

### Support information

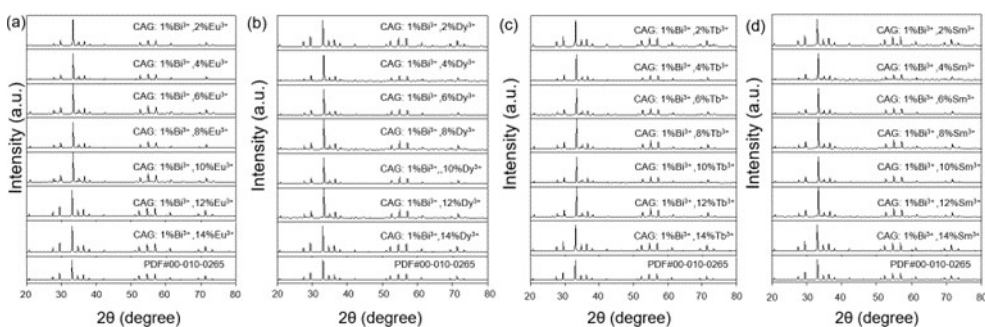


Fig.S1 (a-d) XRD pattern of CAG: 1.0%Bi<sup>3+</sup>/x%Ln<sup>3+</sup> (Ln = Eu, Tb, Dy, Sm) phosphor and standard card (PDF#00-010-0265).

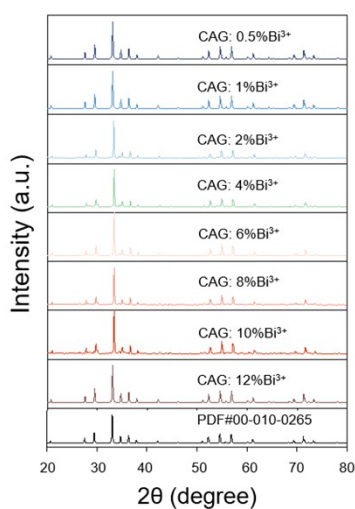


Fig.S2 (a-d) XRD pattern of CAG: 1.0%Bi<sup>3+</sup> phosphor and standard card (PDF#00-010-0265).

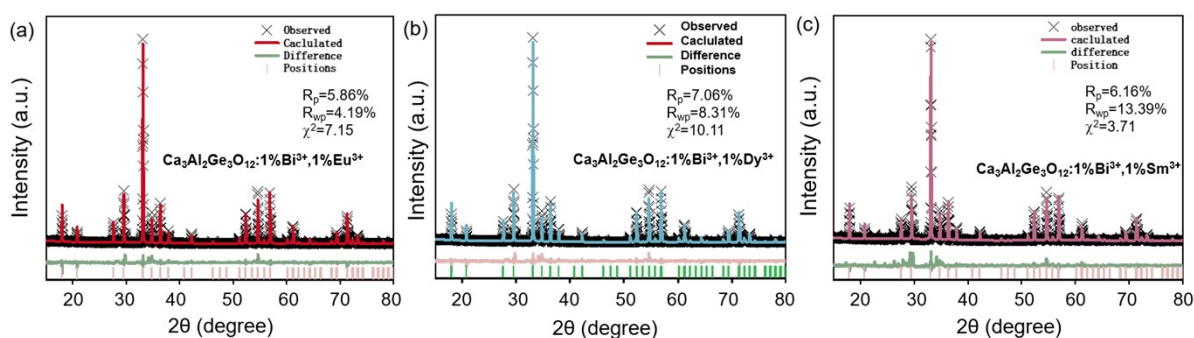


Fig.S3 The refinement XRD patterns of CAG:1%Dy<sup>3+</sup>, 1%Eu<sup>3+</sup>/Dy<sup>3+</sup>/Sm<sup>3+</sup>(a-c).

