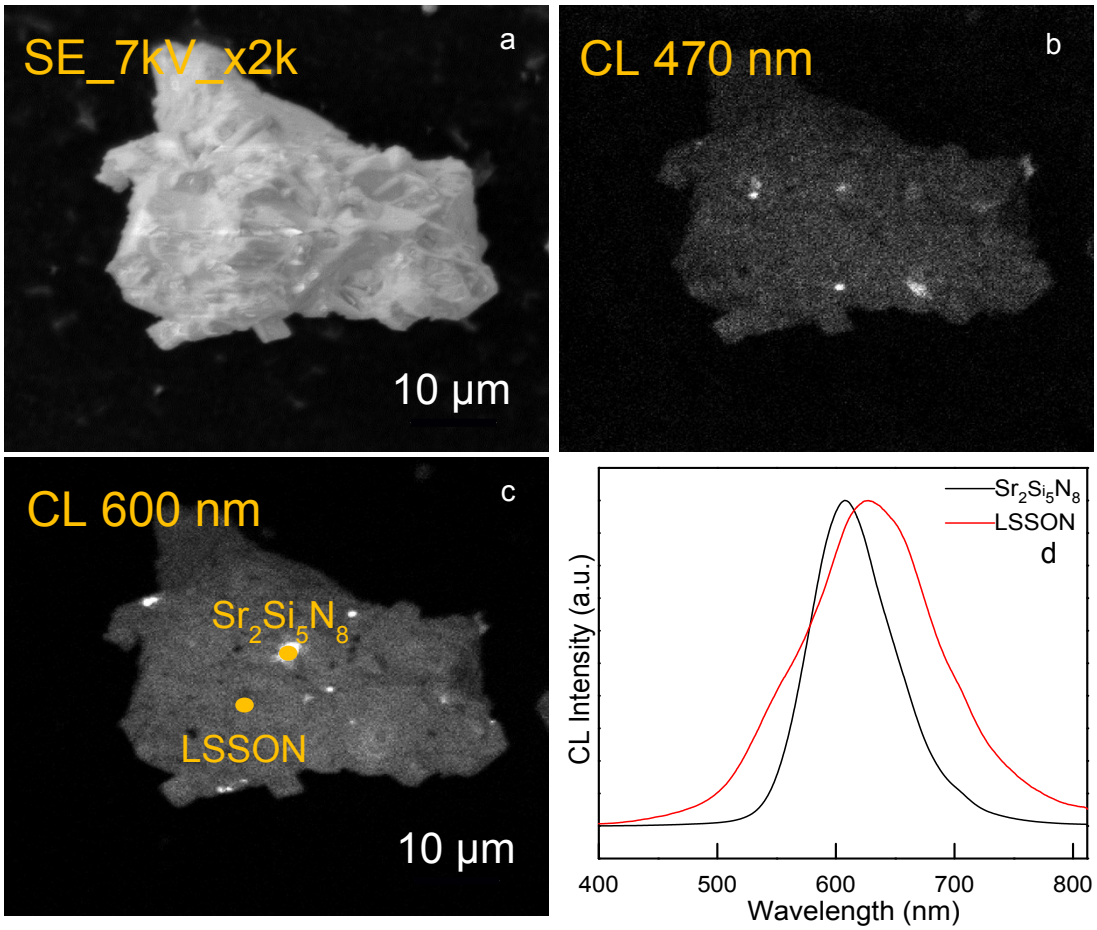
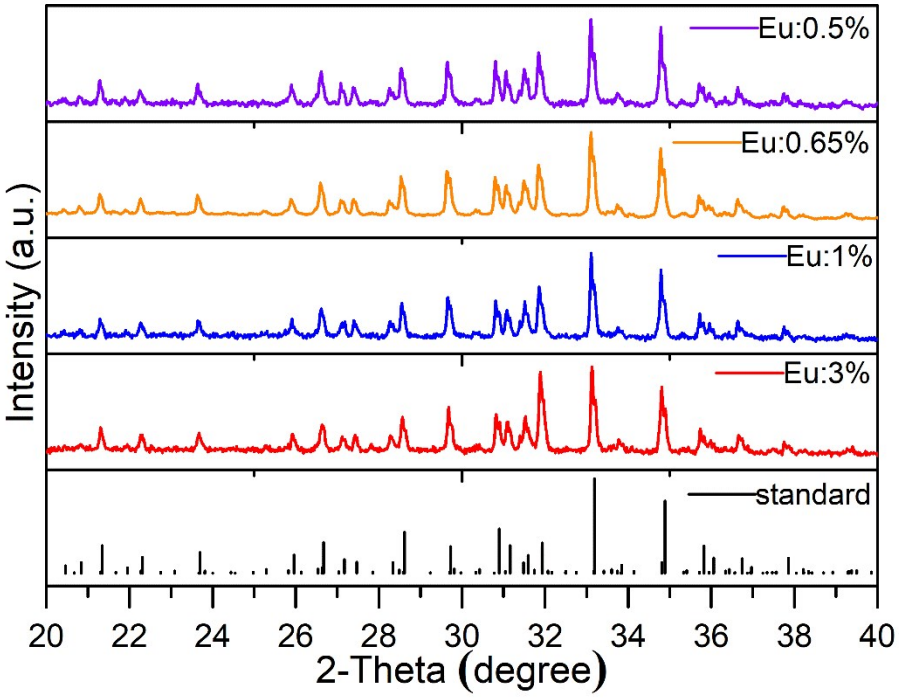


