Supplementary information for

Exclusive confinement of Bi^{3+}-activators in the triangular prism enabling efficient and thermally stable green emission in tridymite-type phosphor $CaBaGa_4O_8:Bi^{3+}$

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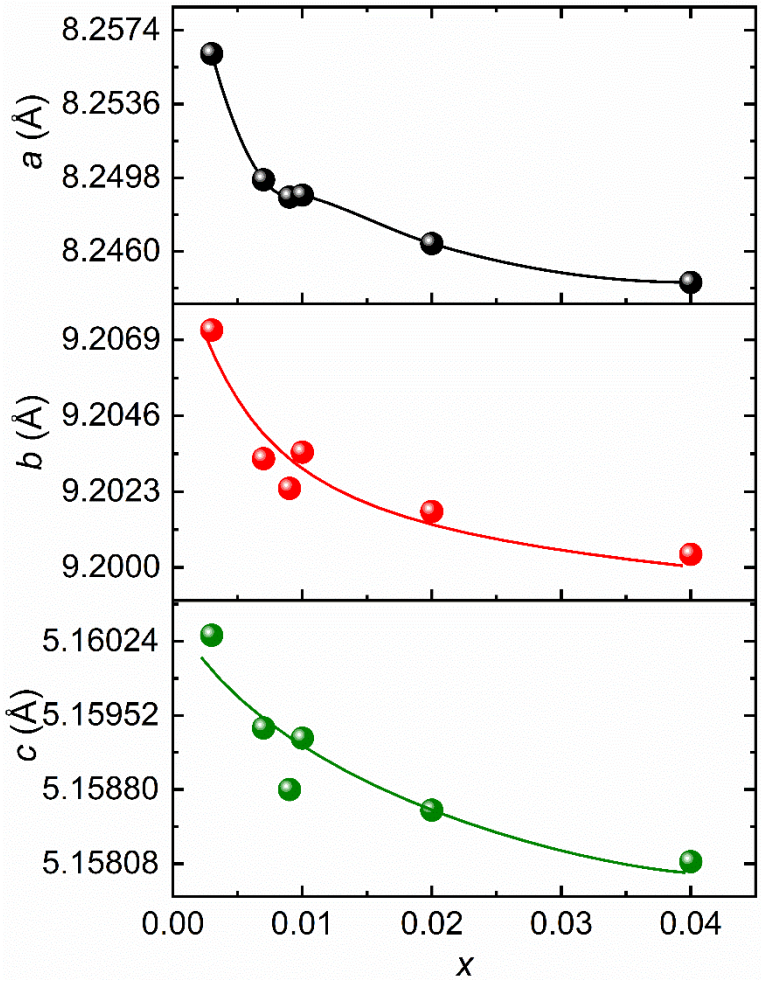

Fig. S1 Plots of lattice parameters of $CaBaGa_4O_8$:$x$$Bi^{3+}$ as a function of Bi^{3+}-content (x).

