Supporting Information

High-sensitivity temperature sensing in $MgGa_2O_4:Bi^{3+}$ phosphors via thermal-assisted energy transfer

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Figure Captions:

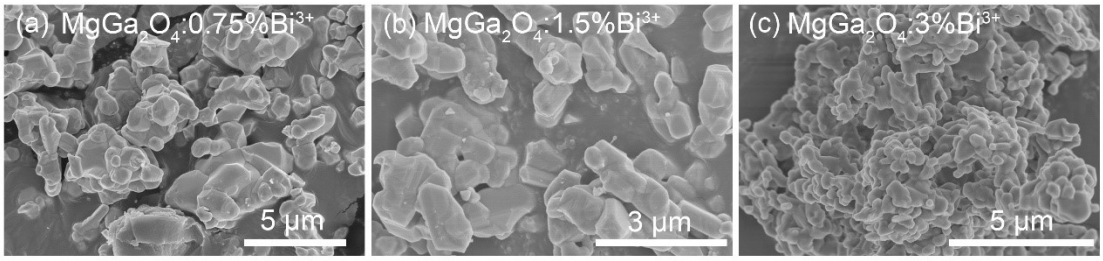

Fig. S1 SEM spectra of $MgGa_2O_4$: x% Bi^{3+} sample, (a) x=0.75, (b) x=1.5, (c) x=3.

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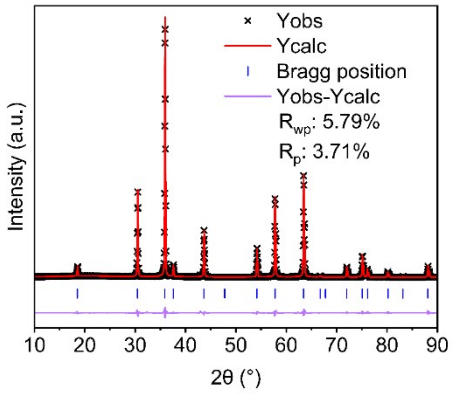

Fig. S2. Rietveld XRD refinements of the prepared $MgGa_2O_4$:1.5%Bi^{3+} phosphors.

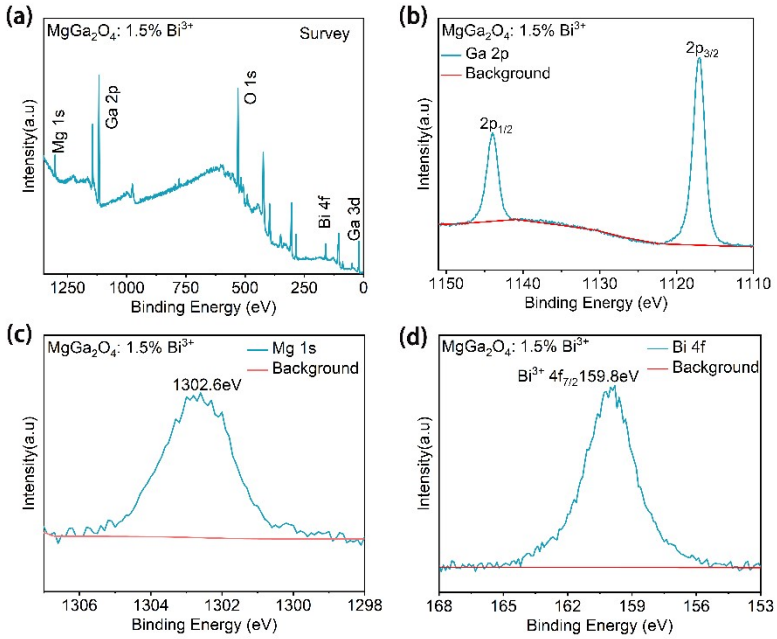

Fig. S3 XPS spectra of $MgGa_2O_4$: 1.5% Bi^{3+} material: (a) Survey, (b) Ga 2p, (c) Mg 1s, and (d) Bi 4f, respectively.