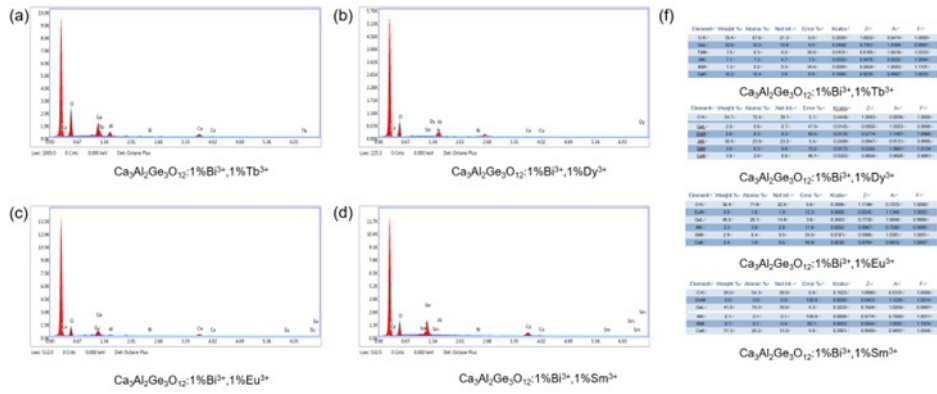


Fig.S4 (a-d) EDS spectrum of CAG: 1.0%Bi<sup>3+</sup>/1%Ln<sup>3+</sup> (Ln = Eu, Tb, Dy, Sm), (f) the weight and atomic percentage.

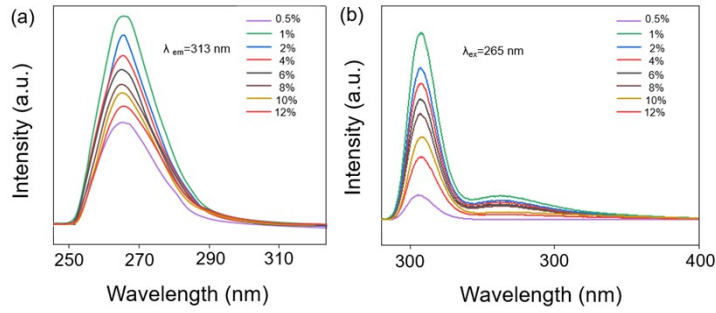


Fig.S5 (a) PLE and (b) PL spectra of CAG:  $x\text{Bi}^{3+}$  ( $x=0.5\%-12\%$ ,  $\lambda_{\text{em}} = 313\text{ nm}$ ,  $\lambda_{\text{ex}} = 265\text{ nm}$ ).

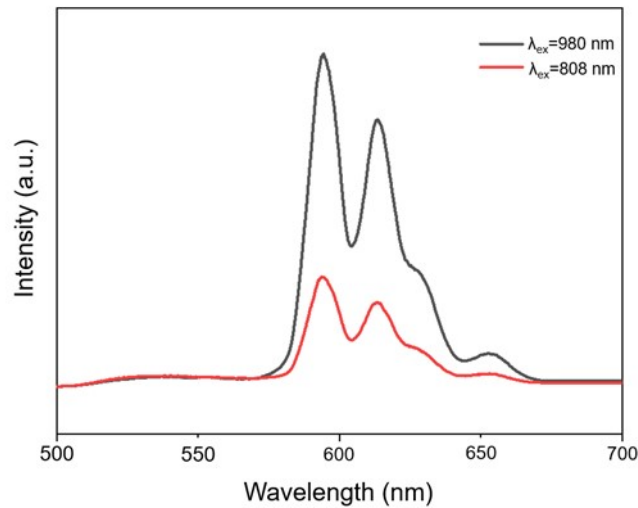


Fig.S6 PSL spectra upon 808 nm and 980 nm laser irradiation (0.7 W).

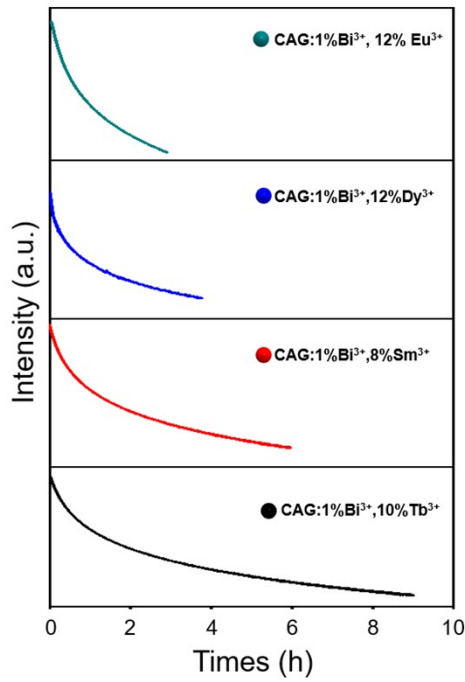


Fig.S7 CAG:1%B $^{3+}$ /xLn $^{3+}$ (x=12%Eu $^{3+}$ , 12%Dy $^{3+}$ , 8%Sm $^{3+}$ , 10%Tb $^{3+}$ ) afterglow duration under UV lamp irradiation.

