

Supporting Information

Multicolor luminescence of Cs₂KLuCl₆ for anti-counterfeiting and information encryption applications

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Table S1. The percentage of element content obtained from energy dispersive spectroscopy.

Atomic% Element	Cs ₂ KLuCl ₆ : 0.3%Sb ³⁺	Cs ₂ KLuCl ₆ : 10%Er ³⁺ /35%Yb ³⁺	Cs ₂ KLuCl ₆ : 0.3%Sb ³⁺ /25% Ho ³⁺
Cs	20.85	20.81	20.29
K	10.33	10.49	10.40
Lu	10.21	6.76	8.52
Cl	58.59	57.48	58.85
Sb	0.02		0.03
Ho			1.91
Er		1.18	
Yb		3.28	

Table S2. A comparison of nominal versus actual doping level in ion-doped Cs₂KLuCl₆.

actual doping Element	Cs ₂ KLuCl ₆ : 0.3%Sb ³⁺	Cs ₂ KLuCl ₆ : 10%Er ³⁺ /35%Yb ³⁺	Cs ₂ KLuCl ₆ : 0.3%Sb ³⁺ /25% Ho ³⁺
Sb	0.2% (0.3%)		0.28% (0.3%)
Ho			18.3% (25%)
Er		10.5% (10%)	
Yb		29.2% (35%)	

(The values in parentheses represent the nominal doping level.)

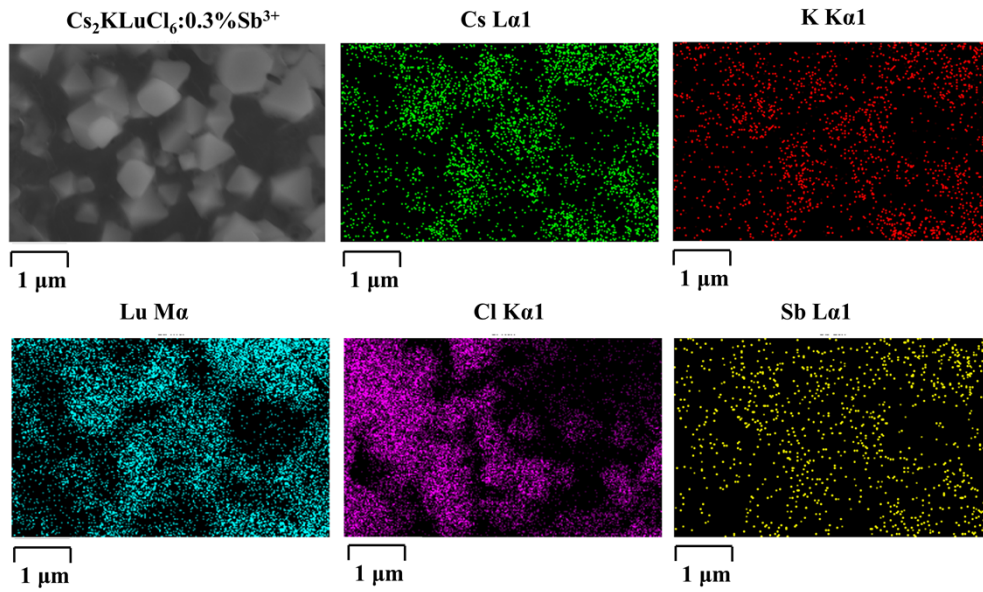


Fig. S1. SEM image and element mappings of the CKLC:0.3% Sb^{3+} .