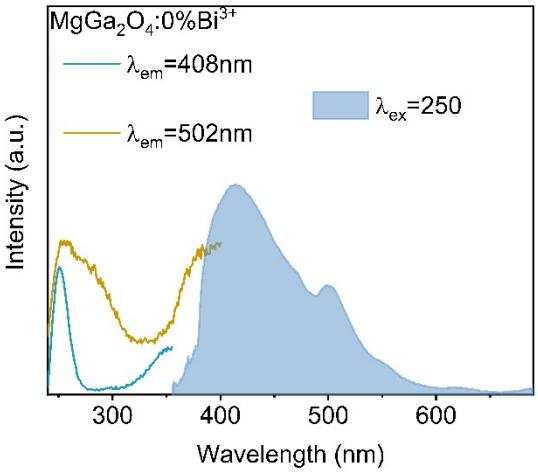

Fig.S4: PLE and PL spectra of $MgGa_2O_4$: 0% Bi^{3+} sample, λ_{em} = 408, 502 nm and λ_{ex} = 250nm;

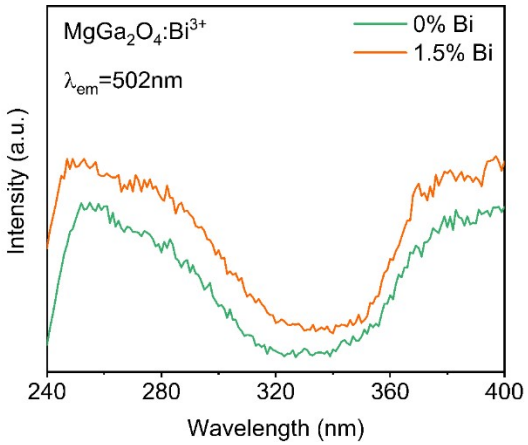

Fig.S5: PLE spectra of $MgGa_2O_4$: Bi^{3+}(0% ,1.5%) sample, λ_{em} = 502nm;

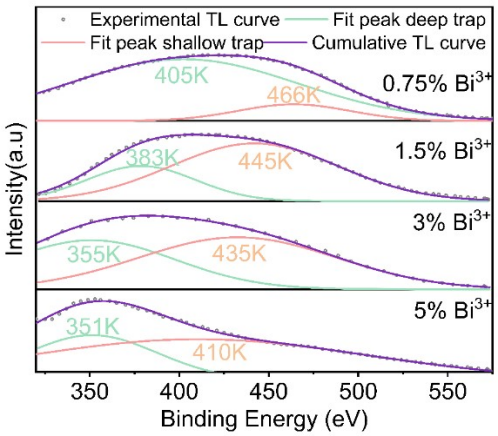

Fig. S6 Multipeak fitting of TL curves for $MgGa_2O_4$: x% Bi materials with x equals to 0.75%, 1.5%, 3% and 5% Bi^{3+}, respectively.

Table S1 Rietveld refined crystallographic data for $MgGa_2O_4$: 1.5% Bi

Parameters	Values
Crystal system	Cubic
Space group	Fd-3m (227)
a (Å) = b (Å) = c (Å)	8.29159(9)
α (°) = β (°) = γ (°)	90
Volume (Å³)	570.05
Z	8
R_p	3.71%
R_{wp}	5.79%
Rc	1.55%
X^2	3.54

Table S2 Atomic occupancy, atomic fraction coordinates, and isotropic temperature factors for $MgGa_2O_4$:1.5% Bi samples.

Atom	**Wyck.**	**s.o.f.**	**x**	**y**	**z**	**B/ 10^4 pm^2**
O1	32e	1.000000	0.243249	0.243249	0.243249	0.515000
MG1	16c	0.492449	0.000000	0.000000	0.000000	0.352000
GA1	16c	0.488024	0.000000	0.000000	0.000000	0.352000
GA2	8b	0.796505	0.375000	0.375000	0.375000	0.317000
MG2	8b	0.200000	0.375000	0.375000	0.375000	0.317000
Bi1	16c	0.019527	0.000000	0.000000	0.000000	0.352000

Atom	Wyck.	s.o.f.	x	y	z	B/ 10^4 pm^2
Bi2	8b	0.009750	0.375000	0.375000	0.375000	0.317000

Table S3 Thermoluminescence kinetic parameters of $MgGa_2O_4$:x%Bi^{3+} (x = 0.75, 1.5, 3, 5) samples**.**

Sample	Deconvoluted TL peaks	Max. tem. peak (Tm)	Activation energy (eV)
$MgGa_2O_4$:0.75%Bi^{3+}	Peak1	405K	0.810
	Peak2	466K	0.932
$MgGa_2O_4$:1.5%Bi^{3+}	Peak1	383K	0.766
	Peak2	445K	0.890
$MgGa_2O_4$:3%Bi^{3+}	Peak1	355K	0.710
	Peak2	435K	0.870
$MgGa_2O_4$:5%Bi^{3+}	Peak1	351K	0.702
	Peak2	410K	0.820