Electronic Supplementary Information

Efficient Emission in Copper-doped Cs_3ZnX_5 (X = Cl, I) for white LED and X-ray Scintillator

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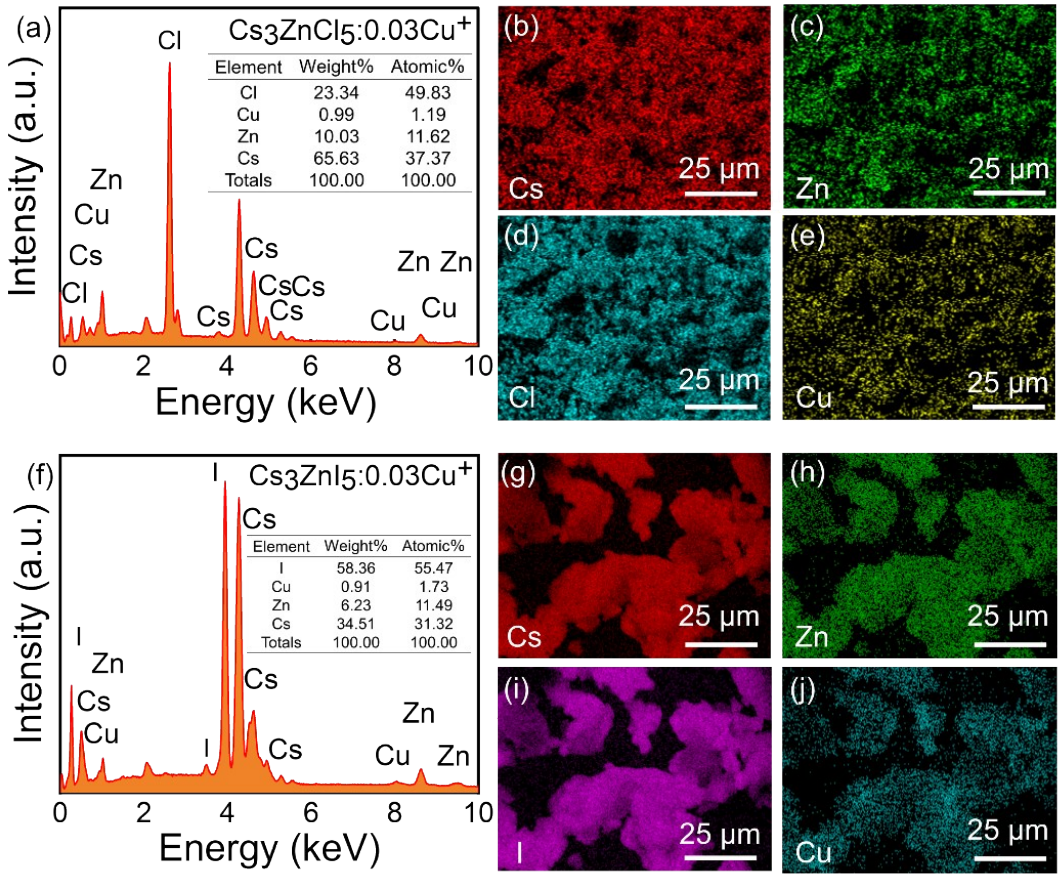

Fig. S1 (a) EDS spectra of $Cs_3Zn_{0.97}Cu_{0.03}Cl_{4.97}$. (b-e) Elemental mapping of one representative particle of sample $Cs_3Zn_{0.97}Cu_{0.03}Cl_{4.97}$. (f) EDS spectra of $Cs_3Zn_{0.97}Cu_{0.03}I_{4.97}$. (g-j) Elemental mapping of one representative particle of sample $Cs_3Zn_{0.97}Cu_{0.03}I_{4.97}$.

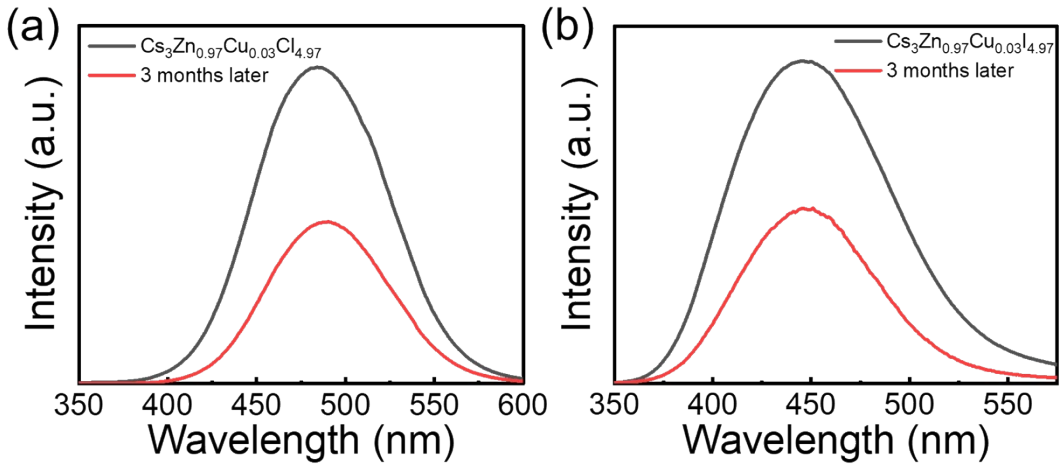

Fig. S2 PL spectra of original crystals (a) $Cs_3Zn_{0.97}Cu_{0.03}Cl_{4.97}$, (b) $Cs_3Zn_{0.97}Cu_{0.03}I_{4.97}$, and the corresponding crystals after storage in air for three months.