Figure S4. (a) SEM images; (b)-(c) CL mapping images at 470 nm and 600 nm; (d) CL point spectra of particles marked $Sr_2Si_5N_8$ and LSSON in Figure S4(C).

(a)



(b)

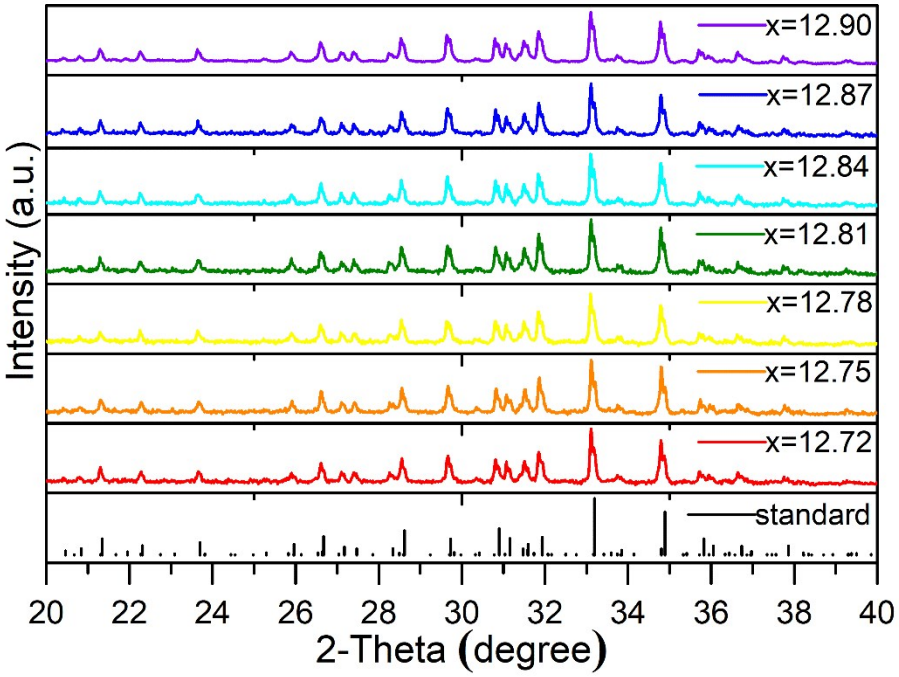


Figure S5. (a) XRD patterns of $La_{13.1}Sr_{12.9}Si_{41}O_{13.9}N_{67.1}$:$yEu^{2+}$ (y = 0.5%-3%); (b) XRD patterns of $La_{26-x}Sr_xSi_{41}O_{x+1}N_{80-x}$:0.65%$Eu^{2+}$ (x = 12.72-12.90).

