Supplementary Information (SI) for Journal of Materials Chemistry C.
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Electronic Supplementary Information (ESI)

Enhanced Optical Properties and Optical Temperature Sensing Performance of $SrGa_4O_7$: Bi^{3+} Co-doped with K^+ and Cr^{3+} via Charge Compensation and Energy Transfer

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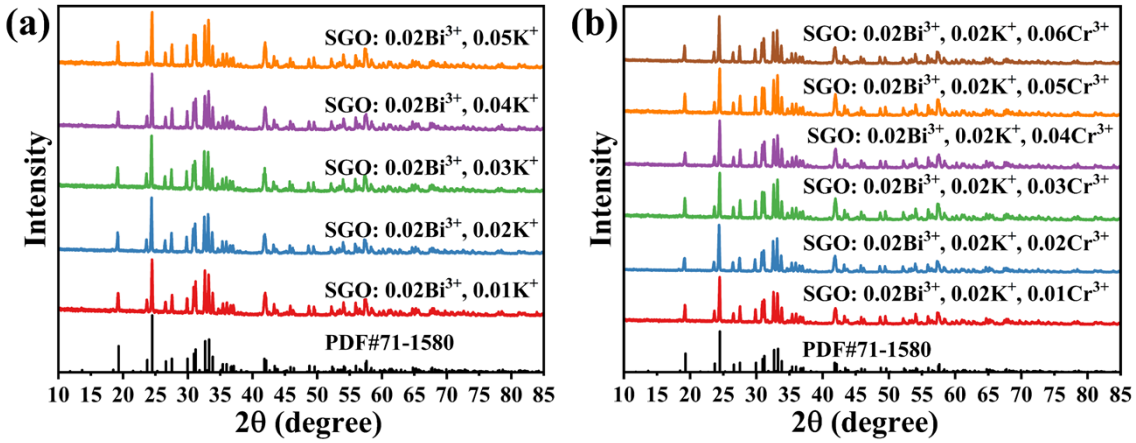

Fig. S1 (a) XRD patterns of SGO: $0.02Bi^{3+}$, yK^{+} (y = 0.01, 0.02, 0.03, 0.04, 0.05). (b) SGO: $0.02Bi^{3+}$, $0.02K^{+}$, zCr^{3+} (z = 0.01, 0.02, 0.03, 0.04, 0.05, 0.06).

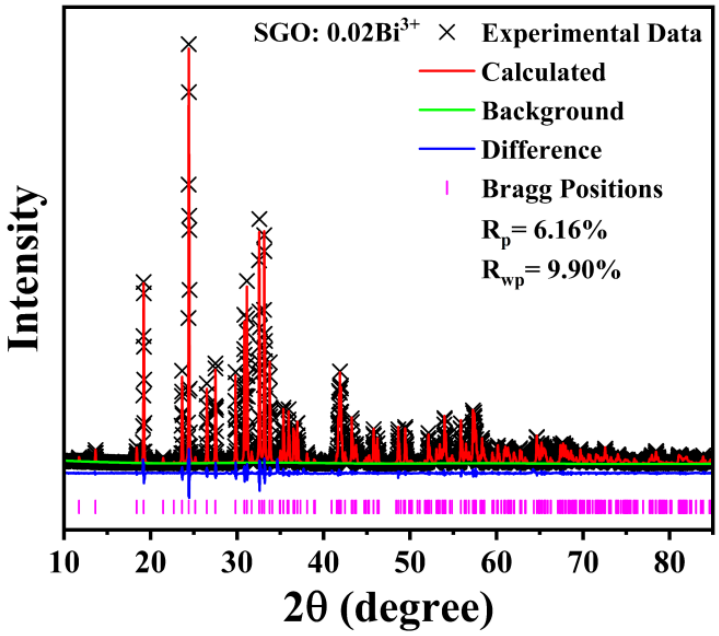

Fig. S2 Rietveld refinement of XRD for SGO: 0.02Bi^{3+}.

