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Supporting Information

Alloying Strategy for Developing a Single-Band Warm White Emitting Material $Cs_2NaGdCl_6$:Bi^{3+} via Ag^+ Co-Doping

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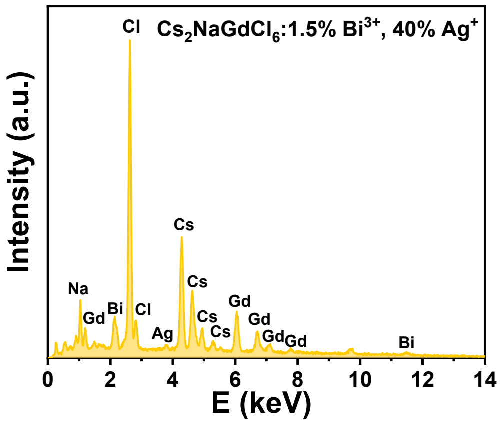

Fig. S1 X-ray energy dispersive spectroscopy (EDS) spectrum of CNAGC:Bi^{3+} measured by EDS using a JEOL 2100F high-resolution transmission electron microscope equipped with an energy-dispersive X-ray detector, operating at an accelerating voltage of 200 kV.

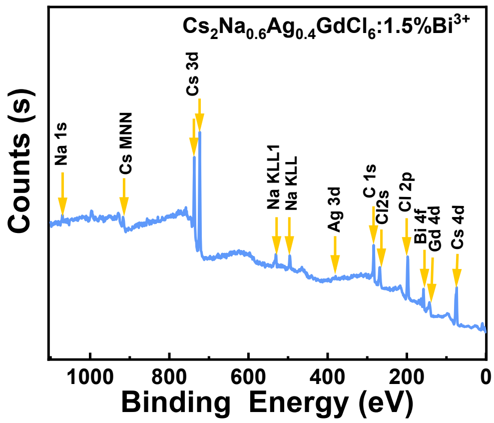

Fig. S2 XPS full spectrum of CNAGC:Bi^{3+}.

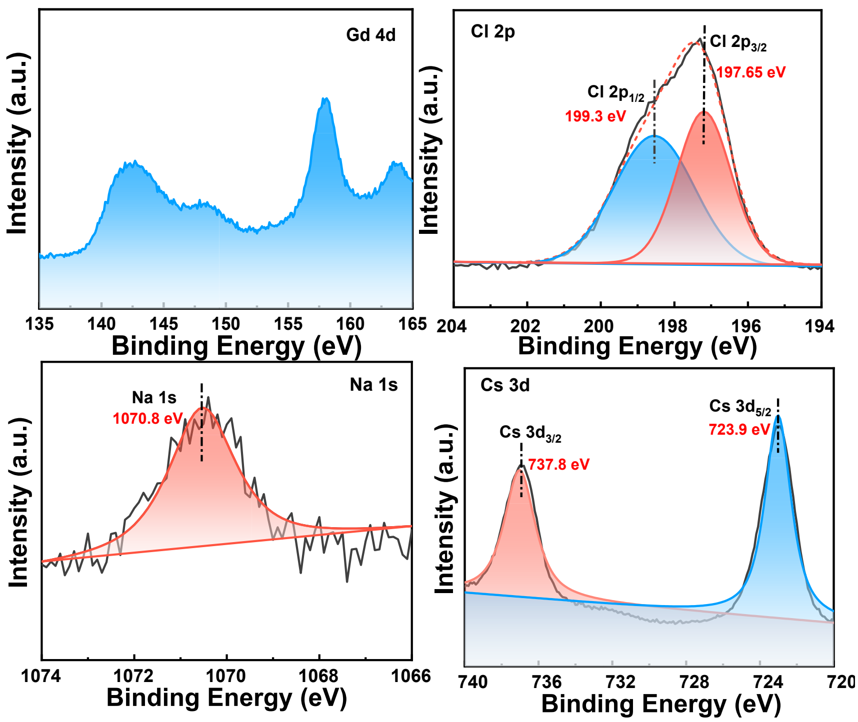

Fig. S3 High-resolution XPS full spectra of Gd 4d, Cl 2p, Cs 3d, and Na 1s for CNAGC:Bi^{3+}.