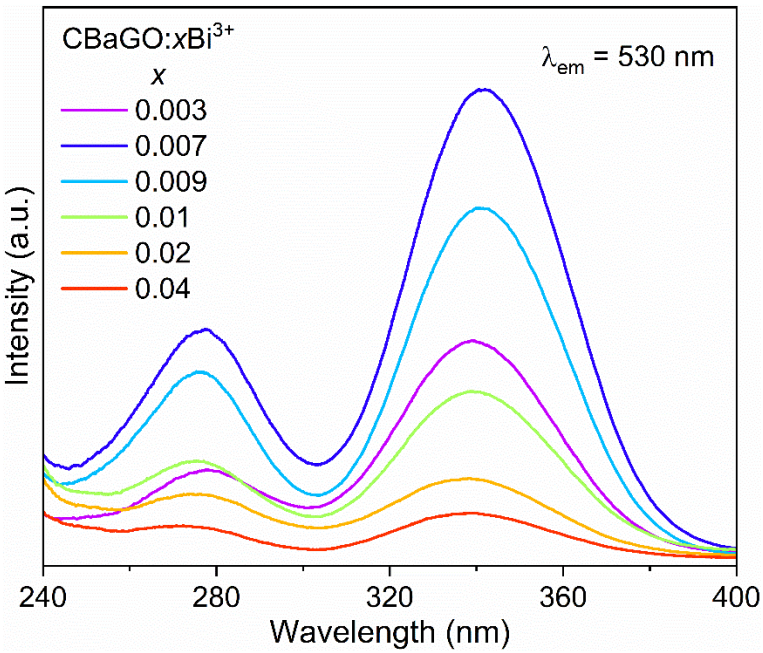

Fig. S2 PLE spectra of $CaBaGa_4O_8$:$x$$Bi^{3+}$ recorded with λ_{em} = 530 nm.

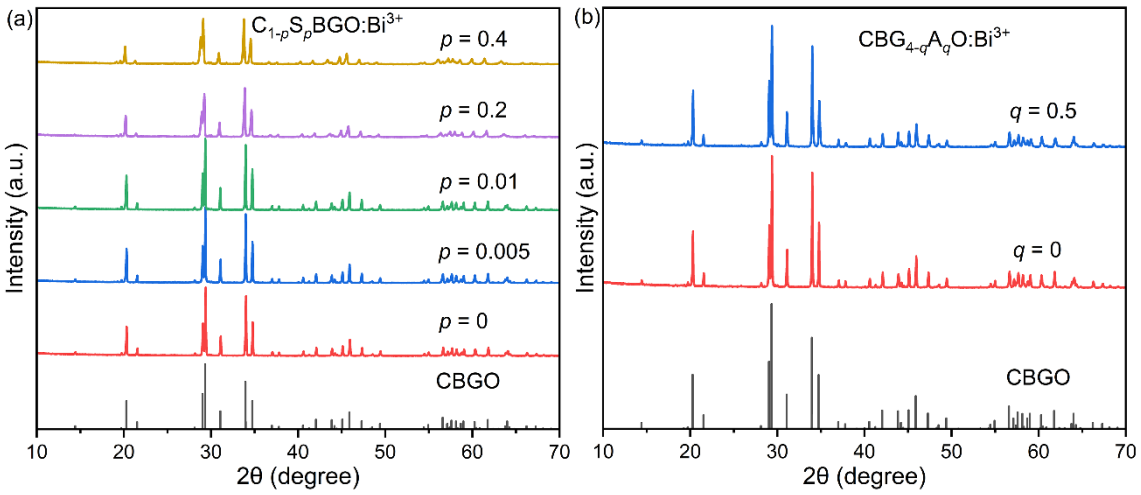

Fig. S3 XRPD patterns for $Ca_{1-p}Sr_pBaGa_4O_8:0.007Bi^{3+}$ ($C_{1-p}S_pBGO:Bi^{3+}$) (a) and $CaBaGa_{4-q}Al_qO_8:0.007Bi^{3+}$ ($CBG_{4-q}A_qO: Bi^{3+}$) (b).