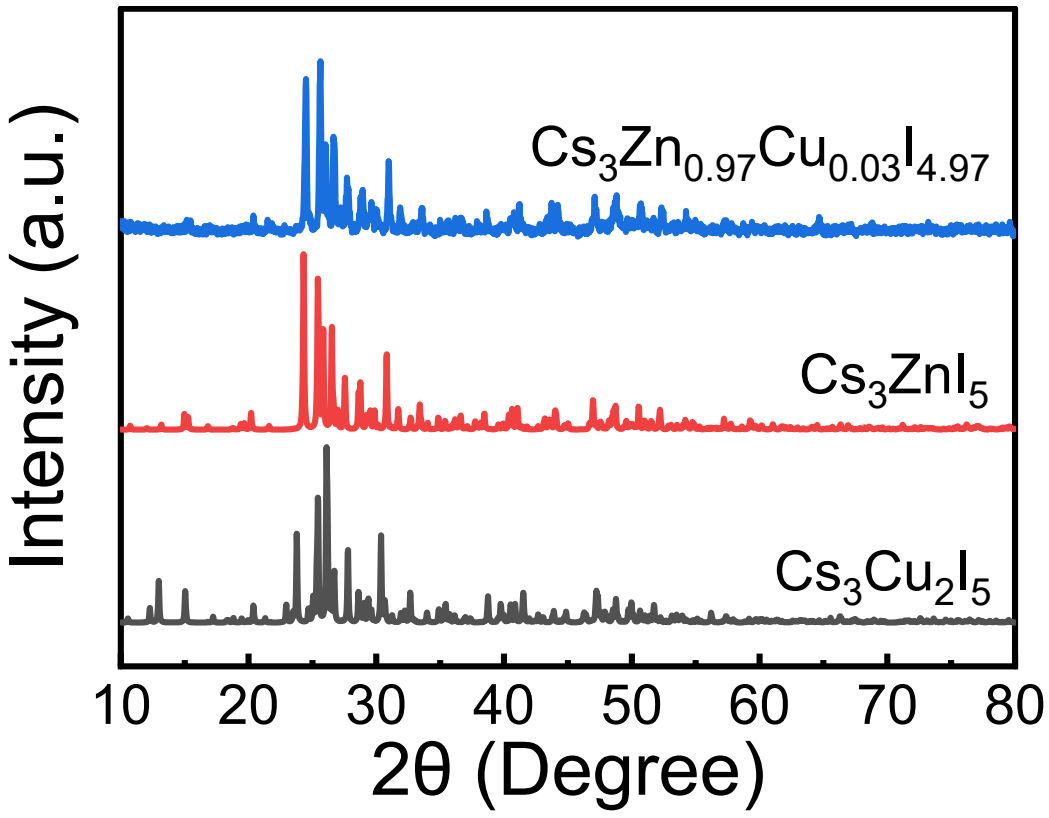

Fig. S3 XRD pattern of $Cs_3Zn_{0.97}Cu_{0.03}I_{4.97}$ compared with $Cs_3Cu_2I_5$ and Cs_3ZnI_5.

