Electronic Supplementary Material (ESI) for RSC Advances.

Design a super broadband near infrared material $Mg_3Y_2Ge_3O_{12}:Cr^{3+}$ using cation inversion for future light sources

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Table S1 Refinement results of $Mg_3Y_2Ge_3O_{12}$

	$Mg_3Y_2Ge_3O_{12}$ (ICSD #280049)	**$Mg_3Y_2Ge_3O_{12}$**
Space group	Ia-3d	Ia-3d
Symmetry	cubic	cubic
a (Å)	12.2489	12.2158
b (Å)	12.2489	12.2158
c (Å)	12.2489	12.2158
V (Å3)	1837.77	1822.921
α (deg)	90	90
β (deg)	90	90
γ (deg)	90	90
Rp		8.59%
Rwp		11.58%
χ2		1.428

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Table S2 The atomic positions of $Mg_3Y_2Ge_3O_{12}$:xCr^{3+} (x=0.01, 0.03, 0.05, 0.07) composition obtained from the Rietveld refinement results

MYG:xCr^{3+}		x	y	z
x=0.01	Mg1/Y	0	0.25	0.125
	Mg2	0	0	0
	Ge	0	0.25	0.375
	O	-0.0314	0.0559	0.1560
x=0.03	Mg1/Y	0	0.25	0.125
	Mg2	0	0	0
	Ge	0	0.25	0.375
	O	-0.0311	0.0559	0.1572
x=0.05	Mg1/Y	0	0.25	0.125
	Mg2	0	0	0
	Ge	0	0.25	0.375
	O	-0.0310	0.0560	0.1570
x=0.07	Mg1/Y	0	0.25	0.125
	Mg2	0	0	0
	Ge	0	0.25	0.375
	O	-0.0316	0.0552	0.1572

Table S3Theatomic positions of $Mg_3Y_2Ge_3O_{12}$:xCr^{3+} (x=0.10, 0.20, 0.30, 0.40) composition obtained from the Rietveld refinement results

MYG:xCr^{3+}		x	y	z
x=0.10	Mg1/Y	0	0.25	0.125
	Mg2	0	0	0
	Ge	0	0.25	0.375
	O	-0.0318	0.0555	0.1572
x=0.20	Mg1/Y	0	0.25	0.125
	Mg2	0	0	0
	Ge	0	0.25	0.375
	O	-0.0319	0.0559	0.1569
x=0.30	Mg1/Y	0	0.25	0.125
	Mg2	0	0	0
	Ge	0	0.25	0.375
	O	-0.0302	0.0557	0.1559
x=0.40	Mg1/Y	0	0.25	0.125
	Mg2	0	0	0
	Ge	0	0.25	0.375
	O	-0.0302	0.0554	0.1570

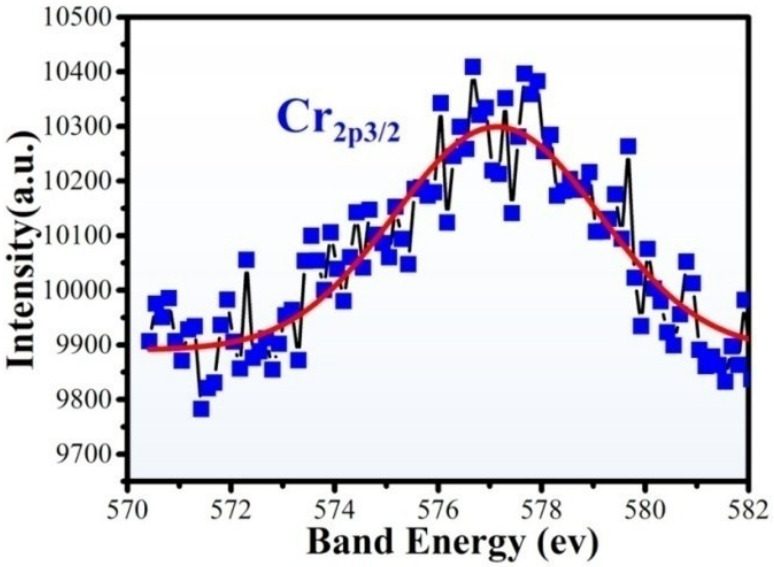

Figure S1 The XPS spectrum of MYG:0.03Cr^{3+}.

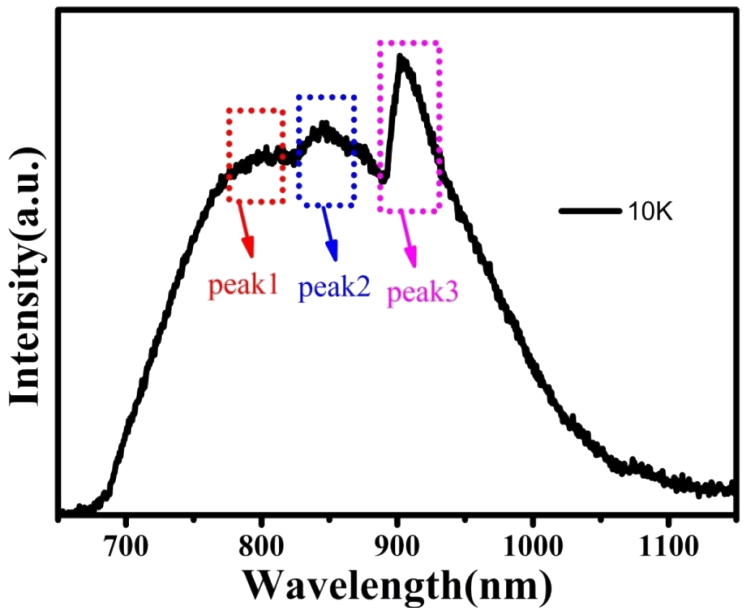

Figure S2 The emission spectrum of MYG:0.03Cr^{3+} at 10K.