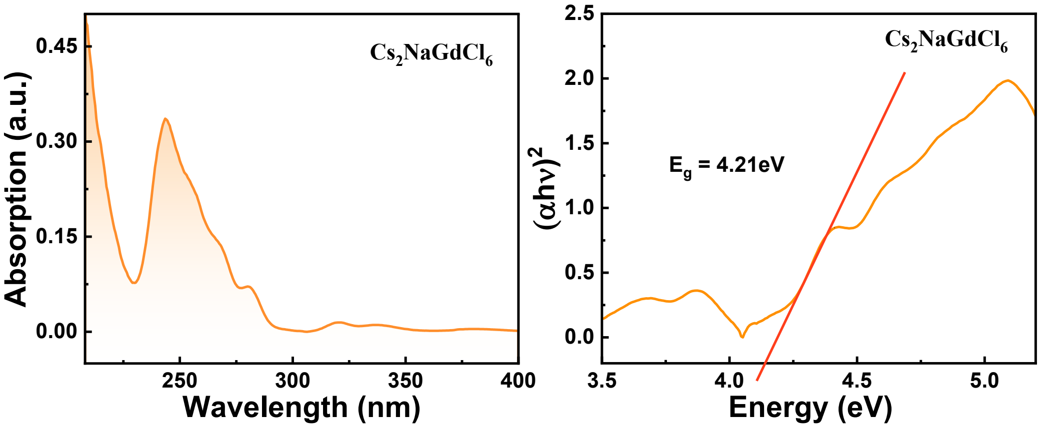

Fig. S4 The UV-vis absorption and bandgap of primitive CNGC host matrix.

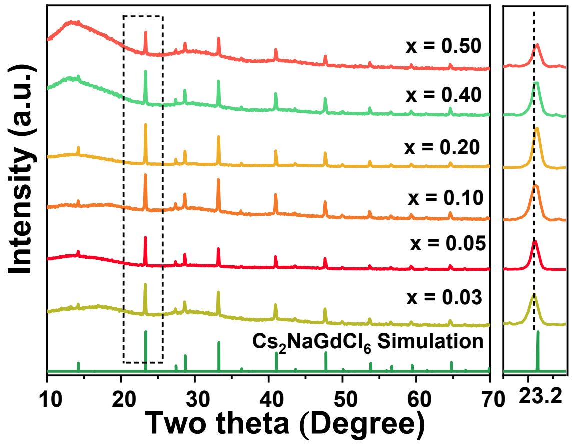

Fig. S5 The XRD patterns of $Cs_2Na_{1-x}Ag_xGdCl_6$ with various Ag^+ ions concentrations.

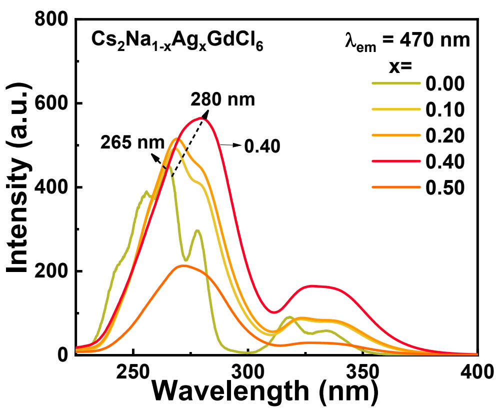

Fig. S6 PLE spectra of $Cs_2Na_{1-x}Ag_xGdCl_6$ with various x values.