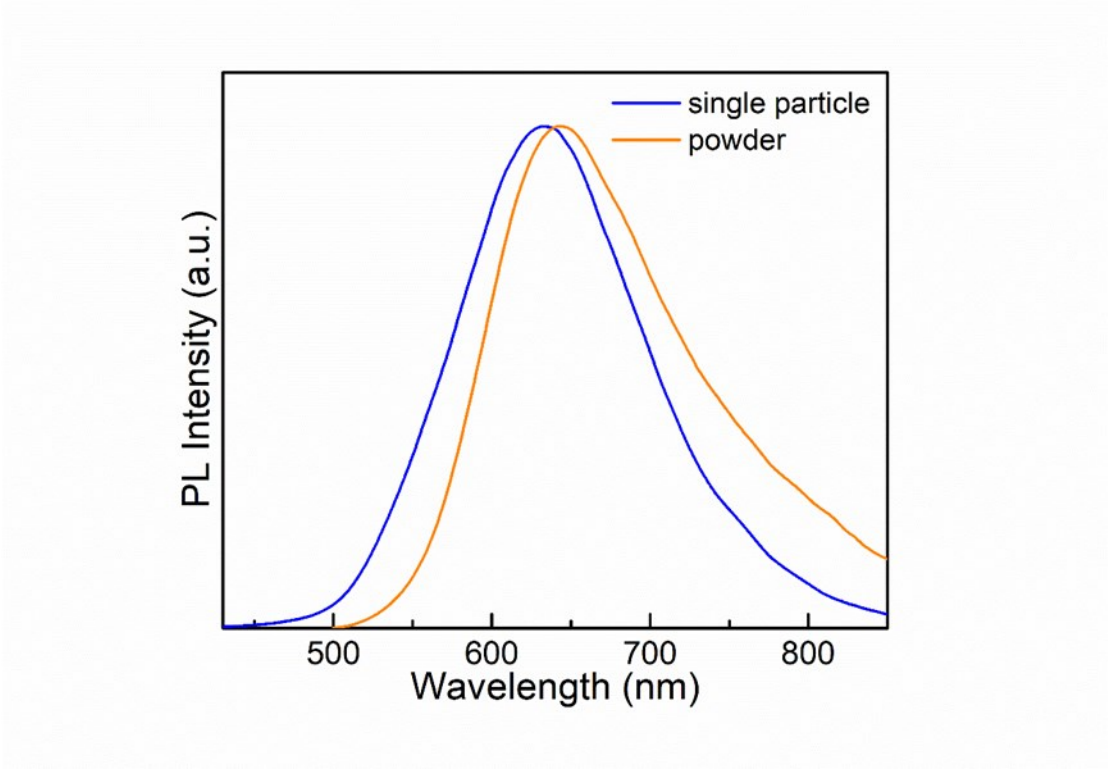


Figure S6. PL emission spectrum of single particle and phosphor powders.

