Supporting Information

Stable Yellow Light-Emitting Devices Based on Ternary Copper Halides with Broadband Emissive Self-Trapped Excitons

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Crystal structure of $CsCu_2I_3$

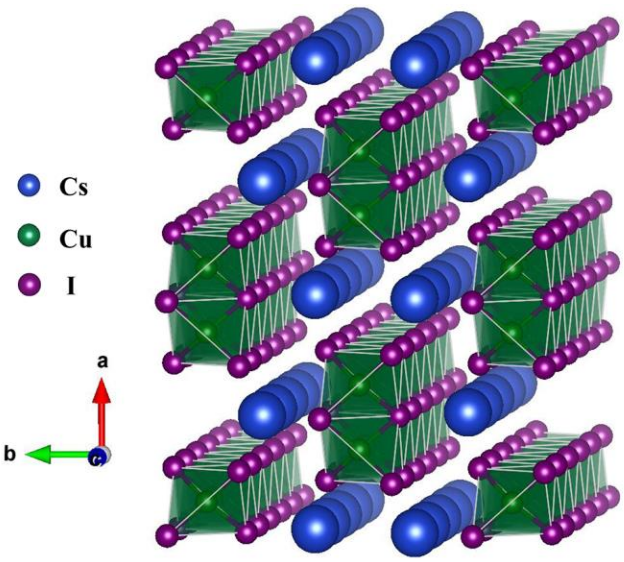

Figure S1. One-dimensional (1D) crystal structure of $CsCu_2I_3$ (blue: Cs atom; purple: I atom; green: Cu atom; dark green octahedron: Cu-I tetrahedron).

Spin-coating speed-time profile

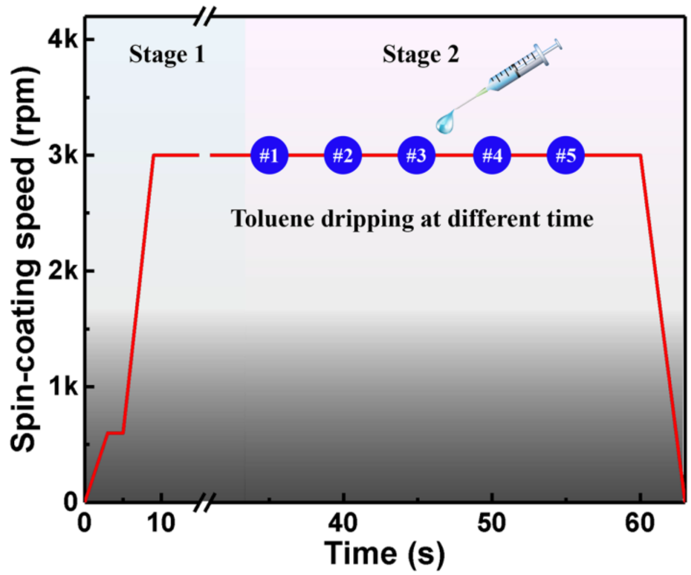

Figure S2. Spin-coating speed-time profile for preparing $CsCu_2I_3$ thin films.

Morphology of the $CsCu_2I_3$ thin films prepared without the antisolvent

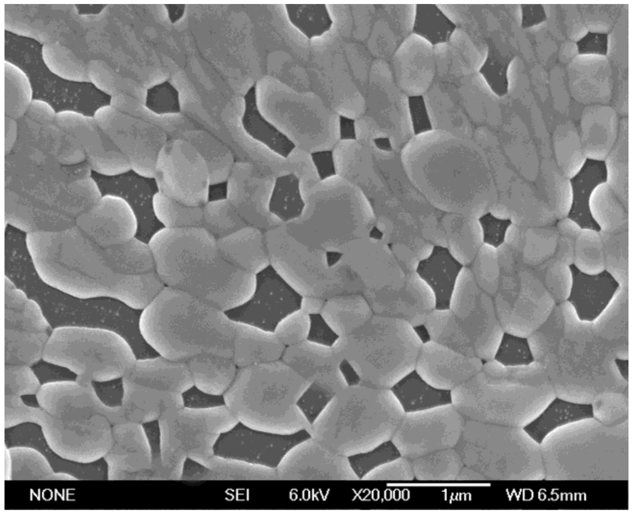

Figure S3. SEM image of the $CsCu_2I_3$ thin films prepared without toluene as the antisolvent.