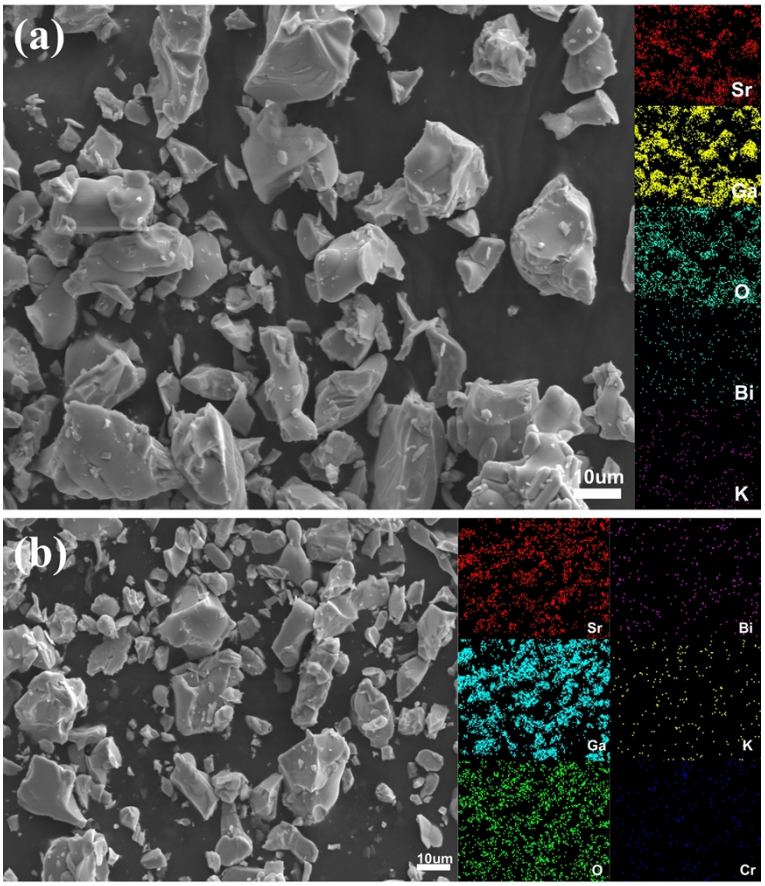

Fig. S3 SEM image and element mapping image of (a) SGO: $0.02Bi^{3+}$, $0.02K^{+}$ and (b)SGO: $0.2Bi^{3+}$, $0.02K^{+}$, $0.01Cr^{3+}$.

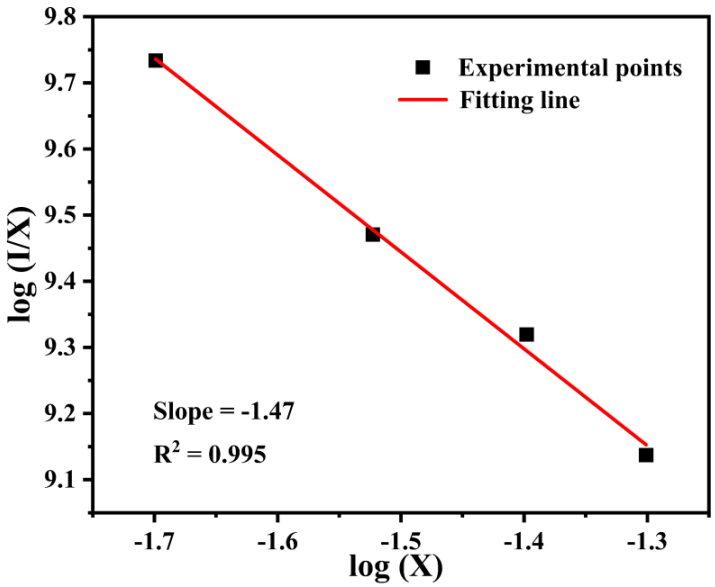

Fig. S4 Plot of log (I/x) versus log(x) of SGO: xBi^{3+} (x = 0.01, 0.02, 0.03, 0.04, 0.05).

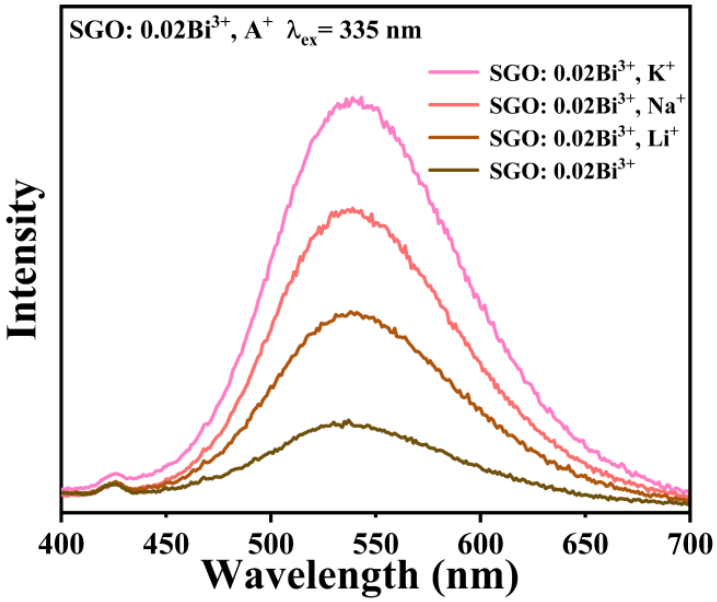

Fig. S5 PL spectra of SGO: $0.02Bi^{3+}$, A^{+}(A^{+}= Li^{+}, Na^{+}, K^{+})