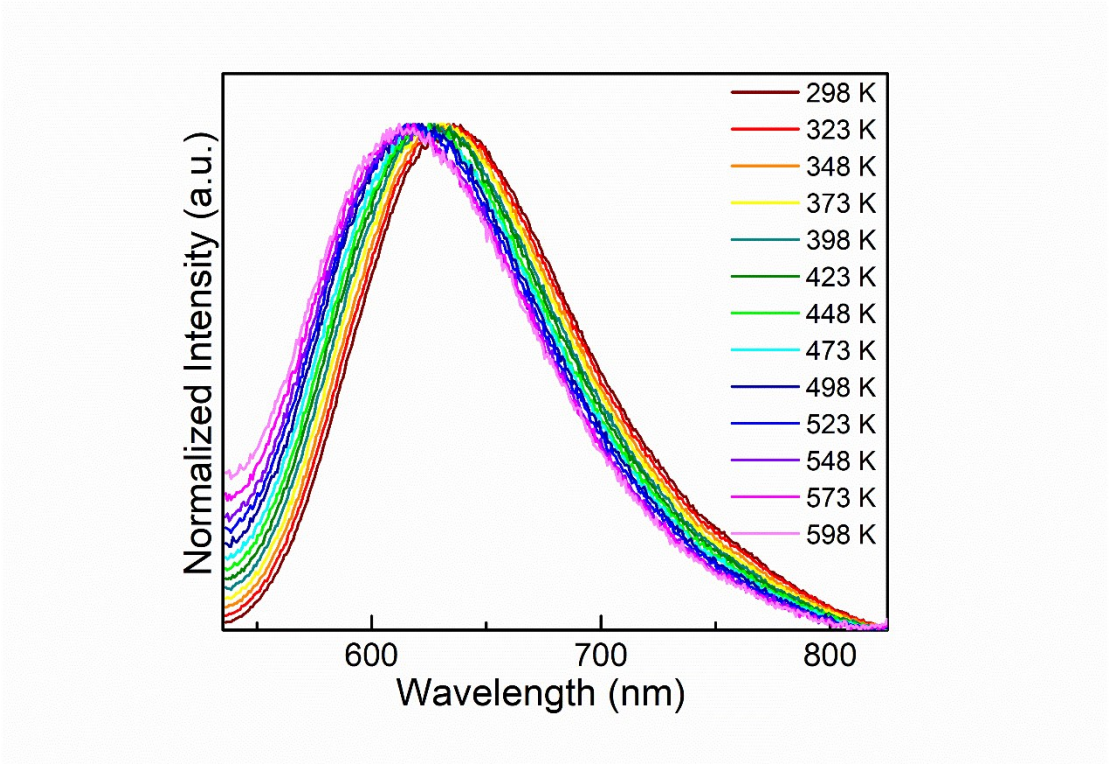


Figure S7. Normalized temperature-dependent emission spectra of LSSON:0.65%Eu^{2+} under the excitation of 450 nm.