Comparison on the surface roughness of five $CsCu_2I_3$ thin films samples

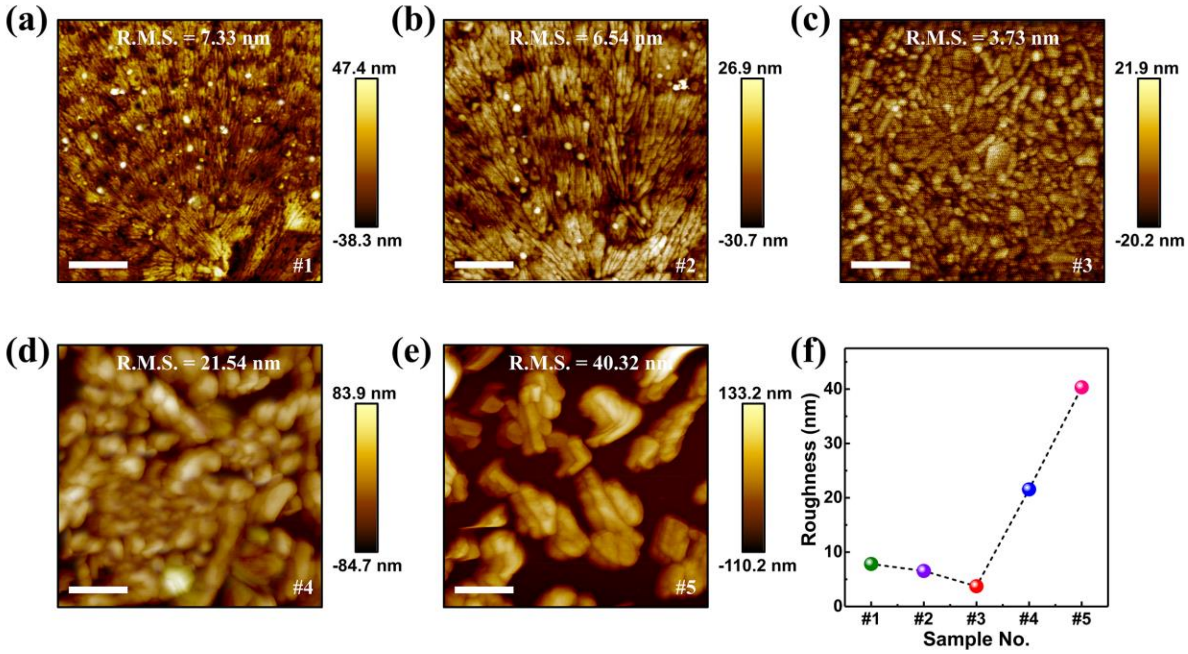

Figure S4. AFM images of the $CsCu_2I_3$ thin films prepared with different dripping time of the toluene antisolvent: (a) #1, 35 s; (b) #2, 40 s; (c) #3, 45 s; (d) #4, 50 s; (e) #5, 55 s. All scale bars are 1 µm. (f) Summary of root-mean-square roughness of the $CsCu_2I_3$ thin films prepared with different conditions.