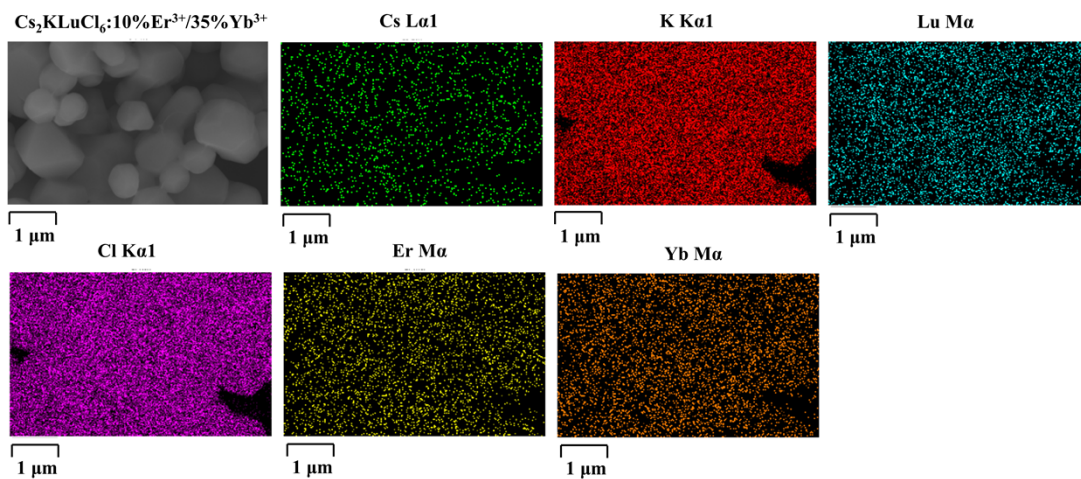


Fig. S2. SEM image and element mappings of the CKLC:10% $\text{Er}^{3+}/35\%\text{Yb}^{3+}$.

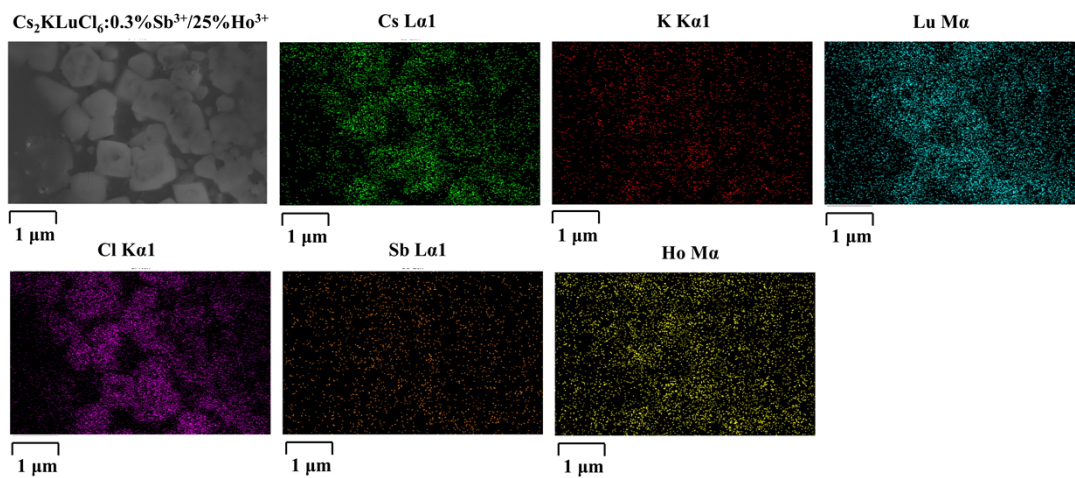


Fig. S3. SEM image and element mappings of the CKLC:0.3% $\text{Sb}^{3+}/25\%\text{Ho}^{3+}$.

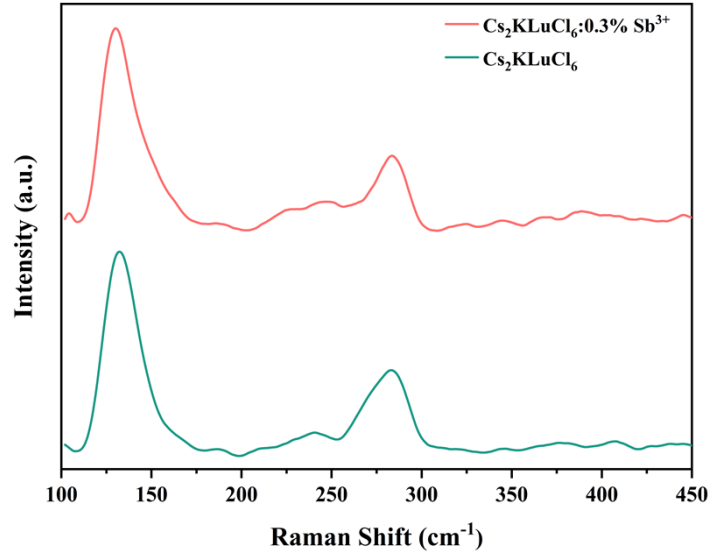


Fig. S4. The Raman spectra of CKLC and CKLC:0.3%Sb³⁺.

