Supporting Information

Lead-free halide $Cs_2MnCl_4:Cu^+$ as a new phosphor for efficient green light emission

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Table S1 Inductively coupled plasma optical emission spectrometer (ICP-OES) results of $Cs_2Mn_xCu_{1-x}Cl_4$.

Sample Labels	Mn (mg/L)	Cu (mg/L)	The ratio of Mn to Cu (mol)
Cs_2MnCl_4	219.343	0	/
$Cs_2Mn_{0.9}Cu_{0.1}Cl_4$	278.117	32.907	1:0.102

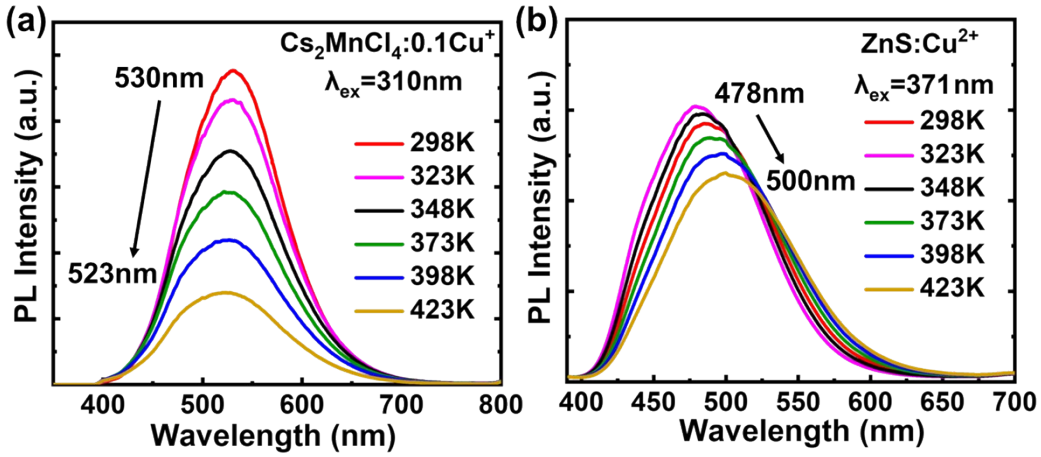

Fig. S1 :(a) Temperature-dependent PL spectra of $Cs_2MnCl_4:Cu^+$. (b) Temperature-dependent PL spectra of $ZnS:Cu^{2+}$.

The thermal stability performance of $Cs_2MnCl_4:0.1Cu^+$ together and the commercially used $ZnS:Cu^{2+}$ were toke out (see Fig.R5). The PL intensity of $Cs_2MnCl_4:0.1Cu^+$ and $ZnS:Cu^{2+}$ decreases with increasing temperature, and the intensity reduces to 30% and 75% of the original intensity, respectively. Generally, the commercial used $ZnS:Cu^{2+}$ phosphor shows better thermal stability than that of $Cs_2MnCl_4:0.1Cu^+$. However, with increasing temperature, the $ZnS:Cu^{2+}$ shows obvious red-shift emission (from 478 nm-500 nm), while the $Cs_2MnCl_4:0.1Cu^+$ shows slight blue-shift emission (from 530 nm-523 nm). This result suggests that $Cs_2MnCl_4:0.1Cu^+$ will be more helpful in helping the light source achieve stable light output rather than chromaticity drift when used in LEDs