Comparison on the PL decay behavior of five $CsCu_2I_3$ thin films samples

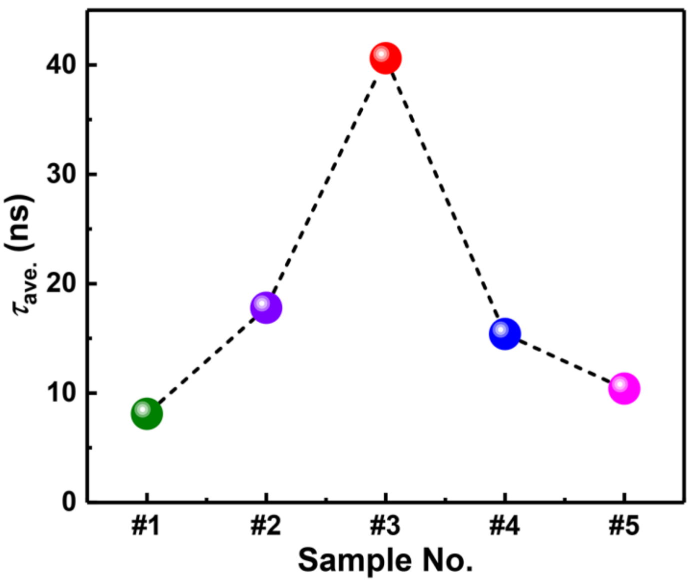

Figure S5. Average PL lifetime of the $CsCu_2I_3$ thin films obtained with different dripping time of toluene.

Dependence of the photon energy on the measured temperature

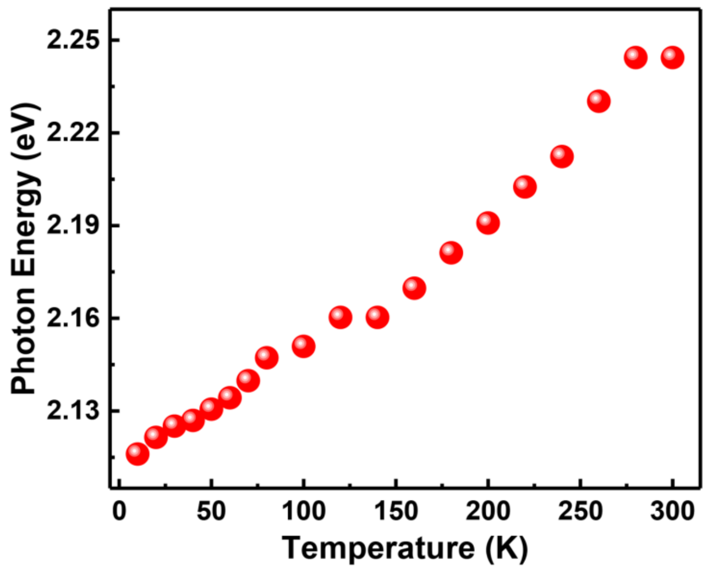

Figure S6. Shift of the photon energy of the $CsCu_2I_3$ thin films as a function of measured temperature (10 to 300 K).

Estimation of the specific formation time of STEs

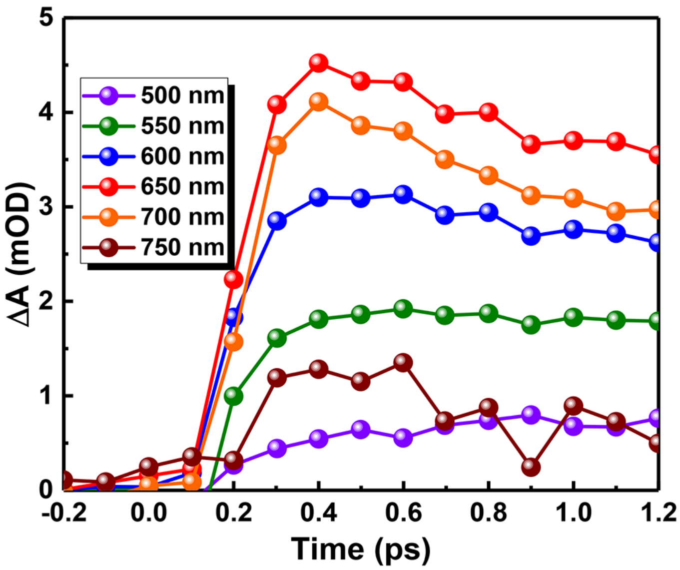

Figure S7. PIA onsets of the $CsCu_2I_3$ probed at different wavelengths.