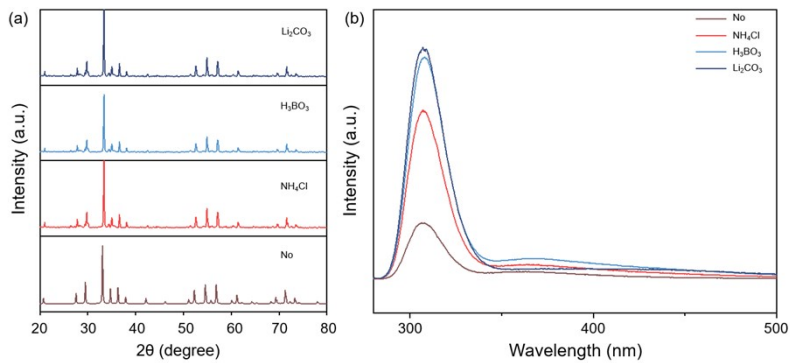


Fig. S8. (a) XRD patterns and (b) PersL spectra of CAG:1%B $^{3+}$  after adding different kinds of fluxes.

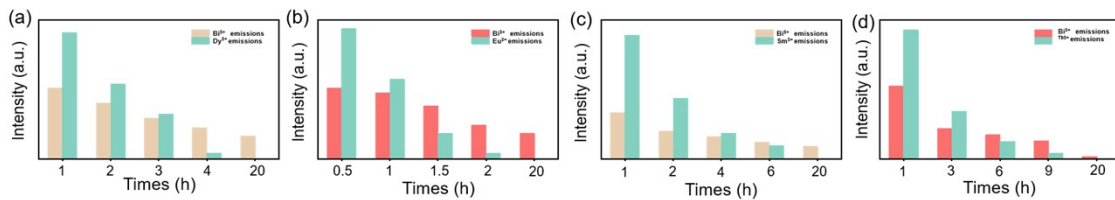


Fig.S9 (a) CAG: 1.0% Bi $^{3+}$ /x% Ln $^{3+}$  (Ln=Eu, Tb, Dy, Sm) afterglow emission intensity comparison at different times.

Table S1 Commission International de l'Eclairage (CIE) for CAG: 1.0% Bi<sup>3+</sup>/x% Ln<sup>3+</sup> (Ln =Eu, Tb, Dy, Sm) chromaticity coordinates column at different concentrations.

Temperature	1.0%Bi <sup>3+</sup> /	1.0%Bi <sup>3+</sup> /	1.0%Bi <sup>3+</sup> /	1.0%Bi <sup>3+</sup> /
	0.5%Tb <sup>3+</sup>	0.5%Eu <sup>3+</sup>	0.5%Dy <sup>3+</sup>	0.5%Sm <sup>3+</sup>
1%	(0.1675,0.1817)	(0.2127,0.0927)	(0.1729,0.1339)	(0.2163,0.2674)
2%	(0.1876,0.2133)	(0.2442,0.1053)	(0.2011,0.1511)	(0.2451,0.2775)
4%	(0.2054,0.2437)	(0.2828,0.1075)	(0.2134,0.1644)	(0.2611,0.2889)
6%	(0.2471,0.3784)	(0.3473,0.1231)	(0.2348,0.1958)	(0.3024,0.3017)
8%	(0.2502,0.4011)	(0.3875,0.1311)	(0.2481,0.2238)	(0.3612,0.3147)
10%	(0.2534,0.4326)	(0.4122,0.1384)	(0.2597,0.2318)	(0.3789,0.3262)
12%	(0.2746,0.4744)	(0.4785,0.1482)	(0.2878,0.2575)	(0.4149,0.3365)
14%	(0.2783,0.4934)	(0.5668,0.1778)	(0.2978,0.2862)	(0.4270,0.3456)