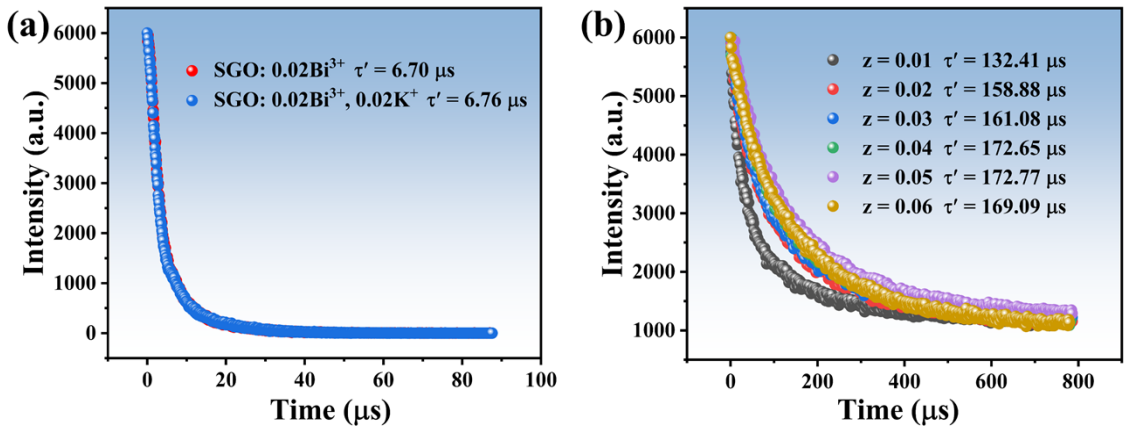

Fig. S6 (a) Decay curves of SGO: $0.2Bi^{3+}$ and SGO: $0.2Bi^{3+}$, $0.02K^{+}$ under 335 nm excitation and detection at 540 nm. (b) Decay curves of SGO: $0.2Bi^{3+}$, $0.02K^{+}$, zCr^{3+} (z = 0.01, 0.02, 0.03, 0.04, 0.05, 0.06) under 335 nm excitation and detection at 765 nm.

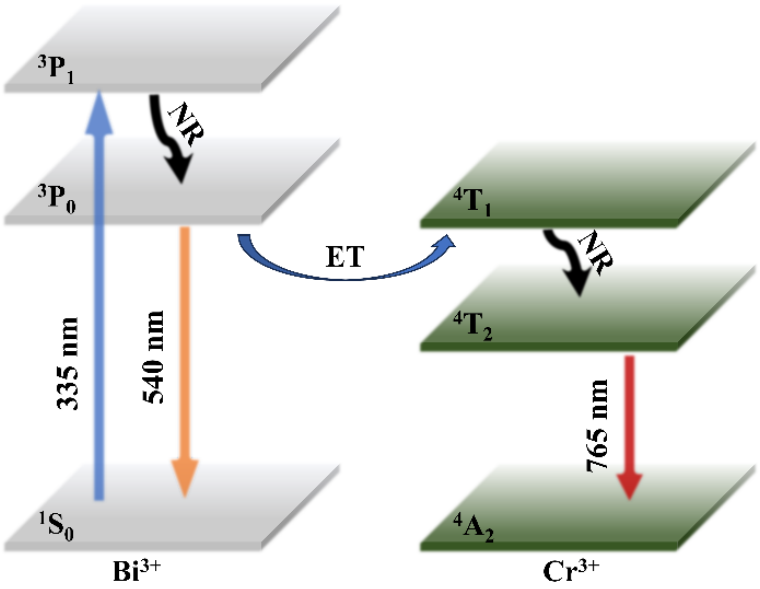

Fig. S7 Energy transfer mechanism diagram.

