

A novel germanate based red-emitting phosphor with high efficiency, high color purity and thermal stability for white light-emitting diodes and field emission displays

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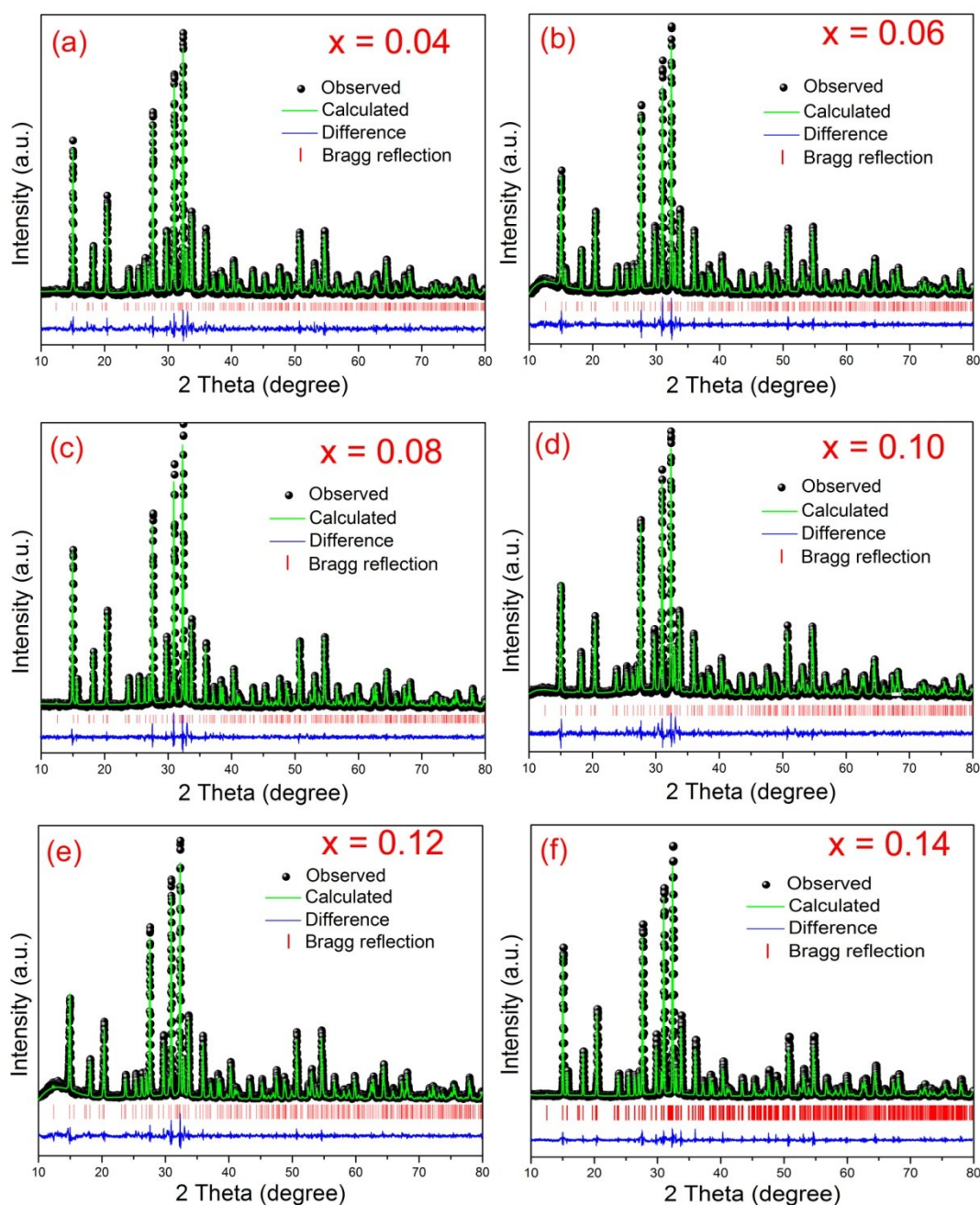


Fig. S1 (a-f) Rietveld refinement results of KSGO: $x\text{Eu}^{3+}$ ($0.04 \leq x \leq 0.14$) phosphors.