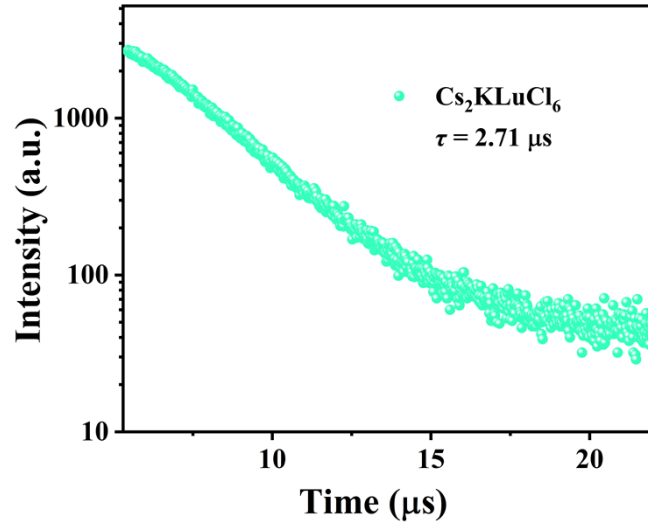


Fig. S5. Photoluminescence (PL) decay curve of CKLC monitored at 498 nm.

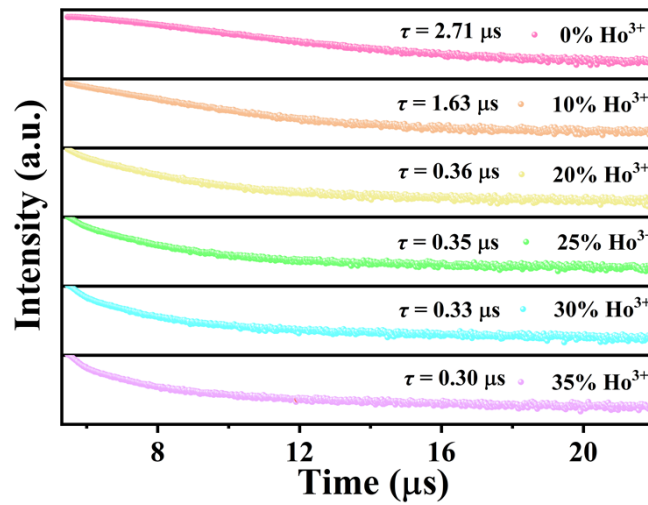


Fig. S6. PL decay curves of CKLC:0.3%Sb³⁺/y%Ho³⁺ monitored at 498 nm.

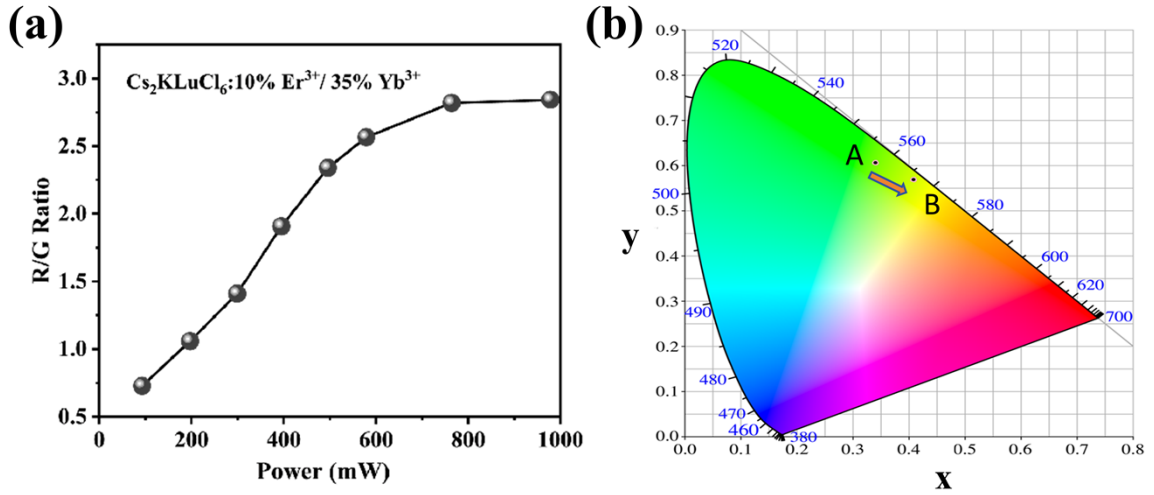


Fig. S7. (a) The R/G (red/green) ratio under different excitation power density and (b) CIE color coordinates at 93 and 978 mW excitation power of CKLC:10%Er³⁺/35%Yb³⁺.

