

Supporting Information

A novel near-infrared phosphor $\text{Mg}_2\text{InSbO}_6:\text{Cr}^{3+}$ with high quantum efficiency and considerable persistent luminescence duration

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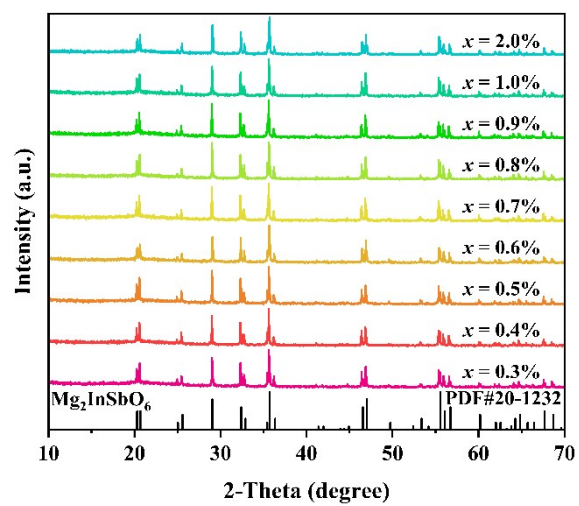


Fig. S1 X-ray diffraction patterns of MISO: $x\text{Cr}^{3+}$ ($x = 0.1\text{-}0.7$ mol%).

Table S1 Rietveld refinement results for $\text{Mg}_2\text{InSbO}_6:0.003\text{Cr}^{3+}$

Formula	$\text{Mg}_2\text{InSbO}_6$
Crystal system	the trigonal crystal system
Space group	$\bar{R}3$ (No. 148)
a (Å)	8.779381(26)
b (Å)	8.779381(26)
c (Å)	10.51128(50)
α (°)	90
β (°)	90
γ (°)	120
Volume (Å ³), Z	701.639(40), 6
R_p	4.69%
R_{wp}	6.56%
χ^2	3.095

Table S2 Crystallographic Data of $\text{Mg}_2\text{InSbO}_6:0.003\text{Cr}^{3+}$

Atom	Wyckoff Position	x/a	y/b	z/c	S.O.F	U (\AA^2)
Mg	18f	0.04073	0.26684	0.21007	0.6667	0.0220
In	18f	0.04073	0.26684	0.21007	0.3333	0.0099
Sb1	3b	0	0	0.5	1	0.0104
Sb2	3a	0	0	0	1	0.0110
O1	18f	0.02694	0.20515	0.39890	1	0.0094
O2	18f	0.18577	0.16090	0.12220	1	0.0231

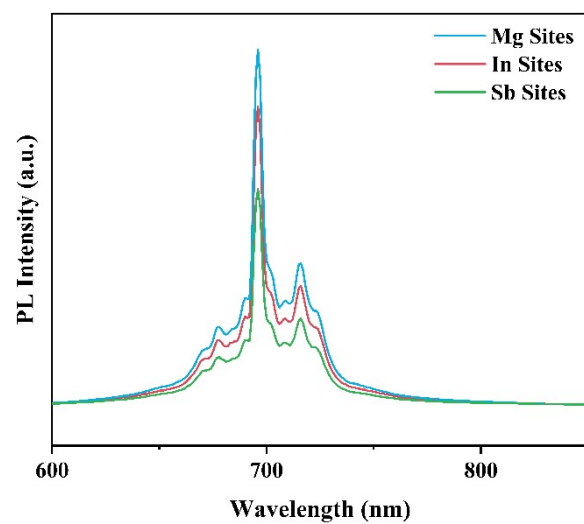


Fig. S2 PL spectra of doped Cr³⁺ on different sites in the MISO host

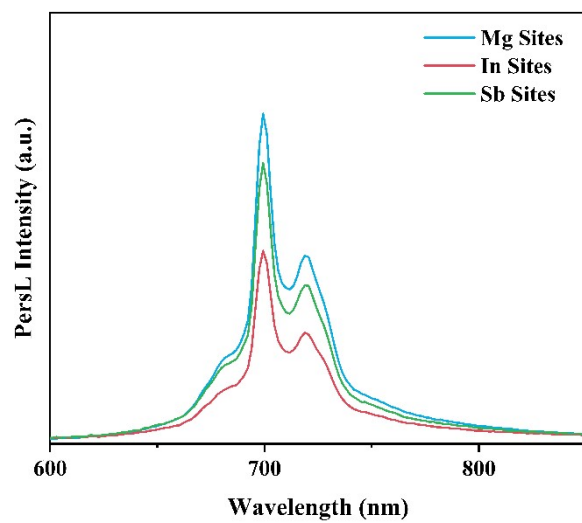


Fig. S3 PersL spectra of doped Cr^{3+} on different sites in the MISO host.