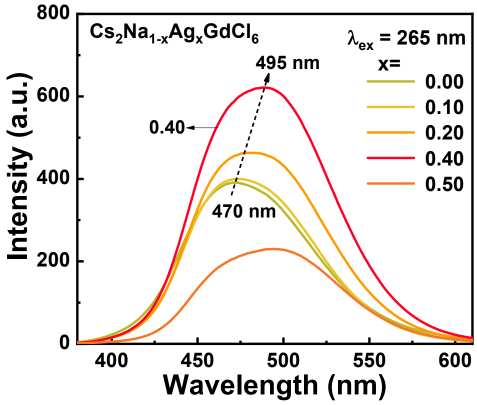

Fig. S7 PL spectra of $Cs_2Na_{1-x}Ag_xGdCl_6$ with various x values.

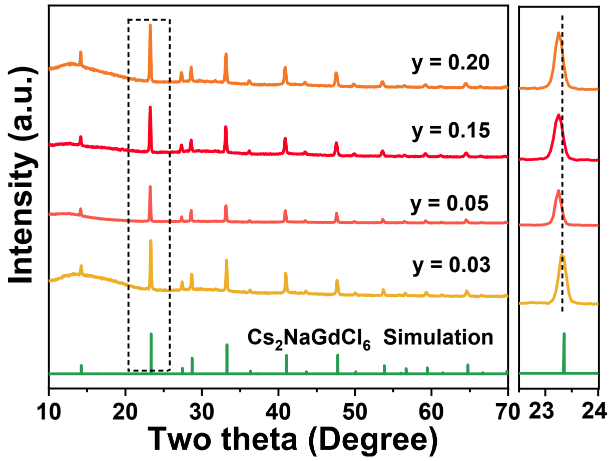

Fig. S8 The XRD patterns of $Cs_2NaGd_{1-y}Bi_yCl_6$ with various Bi^{3+} ions concentrations.

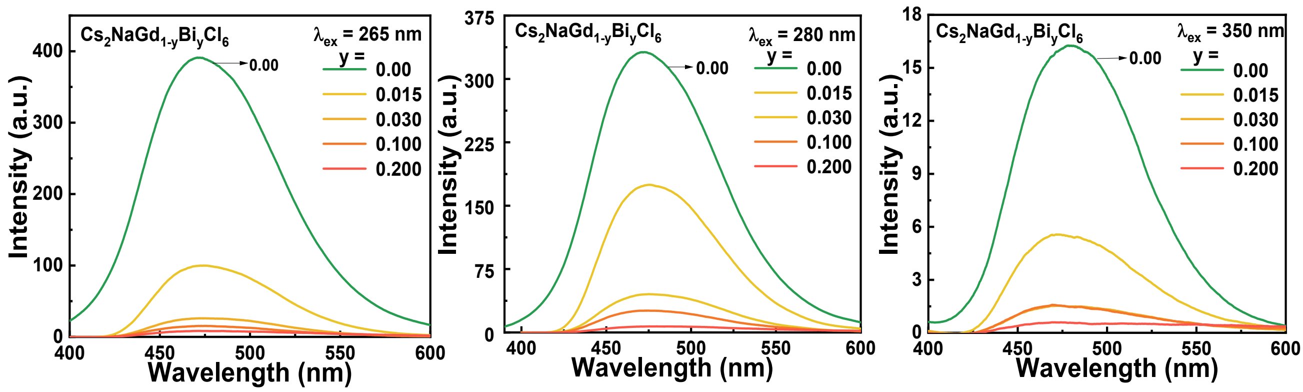

Fig. S9 PL spectra of $Cs_2NaGd_{1-y}Bi_yCl_6$ changes with different y values under different excitation.