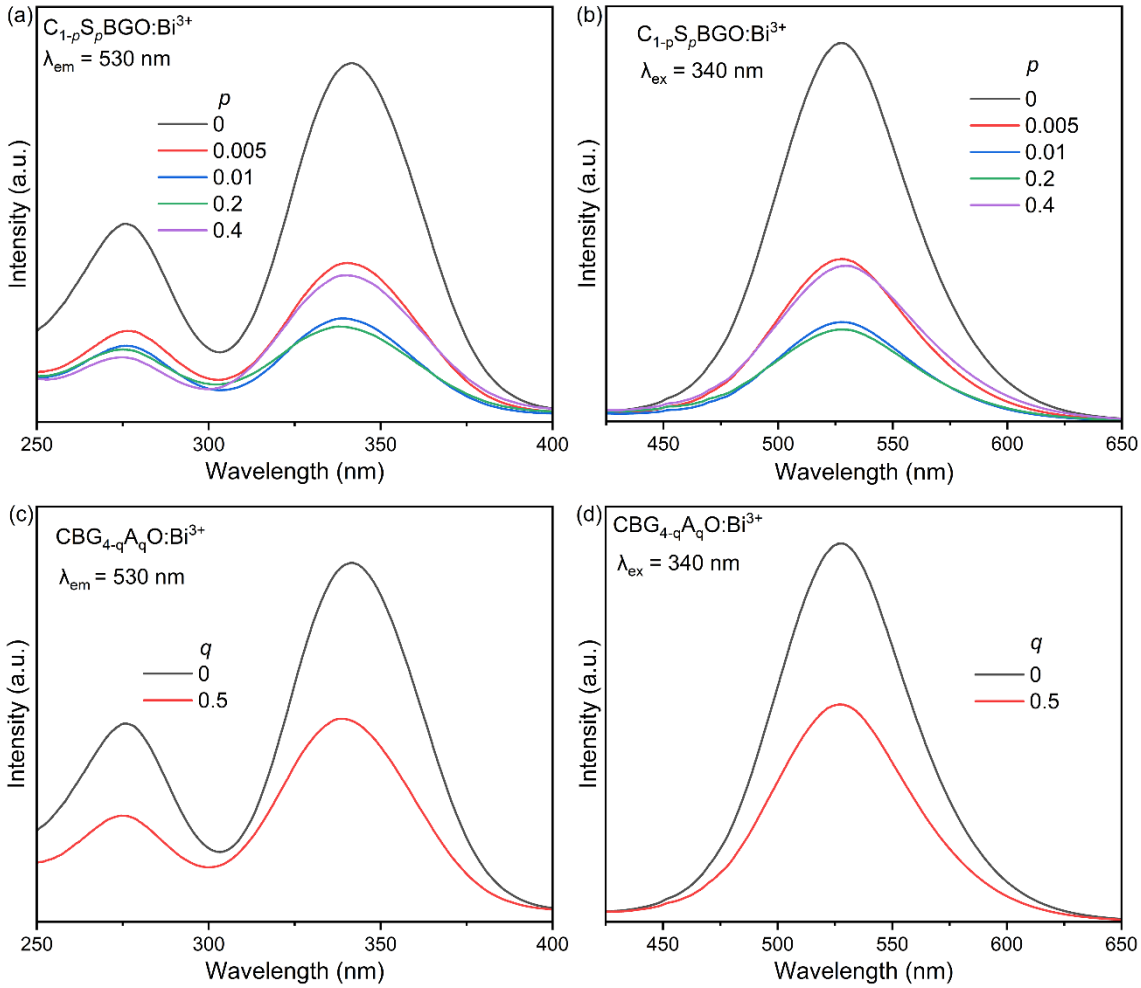

Fig. S4 PLE and PL spectra for $C_{1-p}S_pBGO:Bi^{3+}$ (a, b) and $CBG_{4-q}A_qO: Bi^{3+}$ (c, d).

