

Electronic Supplementary Material (ESI)

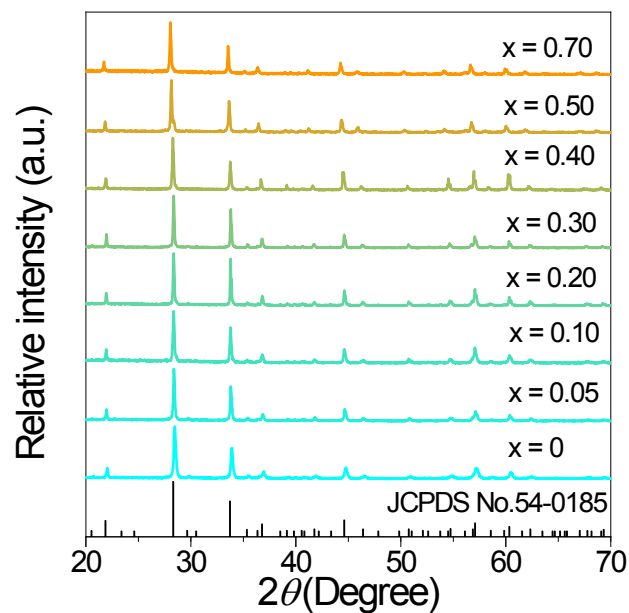


Fig. S1 XRD patterns of $\text{Ba}_{1+x}\text{Sr}_{1-x}\text{Ga}_4\text{O}_8: 0.01\text{Bi}^{3+}$ ($x = 0-0.7$) samples.

Table S1. Cell parameters, volume and residual factor values of the Ba_{1+x}Sr_{1-x}Ga₄O₈:Bi³⁺ (x = 0-0.7) samples.

Samples (x)	Cell parameters (Å)	Volume (Å ³)	R_{wp} , R_p , %, χ^2
Space group: <i>P63</i> (NO.173), <i>Hexagonal</i>			
$\alpha = \beta = 90^\circ$, $\gamma = 120^\circ$			
0	$a = b = 9.20271(23)$ $c = 8.65292(34)$	634.636(33)	5.50, 4.25, 1.617
0.05	$a = b = 9.20635(11)$ $c = 8.66014(17)$	635.668(17)	5.45, 4.18, 1.670
0.1	$a = b = 9.21176(25)$ $c = 8.6715(4)$	637.25(4)	7.87, 5.80, 3.091
0.2	$a = b = 9.21737(18)$ $c = 8.68743(26)$	639.199(26)	8.37, 5.93, 3.586
0.3	$a = b = 9.22762(13)$ $c = 8.70539(17)$	641.947(18)	8.47, 6.10, 3.494
0.4	$a = b = 9.23238(12)$ $c = 8.72096(15)$	643.758(16)	7.60, 5.69, 2.844
0.5	$a = b = 9.24032(25)$ $c = 8.7422(4)$	646.44(4)	7.80, 5.79, 2.803
0.6	$a = b = 9.25272(10)$ $c = 8.76105(15)$	649.569(15)	6.56, 4.97, 2.010
0.7	$a = b = 9.26195(17)$ $c = 8.78285(29)$	652.486(28)	8.08, 5.71, 2.903

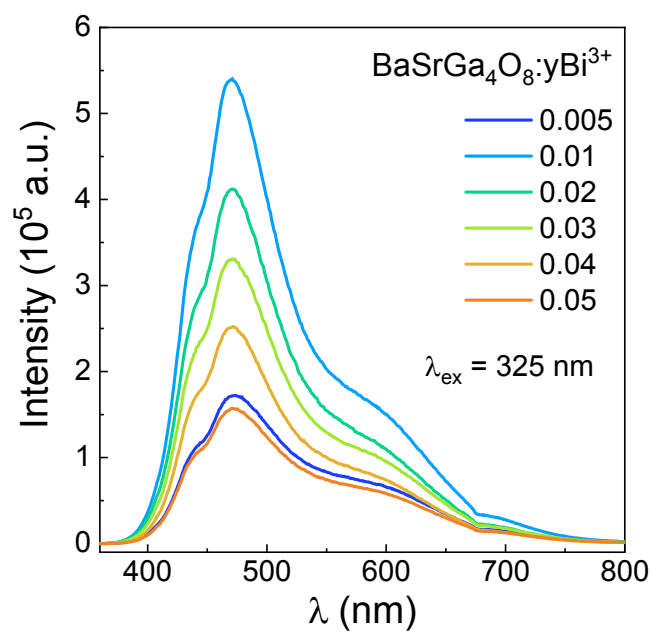


Fig. S2 PL spectra of $\text{BaSrGa}_4\text{O}_8:\text{yBi}^{3+}$ ($\text{y} = 0.005\text{-}0.05$) samples under 325 nm UV excitation.