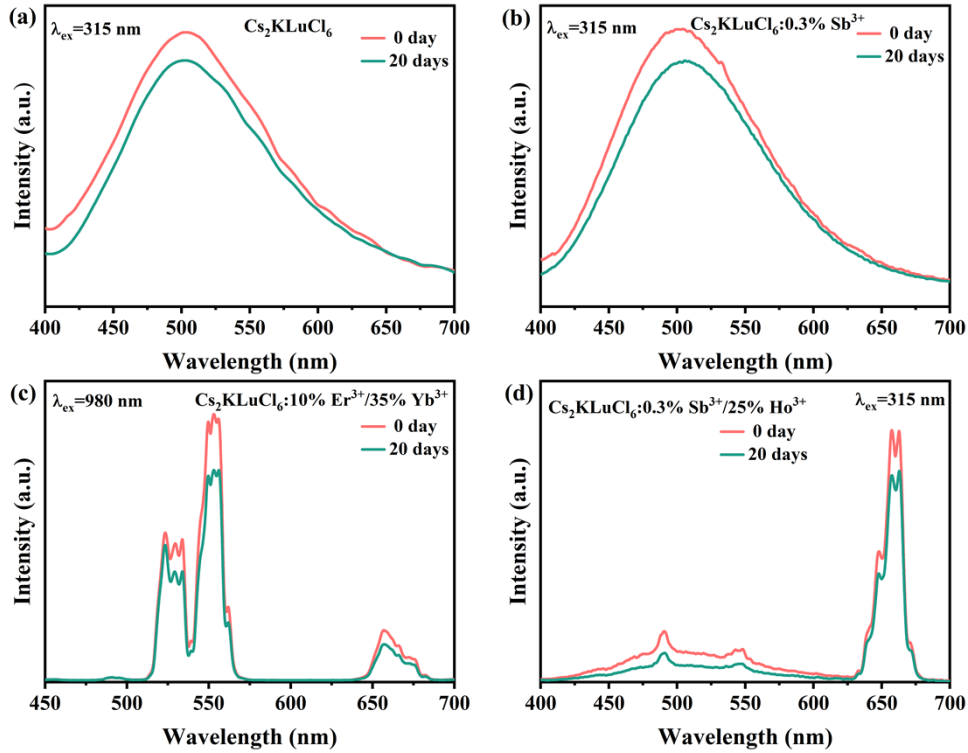


Fig. S8. The PL spectra of (a) CKLC, (b) CKLC:0.3%Sb³⁺, (c) CKLC:10%Er³⁺/35%Yb³⁺ and (d) CKLC:0.3%Sb³⁺/25% Ho³⁺ measured on day 0 and after 20 days.

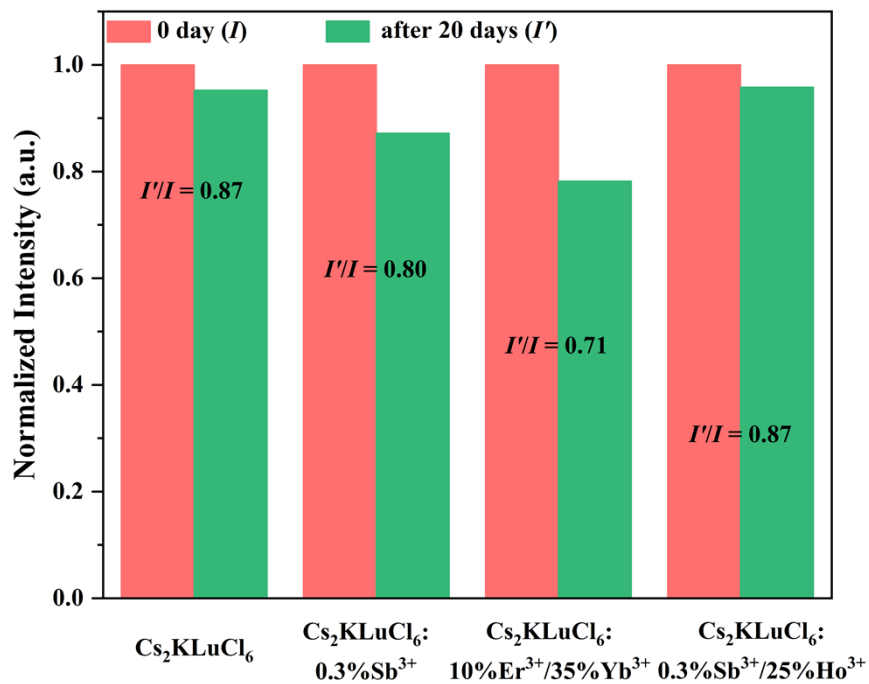


Fig. S9. The comparison of the emission intensity for (a) CKLC, (b) CKLC:0.3% Sb^{3+} , (c) CKLC:10% Er^{3+} /35% Yb^{3+} and (d) CKLC:0.3% Sb^{3+} /25% Ho^{3+} measured on day 0 and after 20 days.