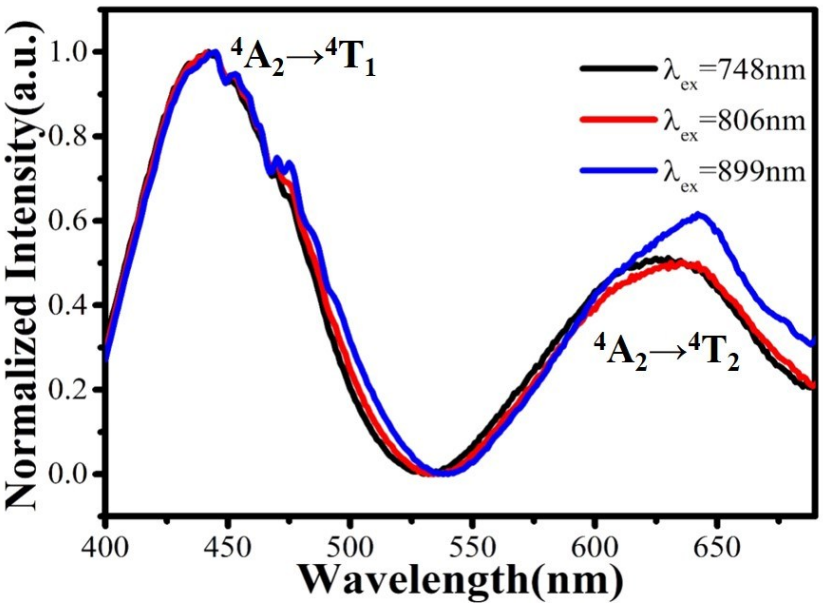

Figure S3 The excitation spectra of MYG:0.03Cr^{3+} monitoring the peaks at 748nm, 806nm and 899nm, respectively.

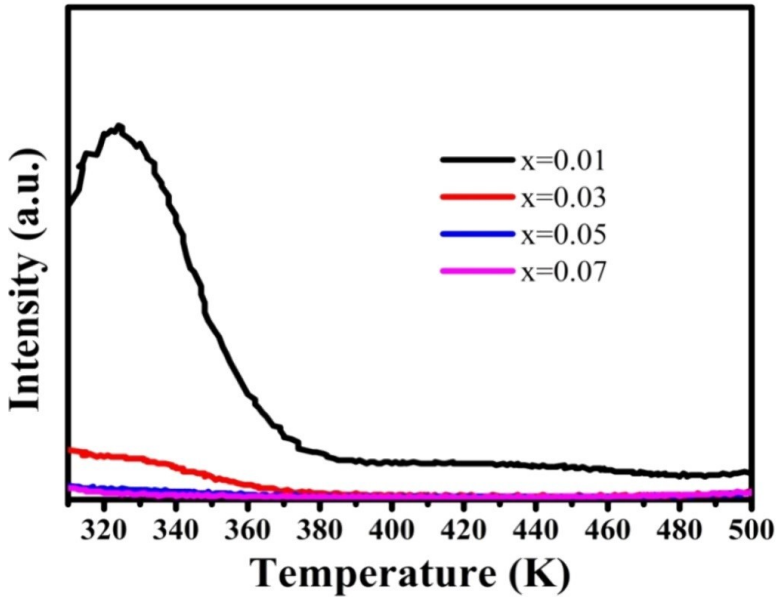

Figure S4 TL spectra of MYG:xCr^{3+}(x=0.01, 0.03, 0.05, 0.07).

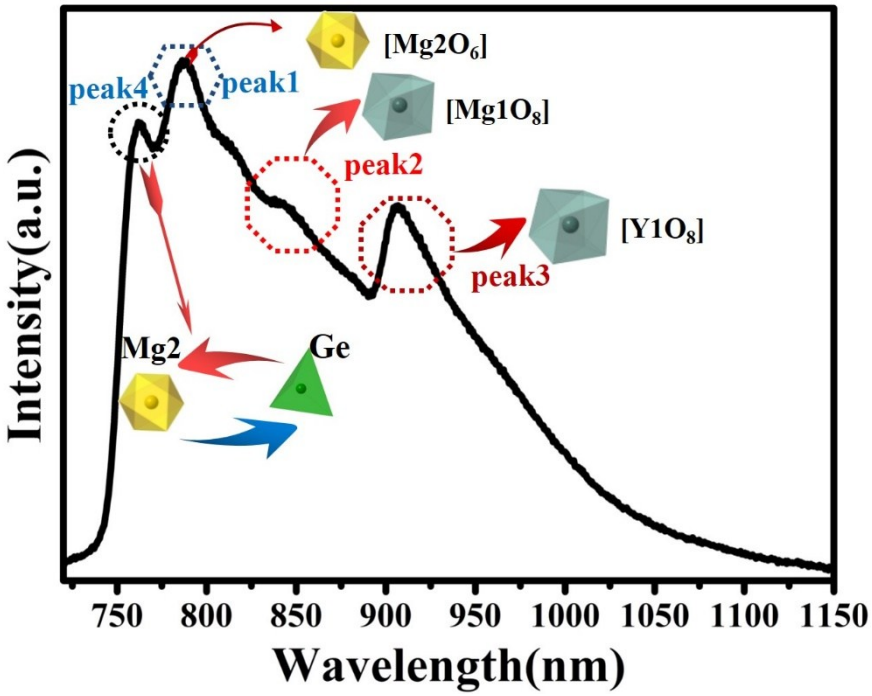

Figure S5 The emission spectrum of MYG:0.30Cr^{3+} at 10K.