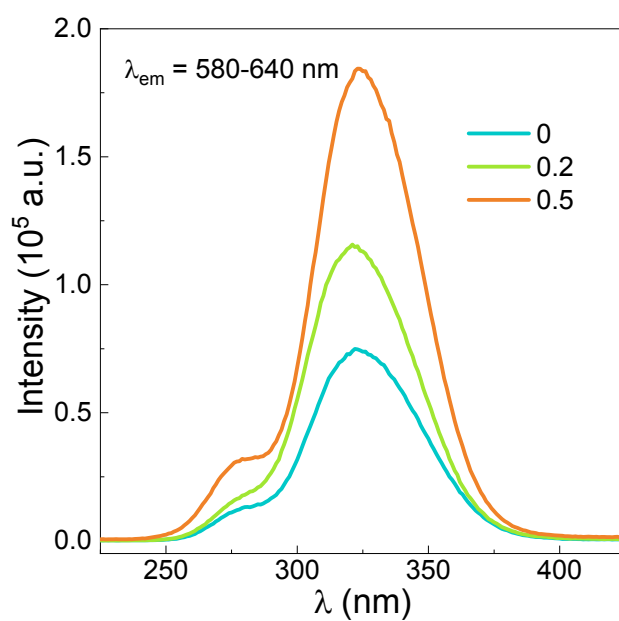


Fig. S3 PLE spectra of $\text{Ba}_{1+x}\text{Sr}_{1-x}\text{Ga}_4\text{O}_8:\text{Bi}^{3+}$ ($x = 0, 0.2, 0.5$) samples monitored at 570 nm, 590 nm, and 640 nm wavelength, respectively.

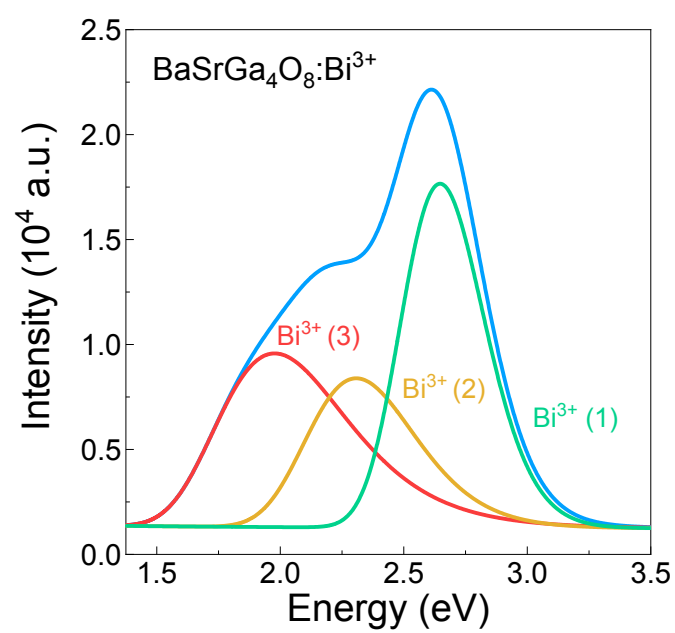


Fig. S4 Three Gaussian components of Bi^{3+} in $\text{BaSrGa}_4\text{O}_8$ host.

Table S2. The emission wavelengths and FWHMs of $\text{Ba}_{1+x}\text{Sr}_{1-x}\text{Ga}_4\text{O}_8:\text{Bi}^{3+}$ ($x = 0-0.7$) samples excited at 325 nm at three Ba1/Sr1, Ba2/Sr2 and Ba3/Sr3 sites.