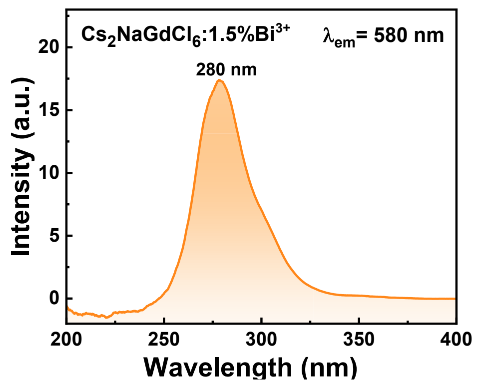

Fig. S10 PLE spectrum of CNGC:Bi^{3+}.

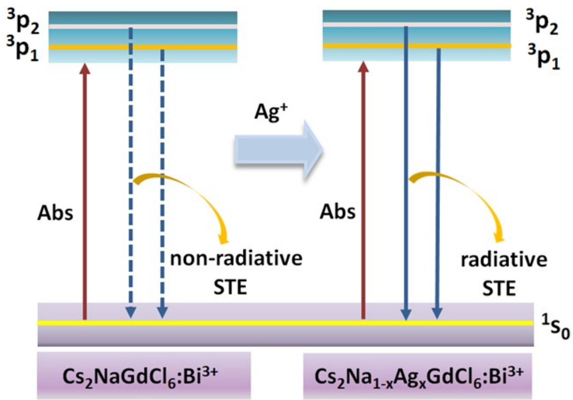

Fig. S11 The PL mechanism of Ag^{+}-doped CNGC:Bi^{3+}.

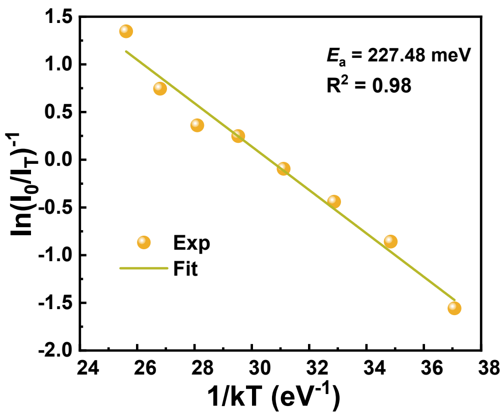

Fig. S12 The relationship between $\ln(I_0/I_T)^{-1}$ and 1/kT of CNGC:Bi^{3+}.

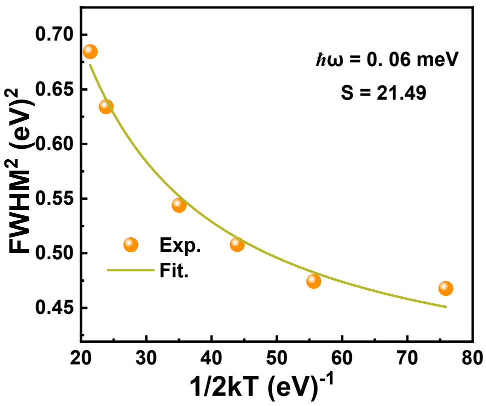

Fig. S13 The FWHM as a function of temperature for CNGC:Bi^{3+}.

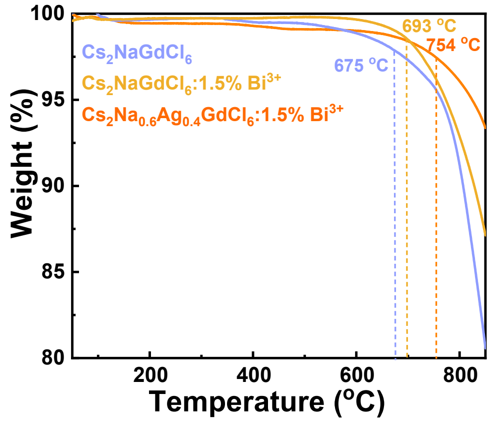

Fig. S14 Thermal gravimetric analysis (TGA) curves measured from room temperature to 900 °C at the heating rate of 10 °C min^{-1} on a synchronous thermal analyzer (TGA/DSC, Mettler, Switzerland).