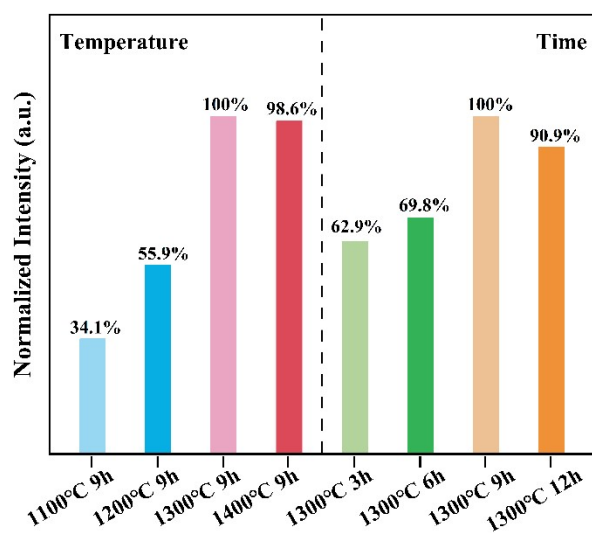


Fig. S4 The comparison of the integral luminescent intensity of MISO:0.003Cr^{3+} phosphors at different calcination temperatures and times.

Table S3 Important photoluminescence data of certain phosphors with the same $\text{Mg}_2\text{InSbO}_6$ matrix.

Phosphor	λ_{ex} (nm)	λ_{em} (nm)	Emission region	E_a (eV)	References
$\text{Mg}_2\text{InSbO}_6:\text{Sm}^{3+}$	406	607	Orange-red	0.20	14
$\text{Mg}_2\text{InSbO}_6:\text{Eu}^{3+}$	395	612	Red	0.26	15
$\text{Mg}_2\text{InSbO}_6:\text{Mn}^{4+}$	301	665	Deep-red	0.27	11
$\text{Mg}_2\text{InSbO}_6:\text{Cr}^{3+}$	266	698	Near-infrared	0.27	This work

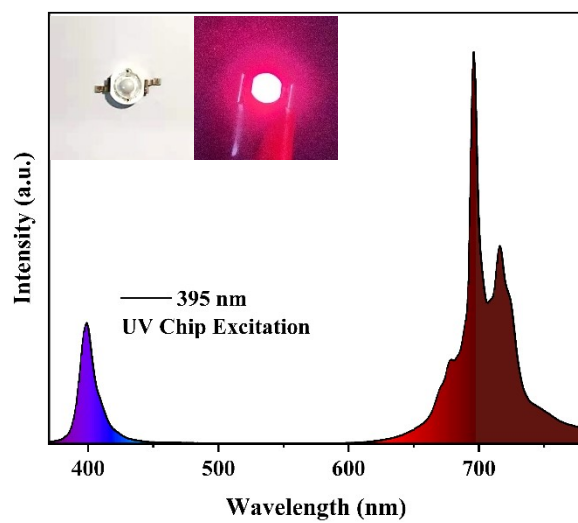


Fig. S5 EL spectrum of as-prepared LEDs, inset shows digital photos of NIR pc-LED turned off and turned on.

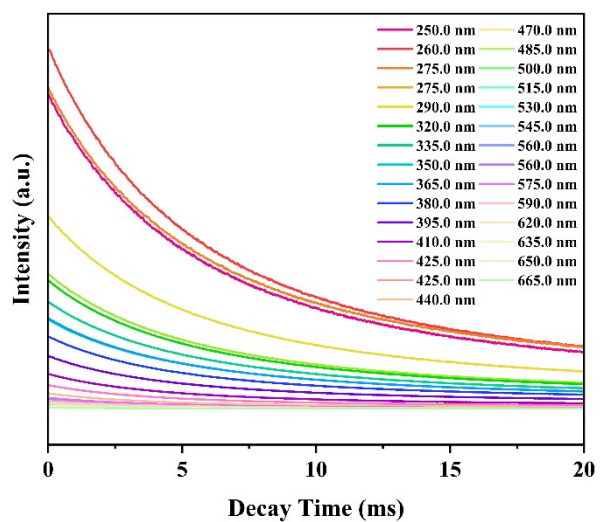


Fig. S6 The PersL decay curves of MISO:0.003Cr³⁺ monitored at 698 nm with different excitation wavelength.