Samples (x)	FWHM (nm)	Em1 (nm)	FWHM (nm)	Em2 (nm)	FWHM (nm)	Em3 (nm)	FWHM (nm)
0	192	468.64	70.14	538.68	120.68	628.33	194.08
0.05	200	470.63	76.83	560.63	124.97	663.49	165.14
0.1	236	463.50	86.90	545.57	126.78	652.30	174.90
0.2	270	473.11	72.74	558.66	136.33	659.33	191.69
0.3	280	481.60	79.39	575.17	135.91	679.68	180.31
0.4	282	484.59	81.83	586.97	140.07	691.02	171.60
0.5	283	487.29	83.42	602.59	146.27	711.95	157.96
0.7	268	493.68	84.98	596.74	132.07	691.87	172.88

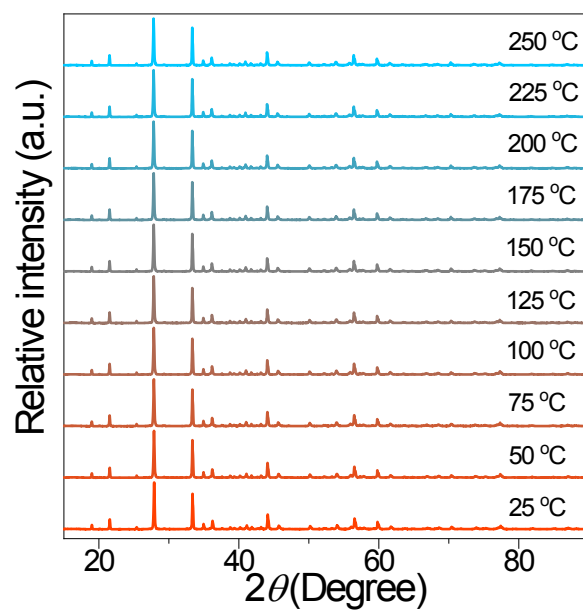


Fig. S5 XRD patterns of the representative $\text{Ba}_{1.5}\text{Sr}_{0.5}\text{Ga}_4\text{O}_8:\text{Bi}^{3+}$ sample at different temperatures (25-250 °C).

Table S3. Cell parameters, volume and residual factor values of the Ba_{1.5}Sr_{0.5}Ga₄O₈:Bi³⁺ sample at different temperatures (25-250 °C).

Samples (x)	Cell parameters (Å)	Volume (Å ³)	R_{wp} , R_p , %
Space group: <i>P63</i> (NO.173), <i>Hexagonal</i>			
$\alpha = \beta = 90^\circ$, $\gamma = 120^\circ$			
25	$a = b = 9.24032(25)$ $c = 8.7422(4)$	646.440(40)	7.80, 5.79
50	$a = b = 9.24384(20)$ $c = 8.74868(30)$	646.847(30)	15.31, 9.60
100	$a = b = 9.24600(21)$ $c = 8.76290(30)$	648.763(31)	15.29, 9.77
150	$a = b = 9.24929(20)$ $c = 8.77086(30)$	649.815(29)	15.33, 9.90
200	$a = b = 9.25203(20)$ $c = 8.77694(29)$	650.651(29)	14.83, 9.49
250	$a = b = 9.25478(19)$ $c = 8.78307(29)$	651.492(29)	14.58, 9.22

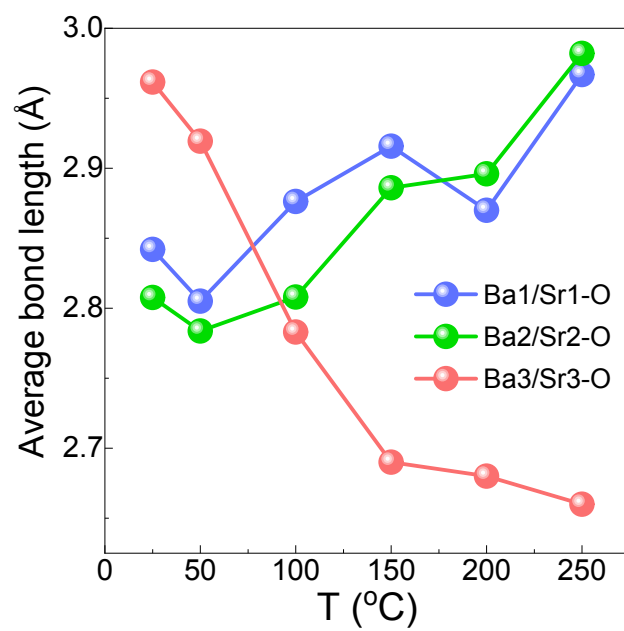


Fig. S6 Average bond length of Ba1/Sr1-O, Ba2/Sr2-O, and Ba3/Sr3-O for the representative $\text{Ba}_{1.5}\text{Sr}_{0.5}\text{Ga}_4\text{O}_8\text{:Bi}^{3+}$ sample at different temperatures (25-250 °C).