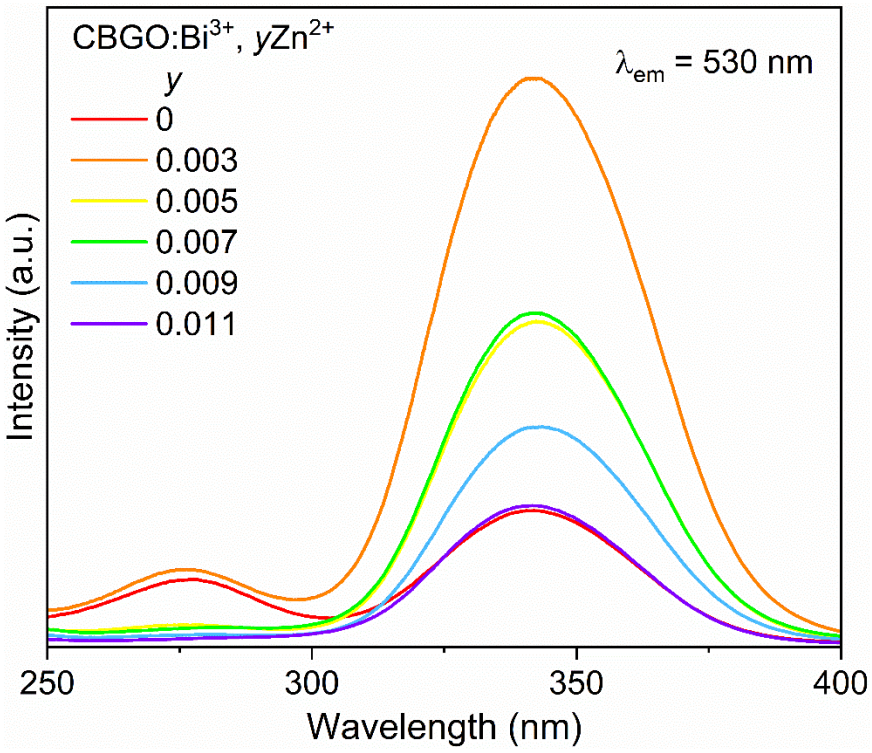

Fig. S5 PLE spectra of CBGO:Bi^{3+}, yZn^{2+} recorded with λ_{em} = 530 nm.