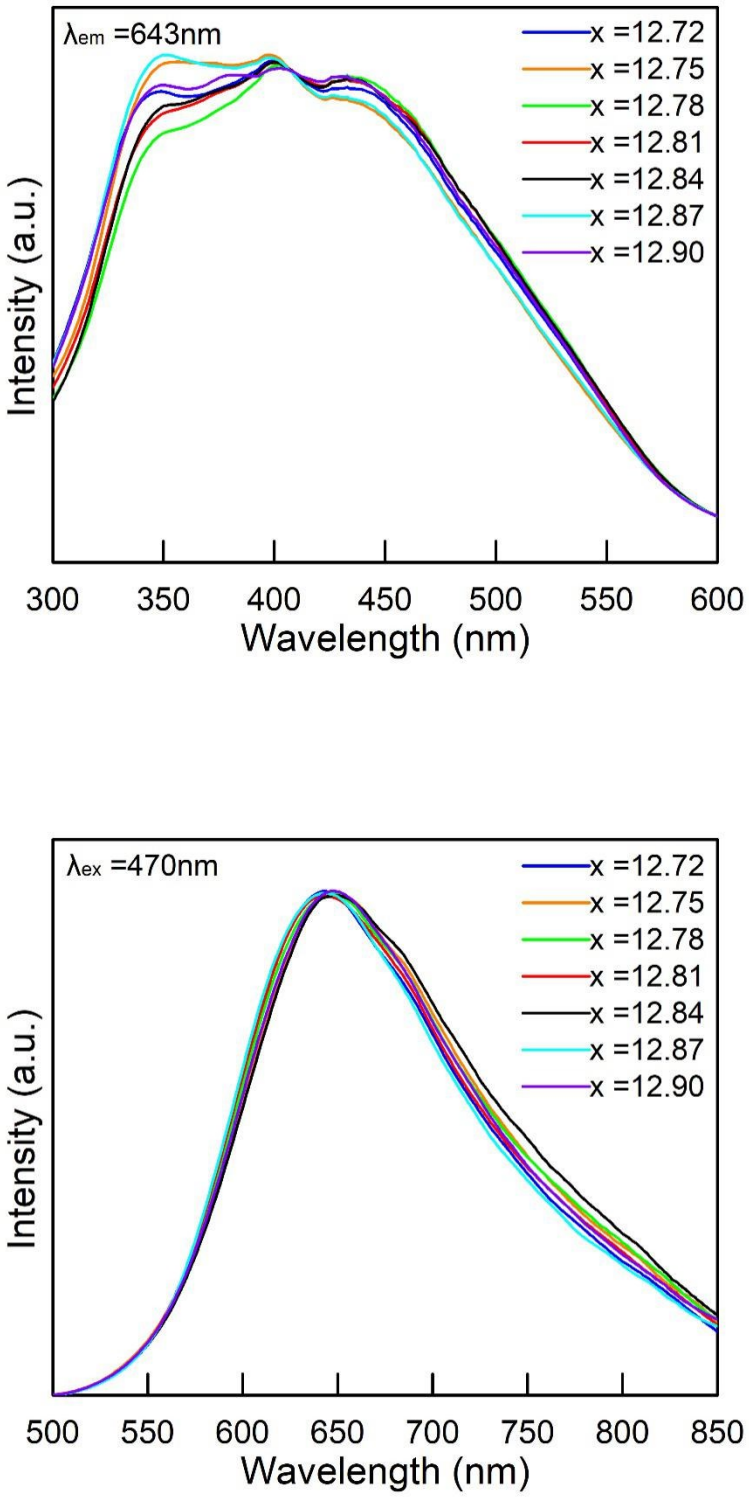


Figure S8. Normalized excitation and emission spectra of $La_{26-x}Sr_xSi_{41}O_{x+1}N_{80-x}$:0.65%$Eu^{2+}$ (x = 12.72-12.90).

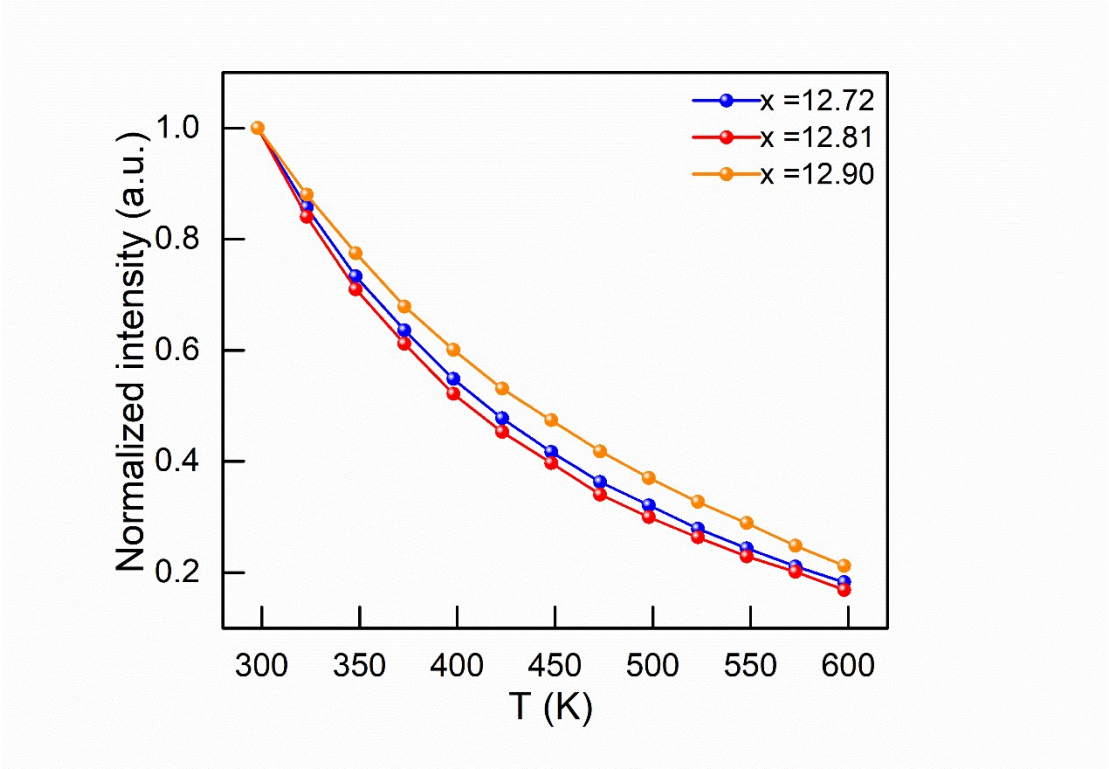


Figure S9. Temperature-dependent integrated emission intensities of $La_{26-x}Sr_xSi_{41}O_{x+1}N_{80-x}$:0.65%$Eu^{2+}$ (x = 12.72, 12.81, 12.90) under the excitation of 450 nm.

