Supporting information

Novel high-efficiency and superior thermal stability red-emitting phosphor for WLED

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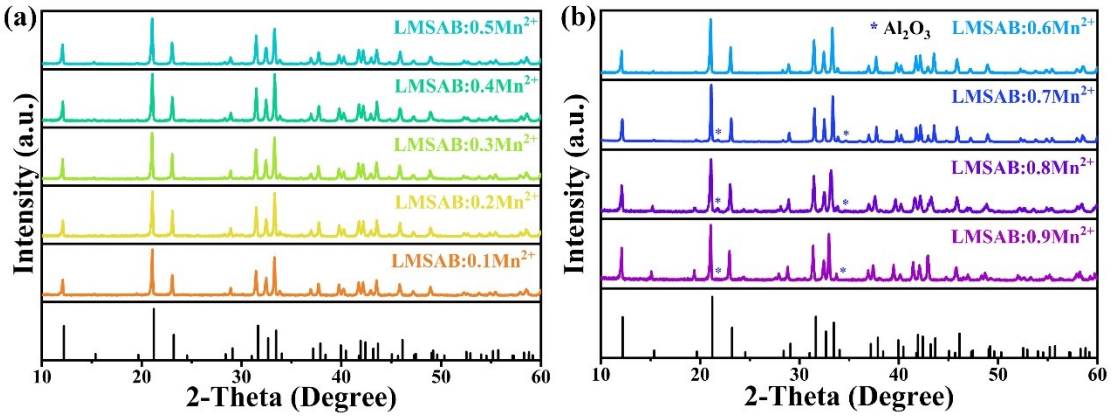

Fig. S1 The XRD patterns of (a) LMSAB:xMn^{2+} (x=0.1, 0.2, 0.3, 0.4, 0.5) and (b) LMSAB:xMn^{2+} (x=0.6, 0.7, 0.8, 0.9) samples

Table S1 Rietveld refinement data and statistics for LMSAB:0.7Mn^{2+} and LMSAB:0.7Mn^{2+},0.1Eu^{2+}

Sample	LMSAB:0.7Mn^{2+}	LMSAB:0.7Mn^{2+},0.1Eu^{2+}
Space group	*R*	
a=b, Å	14.5812(4)	14.5828(3)
c, Å	6.50040(12)	6.50302(11)
α =β	90	90
γ	120	120

V, Å^3	1196.90(5)	1197.65(4)
Rwp, %	7.53%	8.18%
Rp, %	4.96%	5.67%
χ^2	1.642	1.733

Table S2 Refined atomic positions, thermal parameters, and occupancies of LMSAB:0.7Mn^{2+}

Atom	x	y	z	occ
Sr	0.33330	0.66670	0.66670	1
Al	0.33330	0.66670	0.16670	1
Mg	0.0973(4)	0.5062(4)	0.9190(9)	0.0525
Li	0.0973(4)	0.5062(4)	0.9190(9)	0.836
B1	0.1332(6)	0.5251(6)	0.3549(14)	1
B2	0.0581(7)	0.3635(8)	0.5889(15)	1
O1	0.04893(28)	0.47712(28)	0.2205(6)	1
O2	0.21321(21)	0.62968(29)	0.3360(5)	1
O3	0.14704(26)	0.46855(29)	0.5142(5)	1
O4	0.0414(3)	0.3718(3)	0.8035(8)	1
Mn	0.0973(4)	0.5062(4)	0.9190(9)	0.1115

Table S3 Refined atomic positions, thermal parameters, and occupancies of LMSAB:0.7Mn^{2+},0.1Eu^{2+}

Atom	x	y	z	occ
Sr	0.33330	0.66670	0.66670	0.9
Al	0.33330	0.66670	0.16670	1
Mg	0.0975(4)	0.5064(4)	0.9206(9)	0.0525
Li	0.0975(4)	0.5064(4)	0.9206(9)	0.836
B1	0.1334(5)	0.5259(5)	0.3543(13)	1
B2	0.0579(6)	0.3640(7)	0.5891(16)	1
O1	0.04883(27)	0.47702(23)	0.2206(5)	1