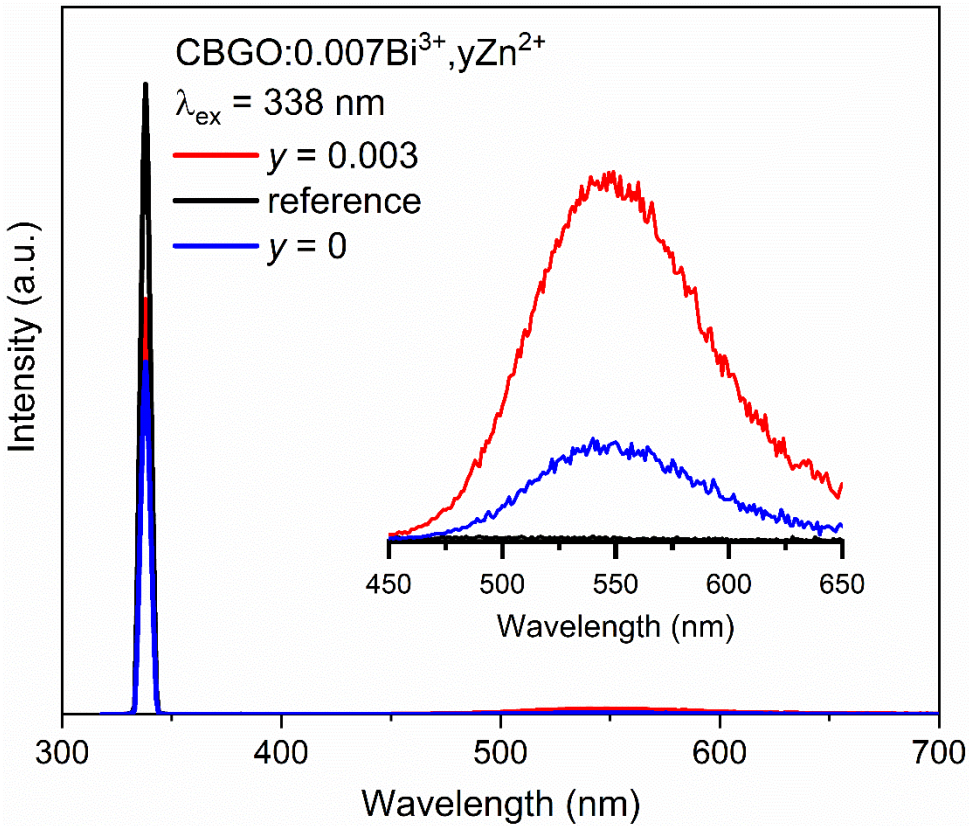

Fig. S6 The optical spectra of CBGO:0.007Bi^{3+}, yZn^{2+} with y = 0 and 0.003 phosphors recorded by the quantum efficiency system under the excitation wavelength of 340 nm. The black lines in the figures represents the reflectance of the $BaSO_4$ standard.

Table S1 Atomic coordinates, site occupancy factor (*sof.*), isotropic thermal displacement factors for $CaBaGa_4O_8:0.01Bi^{3+}$ and $CaBaGa_4O_8:0.007Bi^{3+}$, $0.003Zn^{2+}$ obtained from Rietveld refinements against high-resolution Cu $K_{\alpha1}$ XRPD data.

$CaBaGa_4O_8:0.01Bi^{3+}$						
Atom	site	*x*	*y*	*z*	*sof.*	Beq. (Å^2)
Ca	2a	0	0.5	0.4258(5)	0.99	1.3(1)
Bi	2a	0	0.5	0.4258(5)	0.01	1.3(1)
Ba	2a	0	0	0	1	0.98(3)
Ga	8e	0.29176(9)	0.16730(9)	0.4516(3)	1	0.64(2)
O1	8e	0.2957(6)	0.1655(6)	0.0924(9)	1	0.7(1)
O2	4d	0	0.3288(7)	0.077(1)	1	0.4(1)
O3	4c	0.1891(9)	0	0.566(1)	1	1.0(2)
$CaBaGa_4O_8:0.007Bi^{3+},0.003Zn^{2+}$						
Atom	site	*x*	*y*	*z*	*sof.*	Beq. (Å^2)
Ca	2a	0	0.5	0.4261(6)	0.993	1.2(1)
Bi	2a	0	0.5	0.4261(6)	0.007	1.2(1)
Ba	2a	0	0	0	1	0.97(3)
Ga/Zn	8e	0.2919(1)	0.1671(1)	0.4519(3)	0.997/0.003	0.68(3)
O1	8e	0.2954(7)	0.1674(7)	0.092(1)	1	0.5(1)
O2	4d	0	0.3289(9)	0.078(2)	1	0.3(1)
O3	4c	0.191(1)	0	0.564(2)	1	0.7(2)

Table S2 Selected interatomic distances in $CaBaGa_4O_8:0.01Bi^{3+}$ and $CaBaGa_4O_8:0.007Bi^{3+},0.003Zn^{2+}$ obtained from Rietveld refinements against high-resolution Cu $K_{\alpha1}$ XRPD data.

$CaBaGa_4O_8:0.01Bi^{3+}$					
bond	length (Å)	bond	length (Å)	bond	length (Å)
Ga−O2	1.837(3)	Ca−O2 × 2	2.393(7)	Ba−O3 × 2	2.732(7)
Ga−O1	1.849(5)	Ca−O1 × 4	2.430(5)	Ba−O1 × 4	2.917(5)
Ga−O1	1.854(5)			Ba−O2 × 4	3.053(6)
Ga−O3	1.854(4)			Ba−O3 × 4	3.309(7)
$CaBaGa_4O_8:0.007Bi^{3+},0.003Zn^{2+}$					
bond	length (Å)	bond	length (Å)	bond	length (Å)
Ga−O2	1.835(6)	Ca−O2 × 2	2.389(8)	Ba−O3 × 2	2.749(9)
Ga−O1	1.837(3)	Ca−O1 × 4	2.442(6)	Ba−O1 × 4	2.923(6)
Ga−O1	1.857(6)			Ba−O2 × 4	3.055(8)
Ga−O3	1.842(5)			Ba−O3 × 2	3.309(9)