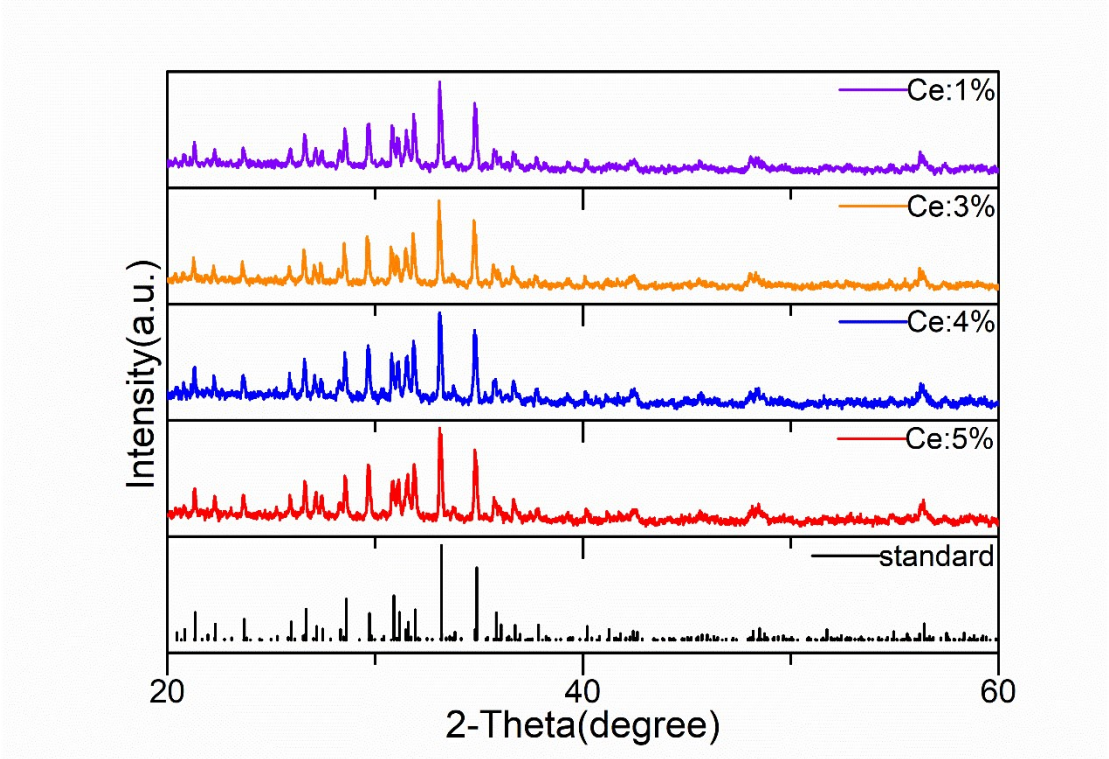


Figure S10. XRD patterns of $La_{13.1}Sr_{12.9}Si_{41}O_{13.9}N_{67.1}$:$z$$Ce^{3+}$ (z = 1%-5%).