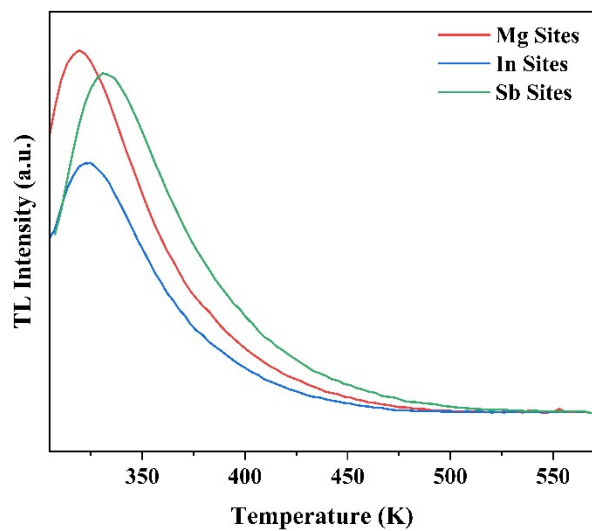


Fig. S7 TL spectra of doped Cr³⁺ on different sites in the MISO host.

Table S4 ICP analysis of Mg, In, Sb and Cr elements in $\text{Mg}_{1.98}\text{InSbO}_6:0.02\text{Cr}^{3+}$ samples.

Nominal composition	Element				Mg	In	Cr	Empirical formula
	Mg	In	Sb	Cr	/Sb	/Sb	/Sb	
	ppm	ppm	ppm	ppm	ratio	ratio	ratio	
$\text{Mg}_{1.98}\text{InSbO}_6:0.02\text{Cr}^{3+}$	126300	318100	331100	2642	1.91	1.01	0.02	$\text{Mg}_{1.91}\text{In}_{1.01}\text{SbO}_6:0.02\text{Cr}^{3+}$

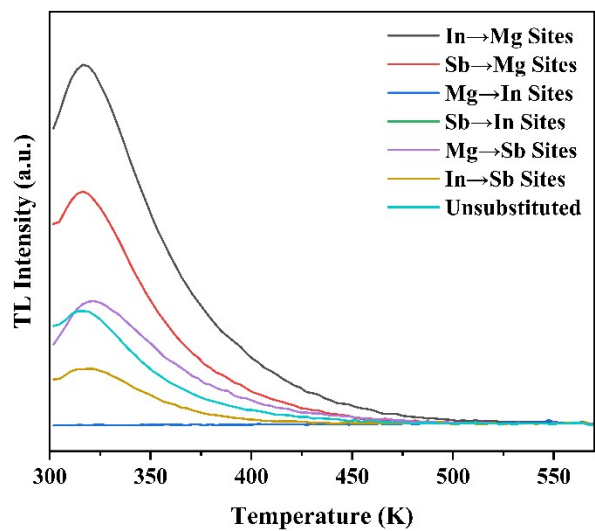


Fig. S8 The TL spectra of the substituted and unsubstituted samples.

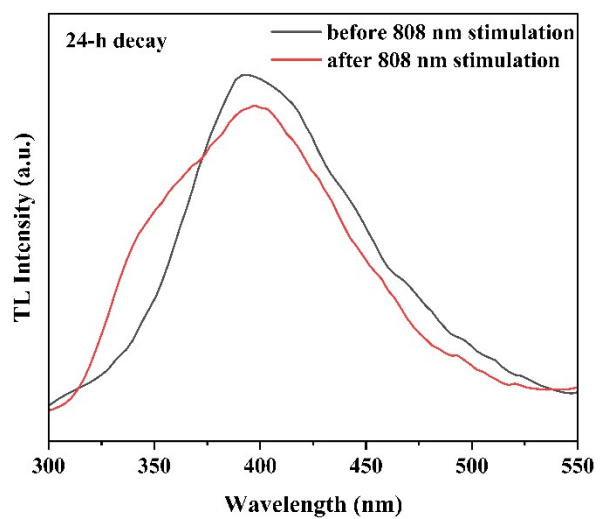


Fig. S9 The TL curves recorded after stopping irradiation for 24 h without (black line) and with (red line) 808 nm stimulation.

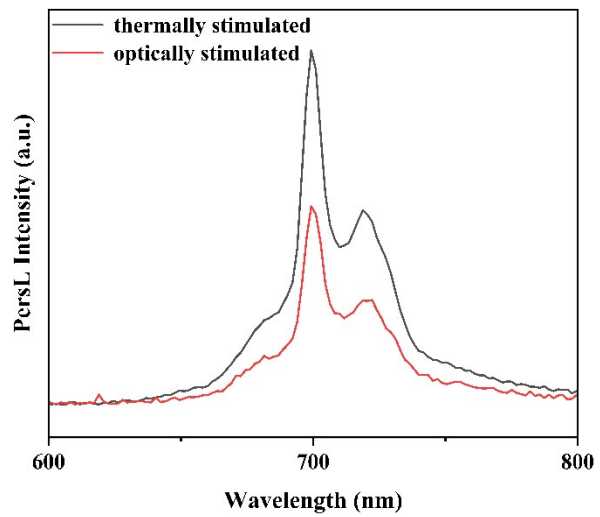


Fig. S10 The PersL spectra of thermally and optically stimulated luminescence.