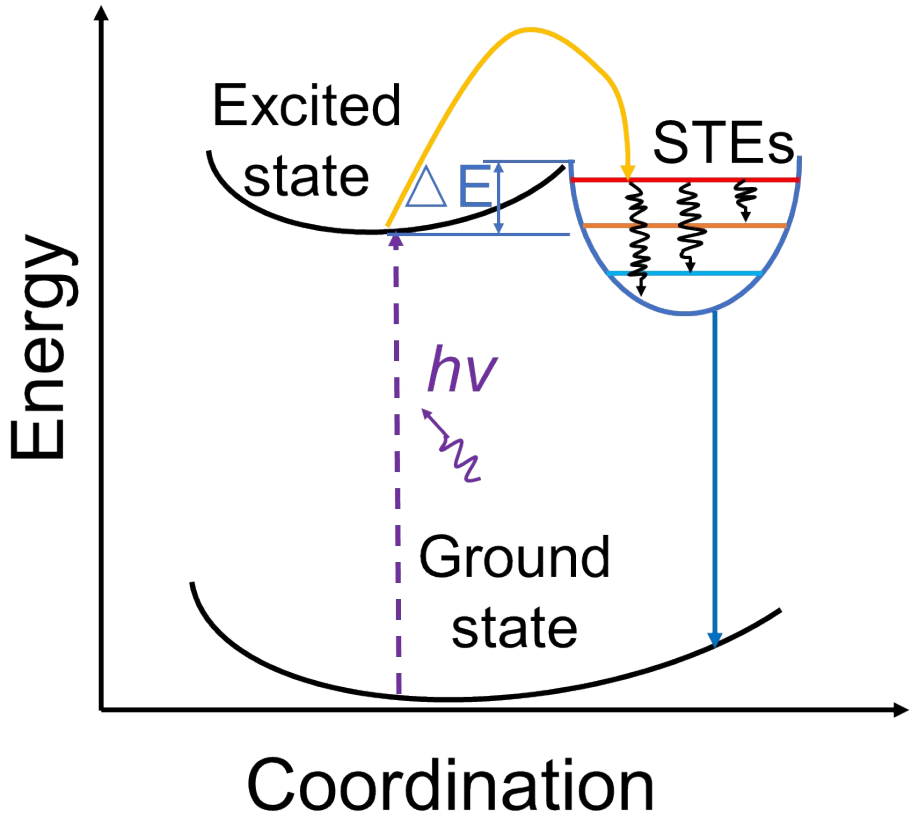

Fig. S4 Schematic diagram of luminescence mechanism of copper-doped Cs_3ZnX_5 (X = Cl, I) series ($Cs_3Zn_{1-x}Cu_xX_{5-x}$ (x = 0 – 0.15))

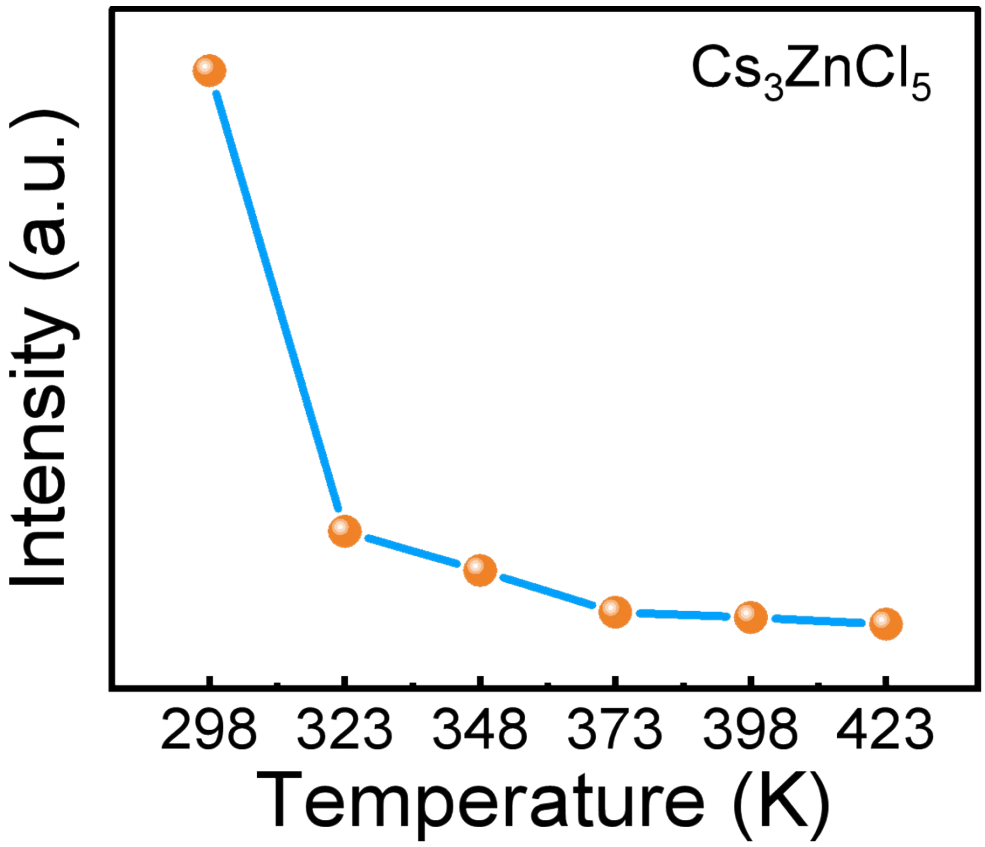

Fig. S5 Variation of the emission intensity for Cs_3ZnCl_5 with temperature.

Table S1 Photoluminescence excitation (PLE), full width at half maximum (FWHM), quantum efficiency (PLQY), and chromaticity coordinates (x, y) of phosphors.

Sample no.	composition	λ_{exc}(nm)	FWHM	PLQY(%)	CIE(x,y)
1	$Cs_3Zn_{0.97}Cu_{0.03}Cl_{4.97}$	265	120	90.2	(0.1494, 0.2821)
2	$Cs_3Zn_{0.97}Cu_{0.03}I_{4.97}$	310	70	11.6	(0.1514, 0.1215)
3	CASN:Eu^{2+}	440	60	96.0	(0.6470, 0.3470)
4	White-light LED	Ra = 92.7	CCT = 4236 K		(0.3464, 0.2706)