Table S1 Atomic occupancies, coordinates and isotropic atomic

displacement parameters of $(La_{26-x}Sr_x)Si_{41}(O_{1+x}N_{80-x}):Eu^{2+}$

Atom	Occupancy	*x*	*y*	*z*	U_{eq} / Å²
La1	1/0	0.666667	0.333333	0.22115(12)	0.0193(4)
La/Sr2	0.62(3)/0.38(3)	0.18831(14)	0.25993(14)	0.5	0.0121(6)
La/Sr3a	0.429(4)/0.448(4)	0.17124(18)	0.0260(2)	0	0.0154(6)
La/Sr3b	0.061(4)/0.063(4)	0.0181(14)	0.1608(17)	0	0.0154(6)
La/Sr4a	0.348(14)/0.391(15)	0.4967(7)	0.1308(7)	0	0.0231(17)
La/Sr4b	0.123(14)/0.138(15)	0.5413(17)	0.1547(8)	0	0.016(4)
La/Sr5	0.78(2)/0.22(2)	0.23656(8)	0.42936(8)	0.29423(6)	0.0130(4)
La/Sr6	0.61(4)/0.39(4)	0	0	0.22477(11)	0.0134(7)
La/Sr7	0.60(4)/0.40(4)	0.333333	0.666667	0.22263(11)	0.0126(7)
La/Sr8	0.68(2)/0.32(2)	0.31403(8)	0.46639(9)	0.11126(6)	0.0114(4)
La/Sr9	0.59(2)/0.41(2)	0.01233(10)	0.32967(9)	0.21895(6)	0.0116(4)
La/Sr10	0.67(2)/0.33(2)	0.23787(9)	0.13841(10)	0.28689(7)	0.0134(4)
La/Sr11	0.83(2)/0.17(2)	0.44899(9)	0.31756(8)	0.11559(6)	0.0136(4)
La/Sr12	0.50(2)/0.50(2)	0.54214(12)	0.10557(11)	0.27616(7)	0.0212(5)
La/Sr13	0.75(2)/0.25(2)	0.18712(9)	0.21006(9)	0.11689(6)	0.0141(4)
La/Sr14	0.79(3)/0.21(3)	0.41570(14)	0.23156(16)	0.5	0.0167(6)
La/Sr15	0.22(3)/0.78(3)	0.15227(18)	0.51717(18)	0	0.0156(8)
Sr16	0/1	0.0171(2)	0.3389(2)	0.5	0.0149(5)
La/Sr17	0.07(6)/0.93(6)	0.666667	0.333333	0.5	0.028(2)
La/Sr18	0.14(3)/0.86(3)	0.0893(2)	0.5799(2)	0.5	0.0261(10)
La/Sr19	0.06(6)/0.94(6)	0.333333	0.666667	0.5	0.0237(18)
Sr20	0/1	0.3721(2)	0.34848(18)	0.38013(12)	0.0302(6)
Sr21	0/0.3333	0.0403(9)	0.0011(8)	0.5	0.026(2)
Si1	1	0.1002(4)	0.5583(4)	0.2580(2)	0.0077(8)
Si2	1	0	0	0.0761(4)	0.0078(14)
Si3	1	0.0134(5)	0.5843(5)	0	0.0063(11)
Si4	1	0.1688(4)	0.0101(4)	0.1474(2)	0.0088(9)
Si5	1	0.0455(4)	0.4463(4)	0.3653(2)	0.0061(8)
Si6	1	0.5117(4)	0.1724(4)	0.1380(2)	0.0095(9)
Si7	1	0.1684(4)	0.5046(4)	0.1490(2)	0.0075(8)
Si8	1	0.3103(7)	0.2319(7)	0	0.0131(14)
Si9	1	0.2217(4)	0.1002(4)	0.4279(2)	0.0055(8)
Si10	1	0.4509(4)	0.2338(4)	0.2554(2)	0.0084(9)
Si11	1	0.2112(7)	0.3376(7)	0	0.0109(13)
Si12	1	0.333333	0.666667	0.0739(4)	0.0073(14)
Si13	1	0.0647(4)	0.2853(4)	0.3740(2)	0.0070(8)