O2	0.21307(20)	0.62973(28)	0.3365(5)	1
O3	0.14692(23)	0.46857(25)	0.5136(5)	1
O4	0.04154(28)	0.37152(30)	0.8040(7)	1
Mn	0.0975(4)	0.5064(4)	0.9206(9)	0.1115
Eu	0.33330	0.66670	0.66670	0.1

Table S4 Selected bond lengths of LMSAB:0.7Mn^{2+}

Bond	Lengths (Å)	Bond	Lengths (Å)	Bond	Bond Lengths (Å)
Sr-O2	2.65290(4)	Al-O2	1.91502(0)	Mg-O1	2.04883(4)
Sr-O2	2.65290(4)	Al-O2	1.91502(0)	Mg-O2	2.04514(5)
Sr-O2	2.65290(4)	Al-O2	1.91502(3)	Mg-O3	2.06058(5)
Sr-O2	2.65290(4)	Al-O2	1.91502(3)	Mg-O4	1.87527(3)
Sr-O2	2.65290(4)	Al-O2	1.91502(3)		
Sr-O2	2.65290(4)	Al-O2	1.91502(4)		
Sr-O3	2.97277(4)				
Sr-O3	2.97277(4)				
Sr-O3	2.97277(8)				
Sr-O3	2.97277(8)				
Sr-O3	2.97277(5)				
Sr-O3	2.97277(5)				

Table S5 Selected bond lengths of LMSAB:0.7Mn^{2+},0.1Eu^{2+}

Bond	Lengths (Å)	Bond	Lengths (Å)	Bond	Bond Lengths (Å)

Sr-O2	2.65370(4)	Al-O2	1.91542(3)	Mg-O1	2.04960(4)
Sr-O2	2.65370(4)	Al-O2	1.91542(3)	Mg-O2	2.04540(4)
Sr-O2	2.65369(4)	Al-O2	1.91542(3)	Mg-O3	2.006087(4)
Sr-O2	2.65369(4)	Al-O2	1.91542(3)	Mg-O4	1.87551(3)
Sr-O2	2.65369(4)	Al-O2	1.91542(3)		
Sr-O2	2.65369(4)	Al-O2	1.91542(3)		
Sr-O3	2.97320(6)				
Sr-O3	2.97320(6)				
Sr-O3	2.97320(6)				
Sr-O3	2.97320(6)				
Sr-O3	2.97320(4)				
Sr-O3	2.97320(4)				

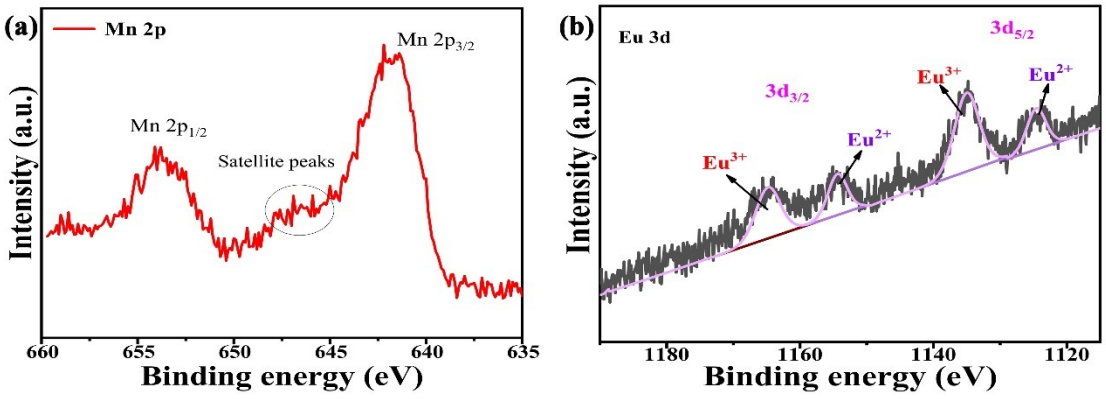

Fig. S2 Mn 2p (a) and Eu 3d (b) XPS region analysis of LMSAB:0.7Mn^{2+},0.1Eu^{2+}