

Supporting information

Highly efficient near-infrared phosphor LaMgGa₁₁O₁₉:Cr³⁺

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Table S1. The refined structural parameters of LaMgGa₁₁O₁₉ with *P*6₃/*mmc* space group.

Atom	x	y	z	Occ.	Site		
1 Ga Ga ^I	0.000(0)	0.000(0)	0.000(0)	0.750	2a	space group	<i>P</i> 6 ₃ / <i>mmc</i> (194)
Mg							
2 Mg ^I	0.000(0)	0.000(0)	0.000(0)	0.250	2a	symmetry	hexagonal
3 Ga Ga ^{II}	0.000(0)	0.000(0)	0.241(4)	0.499	4e		
4 Ga Ga ^{III}	0.333(3)	0.666(7)	0.027(3)	0.625	4f		
Mg							
5 Mg ^{III}	0.333(3)	0.666(7)	0.027(3)	0.375	4f	Lattice	a=5.80559 c=22.71567
6 Ga Ga ^{IV}	0.333(3)	0.666(7)	0.188(9)	1.000	4f		
7 Ga Ga ^V	-0.164(4)	0.164(4)	0.109(7)	1.000	12k	parameters (Å)	
8 O O ^I	0.000(0)	0.000(0)	0.149(9)	1.000	4e	<i>R_p</i>	7.101
9 O O ^{II}	0.666(7)	0.333(3)	0.057(6)	1.000	4f		
10 O O ^{III}	0.182(0)	-0.182(0)	0.250(0)	1.000	6h	<i>R_w</i>	9.413
11 O O ^{IV}	0.152(0)	-0.152(0)	0.053(0)	1.000	12k	<i>R_{exp}</i>	4.219
12 O O ^V	0.505(0)	-0.505(0)	0.150(8)	1.000	12k		
13 La La ^I	0.666(7)	0.333(3)	0.250(0)	0.770	2d		
14 La La ^{II}	0.732(3)	0.267(7)	0.250(0)	0.076	6h		

Table S2. Ga-O bond length data derived from the refined result.

	Bond length (Å)	Average (Å)		Bond length (Å)	Average (Å)		Bond length (Å)	Average (Å)
Ga ^I -O	1.945(7)	1.946	Ga ^{IV} -O	2.035(5)	1.966	Ga ^V -O	1.931(0)	2.008
	1.945(7)			1.918(7)			2.059(6)	
	1.945(7)			2.057(4)			2.059(6)	
	1.945(7)			1.918(7)			1.931(0)	
	1.945(7)			1.899(7)			2.059(6)	
	1.945(7)			2.035(5)			1.931(0)	

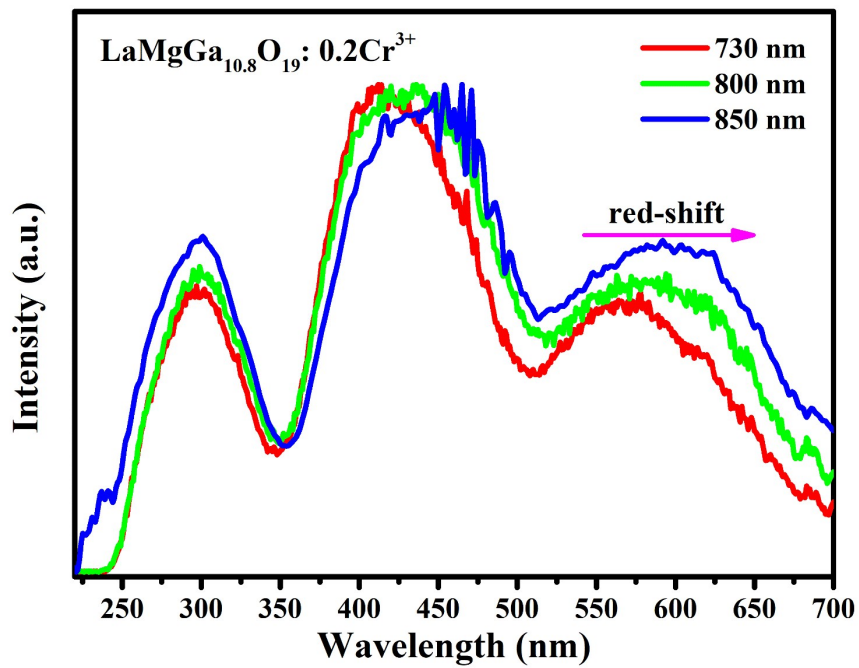


Figure S1. PLE spectra of $\text{LaMgGa}_{10.8}\text{O}_{19}:0.2\text{Cr}^{3+}$ monitored at different emission wavelength (730, 800 and 850 nm).

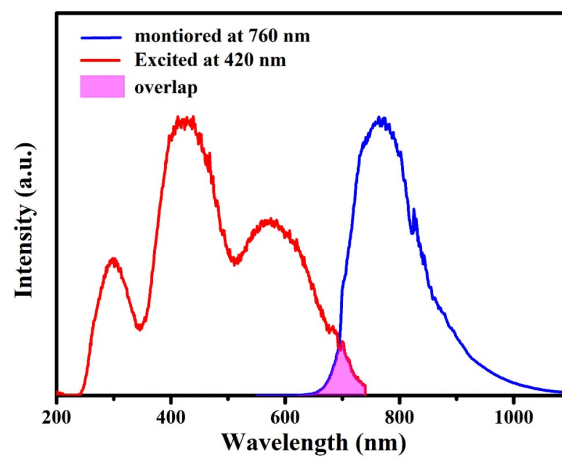


Figure S2. PL and PLE spectra of $\text{LaMgGa}_{10.8}\text{O}_{19}:0.2\text{Cr}^{3+}$.

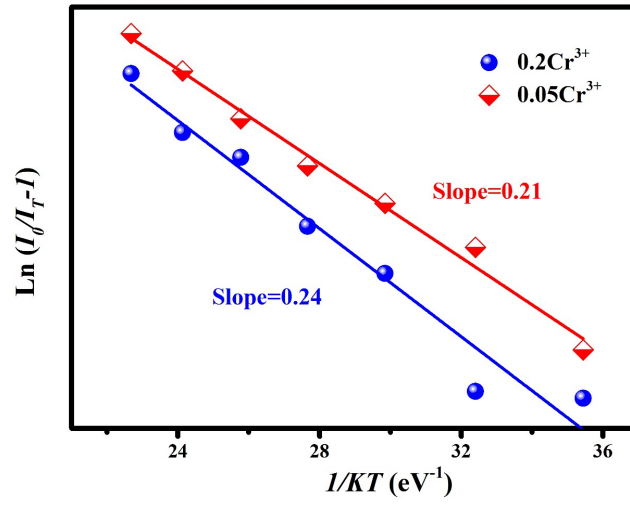


Figure S3. $\ln(I_0/I_{T-1})$ vs. $1/KT$ graph for thermal quenching of $\text{LaMgGa}_{11-x}\text{O}_{19}:x\text{Cr}^{3+}$ ($x=0.05, 0.2$)