Si14	1	0.3844(4)	0.1194(4)	0.3618(2)	0.0061(8)
Si15	1	0.5381(4)	0.1208(4)	0.4311(2)	0.0065(8)
Si16	1	0.2172(4)	0.6176(4)	0.3645(2)	0.0055(8)
Si17	1	0.0161(4)	0.4798(4)	0.1281(4)	0.0104(9)
Si18	1	0.3338(4)	0.3340(4)	0.2294(2)	0.0081(8)
Si19	1	0.0590(4)	0.3330(4)	0.0694(4)	0.0115(9)
Si20	1	0.1177(4)	0.2243(4)	0.2627(2)	0.0096(9)
Si21	1	0.0650(4)	0.1144(4)	0.3738(2)	0.0073(8)
Si22	1	0.2126(4)	0.4599(4)	0.4302(2)	0.0075(8)
Si23	1	0.666667	0.333333	0.0731(4)	0.0076(14)
Si24	1	0.5523(4)	0.2917(4)	0.3733(2)	0.0079(8)
N/O1	0.83/0.17	0	0	0.3902(13)	0.011(5)
N/O2	0.83/0.17	0.0745(11)	0.4216(11)	0.1122(8)	0.012(3)
N/O3	0.83/0.17	0.5022(13)	0.0180(13)	0.3991(9)	0.017(3)
N/O4	0.83/0.17	0.2335(13)	0.2789(14)	0.2635(9)	0.019(3)
N/O5	0.83/0.17	0.215(2)	0.501(2)	0.5	0.026(6)
N/O6	0.83/0.17	0.666667	0.333333	0.3850(14)	0.014(5)
N/O7	0.83/0.17	0.666667	0.333333	0	0.06(2)
N/O8	0.83/0.17	0.3200(13)	0.1610(13)	0.3908(9)	0.016(3)
N/O9	0.83/0.17	0.3190(14)	0.5024(13)	0.4026(9)	0.019(4)
N/O10	0.83/0.17	0.3368(10)	0.0061(10)	0.3841(7)	0.007(2)
N/O11	0.83/0.17	0.4086(16)	0.3281(17)	0	0.013(4)
N/O12	0.83/0.17	0.1587(10)	0.5066(10)	0.3857(7)	0.008(2)
N/O13	0.83/0.17	0.0073(11)	0.1716(10)	0.3961(7)	0.009(2)
N/O14	0.83/0.17	0.2028(10)	0.6187(10)	0.2884(7)	0.009(2)
N/O15	0.83/0.17	0	0	0	0.008(6)
N/O16	0.83/0.17	0.1520(9)	0.3450(9)	0.4208(7)	0.006(2)
N/O17	0.83/0.17	0.3877(11)	0.1243(11)	0.2848(8)	0.011(3)
N/O18	0.83/0.17	0.0820(11)	0.1236(11)	0.2970(8)	0.013(3)
N/O19	0.83/0.17	0.0458(11)	0.4548(11)	0.2877(8)	0.011(3)
N/O20	0.83/0.17	0.3234(11)	0.3429(11)	0.1563(8)	0.012(3)
N/O21	0.83/0.17	0.1582(13)	0.1498(13)	0.4174(9)	0.016(3)
N/O22	0.83/0.17	0.3917(13)	0.4307(13)	0.2688(8)	0.016(3)
N/O23	0.83/0.17	0.333333	0.666667	0.3791(13)	0.008(4)
N/O24	0.83/0.17	0.5243(13)	0.3453(13)	0.4260(8)	0.016(3)
N/O25	0.83/0.17	0.6068(13)	0.2231(13)	0.1003(8)	0.015(3)
N/O26	0.83/0.17	0.5049(11)	0.0779(11)	0.1667(7)	0.011(3)
N/O27	0.83/0.17	0.343(2)	0.333(2)	0.5	0.018(5)

N/O28	0.83/0.17	0.1074(11)	0.5504(11)	0.1785(8)	0.012(3)
N/O29	0.83/0.17	0.0823(13)	0.2892(13)	0.3019(8)	0.014(3)
N/O30	0.83/0.17	0.4956(11)	0.1769(11)	0.3866(7)	0.011(3)
N/O31	0.83/0.17	0.316(2)	0.426(2)	0	0.018(5)
N/O32	0.83/0.17	0.2147(17)	0.2388(17)	0	0.013(4)
N/O33	0.83/0.17	0.2493(18)	0.1001(18)	0.5	0.016(4)
N/O34	0.83/0.17	0.333333	0.666667	0	0.023(9)
N/O35	0.83/0.17	0.2140(15)	0.4667(15)	0.1949(11)	0.025(4)
N/O36	0.83/0.17	0.1590(13)	0.3372(13)	0.0659(9)	0.017(3)
N/O37	0.83/0.17	0.2598(13)	0.0205(13)	0.1057(9)	0.019(3)
N/O38	0.83/0.17	0.021(2)	0.337(2)	0	0.020(5)
N/O39	0.83/0.17	0.0138(14)	0.5281(14)	0.0639(9)	0.020(3)
N/O40	0.83/0.17	0.5140(14)	0.2353(14)	0.1963(10)	0.021(4)
N/O41	0.83/0.17	0.2388(16)	0.5771(15)	0.0973(11)	0.025(4)
N/O42	0.83/0.17	0.0119(15)	0.0981(15)	0.0988(11)	0.025(4)
N/O43	0.83/0.17	0.2943(14)	0.1699(14)	0.0617(10)	0.022(4)
N/O44	0.83/0.17	0.504(2)	0.136(2)	0.5	0.029(7)
N/O45	0.83/0.17	0.4262(16)	0.1544(16)	0.0920(11)	0.026(4)
N/O46	0.83/0.17	0.5358(15)	0.3075(15)	0.3000(10)	0.023(4)
N/O47	0.83/0.17	0.1850(17)	0.0951(17)	0.1885(11)	0.029(5)
N/O48	0.83/0.17	0.0769(17)	0.2118(17)	0.1917(13)	0.031(5)
N/O49	0.83/0.17	0.386(2)	0.272(2)	0.2356(14)	0.039(6)