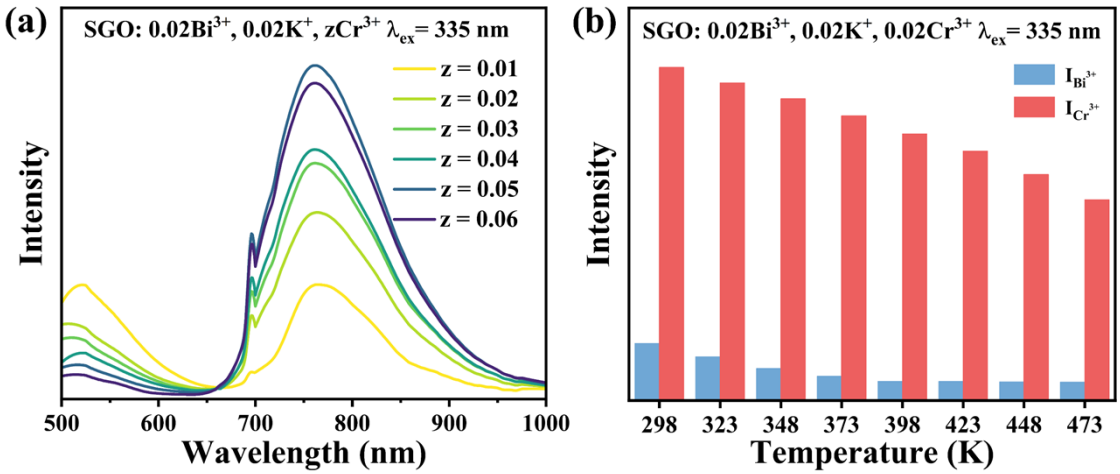

Fig. S8 (a) PL spectra of SGO: $0.02Bi^{3+}$, $0.02K^{+}$, zCr^{3+} (z = 0.01, 0.02, 0.03, 0.04, 0.05, 0.06). (b) Histogram of the emission intensity for the Bi^{3+} and Cr^{3+} of SGO: $0.02Bi^{3+}$, $0.02K^{+}$, $0.02Cr^{3+}$.

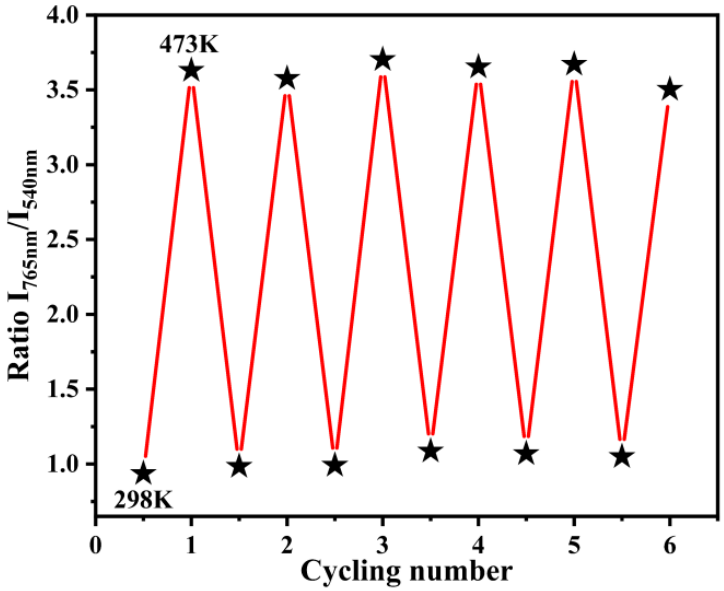

Fig. S9 Plot of I_{765nm}/I_{540nm} as a function of the temperature measured in the temperature cycling process for a range of 298–473 K.

Table S1. Main parameters of processing and refinement results of SGO and SGO:0.02Bi^{3+}.

Compound	SGO	SGO: 0.02 Bi^{3+}
Space group	*C 2/c*	*C 2/c*
a, Å	13.462	13.460
b, Å	9.220	9.221
c, Å	5.708	5.707
V, $Å^3$	681.610	681.513
α=β, °	90	90
γ, °	105.824	105.818
R_{wp}, %	6.57	9.90
R_p, %	5.05	6.16

Table S2 · Comparison of temperature sensing properties of different Bi^{3+}-activated phosphors.

Phosphors	Temperature range (K)	Maximum Sr (%K^{-1})	Ref.
$Li_3Gd_3Te_2O_{12}$: Bi^{3+}, Pr^{3+}	100-300	0.672	1
$Ca_2YZr_2Al_3O_{12}$: Bi^{3+}, Eu^{3+}	250-575	0.664	2
$Ca_3Sc_2Si_3O_{12}$: Bi^{3+}, Eu^{3+}, Tb^{3+}	300-500	1	3
$CaBaZn_2Ga_2O_7$: Bi^{3+}	298-473	1.45	4
$SrGa_4O_7$: Bi^{3+}, K^{+}, Cr^{3+}	298-473	1.27	this work

Reference

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2. Z. Zheng, J. Zhang, X. Liu, R. Wei, F. Hu and H. Guo, *Ceramics International*, 2020, **46**, 6154-6159.
3. Z. Sun, M. Jia, Y. Wei, J. Cheng, T. Sheng and Z. Fu, *Chemical Engineering Journal*, 2020, **381**, 122654.
4. D. Liu, X. Yun, P. Dang, H. Lian, M. Shang, G. Li and J. Lin, *Chemistry of Materials*, 2020, **32**, 3065-3077.