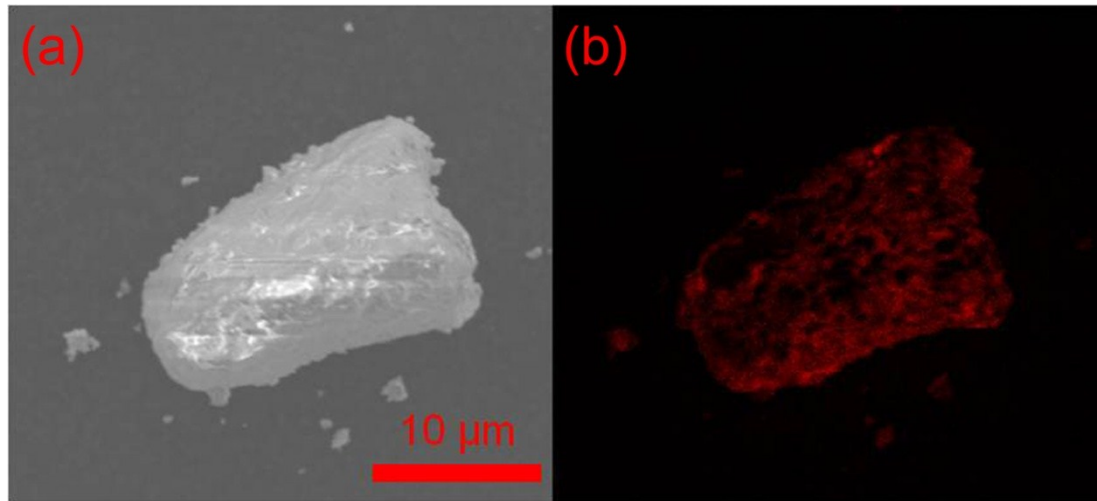


Fig. S2 SEM image (a) and CL mapping image (b) of KSGO: 0.08Eu³⁺ phosphor monitored at 617 nm of the same area.

Table. S1 main parameters of processing and refinement of KSGO: $x\text{Eu}^{3+}$ ($0.04 \leq x \leq 0.14$) phosphors.

x	0.04	0.06	0.08	0.10	0.12	0.14
Space group	P-3c1	P-3c1	P-3c1	P-3c1	P-3c1	P-3c1
$a/\text{Å}$	11.56901(13)	11.56796(20)	11.56712(18)	11.56494(12)	11.56233(23)	11.56029(27)
$b/\text{Å}$	11.56901(13)	11.56796(20)	11.56712(18)	11.56494(12)	11.56233(23)	11.56029(27)
$c/\text{Å}$	19.1735(5)	19.1709(4)	19.1698(4)	19.1664(3)	19.1629(5)	19.1605(9)
$V/\text{Å}^3$	2222.41(6)	2221.70(9)	2221.16(9)	2220.03(6)	2218.62(11)	2217.56(24)
Z	6	6	6	6	6	6
R_{wp}	7.67%	8.81%	7.84%	7.36%	7.28%	7.95%
R_{p}	6.16%	7.21%	6.66%	5.91%	6.26%	6.03%
χ^2	1.80	2.58	2.44	1.90	1.79	1.89

Table. S2 PL properties of some Eu³⁺-activated phosphors.

Phosphor	Main peak of emission	CIE coordinates	Color purity	QY (%)	$I_{150^\circ\text{C}}$ (%)	Ref.
KSGO:Eu ³⁺	617 nm	(0.670,0.329)	95.5%	57.6	80.9	This work
Na ₃ Sc ₂ (PO ₄) ₃ :Eu ³⁺	621 nm	(0.642,0.353)	87%	49	73.4	1
Ca ₂ YZr ₂ Al ₃ O ₁₂ :Eu ³⁺	611 nm	(0.628,0.360)	–	–	62	2
Ca ₃ GdNa(PO ₄) ₃ F:Eu ³⁺	620 nm	(0.654,0.346)	–	40	–	3
Sr ₂ LaSbO ₆ :Eu ³⁺	610 nm	(0.634,0.354)	–	48.3	71.2	4
Na _{0.5} Gd _{0.5} MoO ₄ :Eu ³⁺	615 nm	(0.667,0.332)	97.8%	–	60.4	5

Supplementary References

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