

## Supporting Information

### Investigation on photoluminescence and long persistent luminescence at extremely low temperature of BaGa<sub>2</sub>O<sub>4</sub>:Bi<sup>3+</sup>

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**Table S1** Rietveld refinement and lattice parameters of BaGa<sub>2</sub>O<sub>4</sub>:0.02Bi<sup>3+</sup>.

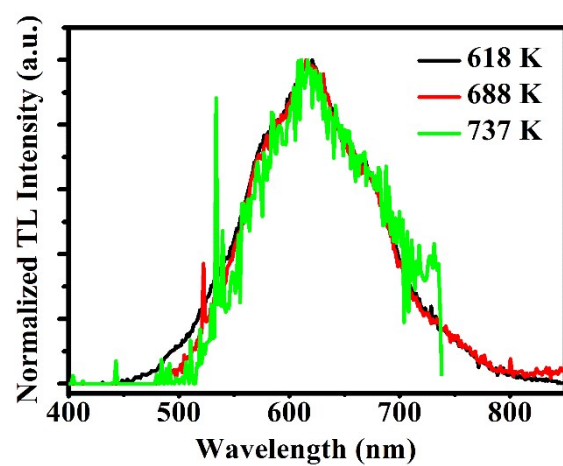
Formula	BaGa <sub>2</sub> O <sub>4</sub> :0.02Bi <sup>3+</sup>
Space group	P-63(173)
a = b (Å)	18.624645
c (Å)	8.658551
$\alpha = \beta$	90
$\gamma$	120
Units, Z	24
V (Å <sup>3</sup> )	2601.096
R <sub>p</sub> (%)	7.51
R <sub>wp</sub> (%)	9.82
$\chi^2$	3.252

**Table S2** Lattice parameters and atom positions BaGa<sub>2</sub>O<sub>4</sub>:0.02Bi<sup>3+</sup>.

NO.	Element	Sites	x	y	z	Occ.	U
1	Ba	Ba1	0	0	0.18533	1	0.04
2	Ba	Ba2	0.16163	0.8284	0.16038	1	0.024
3	Ba	Ba3	0.32882	0.18843	0.16906	1	0.024
4	Ba	Ba4	0.33333	0.66667	0.15732	1	0.029
5	Ba	Ba5	0.33333	0.66667	0.64893	1	0.033
6	Ba	Ba6	0.4859	-0.00226	0.67502	1	0.043
7	Ga	Ga1	0.15784	0.16563	0.46937	1	0.006
8	Ga	Ga2	0.17406	0.01851	0.36792	1	-0.005
9	Ga	Ga3	0.33429	0.00578	0.36694	1	0.008
10	Ga	Ga4	0.33333	0.00182	-0.04029	1	0.021
11	Ga	Ga5	0.32733	0.82832	-0.0299	1	0.025
12	Ga	Ga6	0.34499	0.82721	0.36474	1	0.027
13	Ga	Ga7	0.50081	0.16409	-0.03257	1	0.041
14	Ga	Ga8	0.49557	0.16533	0.3612	1	0.063
15	O	O1	0.38792	0.77105	0.86908	1	-0.053
16	O	O2	0.10239	0.8948	0.36382	1	-0.042
17	O	O3	0.10189	0.04465	0.43708	1	0.016
18	O	O4	0.21856	-0.03854	-0.07896	1	0.005
19	O	O5	0.24277	0.00741	0.45275	1	-0.062
20	O	O6	0.26886	0.74393	0.3369	1	0.119
21	O	O7	0.15499	0.06666	0.14897	1	-0.004
22	O	O8	0.27946	0.88856	0.42785	1	-0.052
23	O	O9	0.55359	-0.04456	0.55077	1	0.231
24	O	O10	0.37883	-0.06046	0.87409	1	-0.08
25	O	O11	0.35939	0.83754	-0.02028	1	-0.018
26	O	O12	0.31021	0.14564	0.90198	1	-0.048
27	O	O13	0.42488	0.5657	0.48466	1	-0.057
28	O	O14	0.48343	0.1758	0.14576	1	-0.012
29	O	O15	0.33746	0.01351	0.1297	1	0.025
30	O	O16	0.33333	0.17457	0.54658	1	-0.06

**Table S3** Fitting parameters of TL spectra.

Traps	Peak Position	Peak Height	Peak Area
1	185.24	692765	1.51E+07
2	401.377	9.92E+06	5.14E+08
3	475.068	6.97E+06	5.02E+08
4	596.553	1.52E+06	1.78E+08
5	687.731	784599	9.98E+07



**Fig. S1** TL spectra monitored at 618, 688 and 737 K.