Investigation on the excitation and emission spectra of the $CsCu_2I_3$ thin films

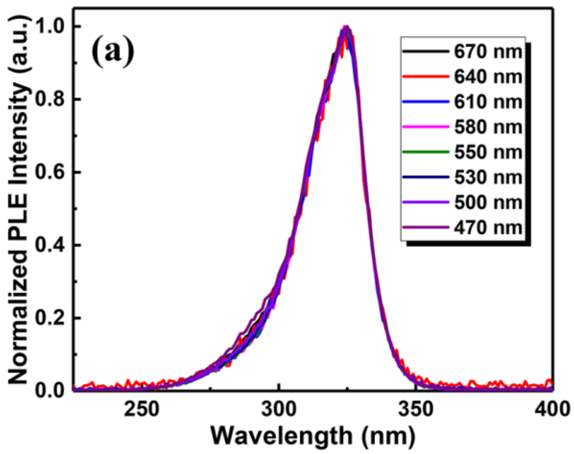

Figure S8. (a) Normalized excitation spectra of the $CsCu_2I_3$ thin films for the emission from 470 to 670 nm. (b) Normalized PL spectra of the $CsCu_2I_3$ thin films measured at different excitation wavelengths.

Calculation of the structural distortion of $CsCu_2I_3$

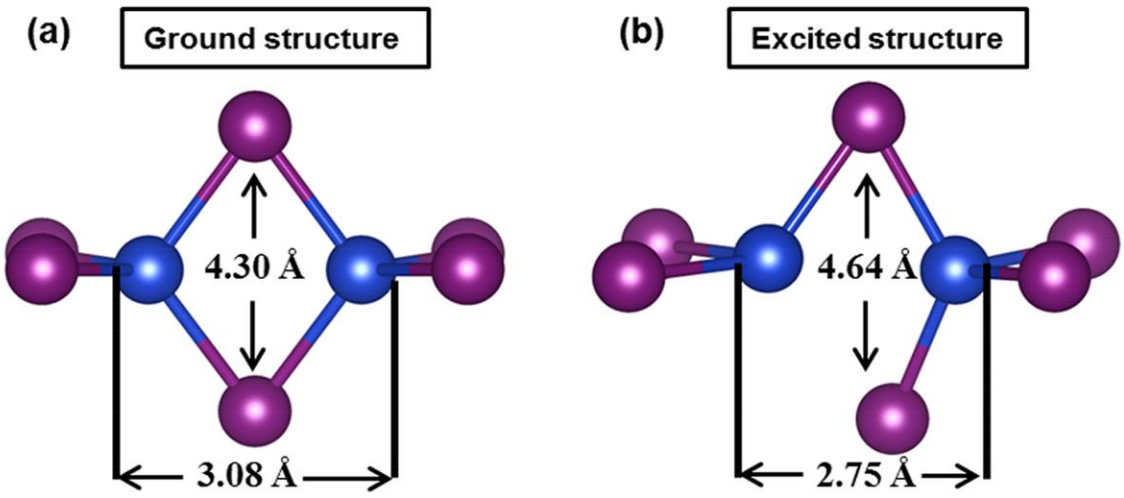

Figure S9. The geometric (a) ground state, and (b) excited state structures of $CsCu_2I_3$.

Photograph of the fabricated device

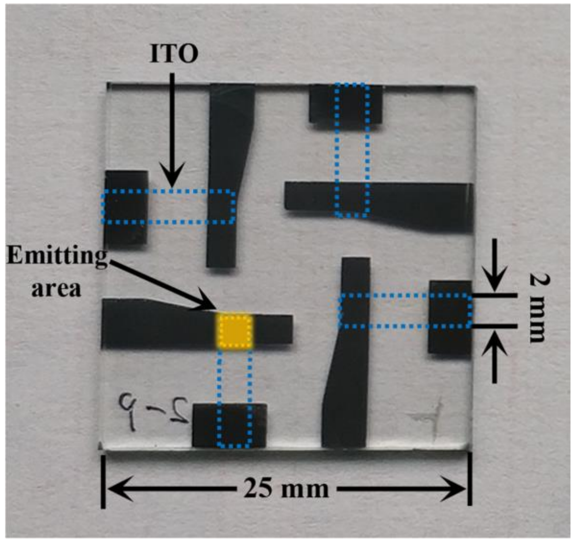

Figure S10. Photograph of the fabricated device consisting of four emitting units. The active area of each unit is 2 × 2 mm^2.

Comparison of the device performances of five devices

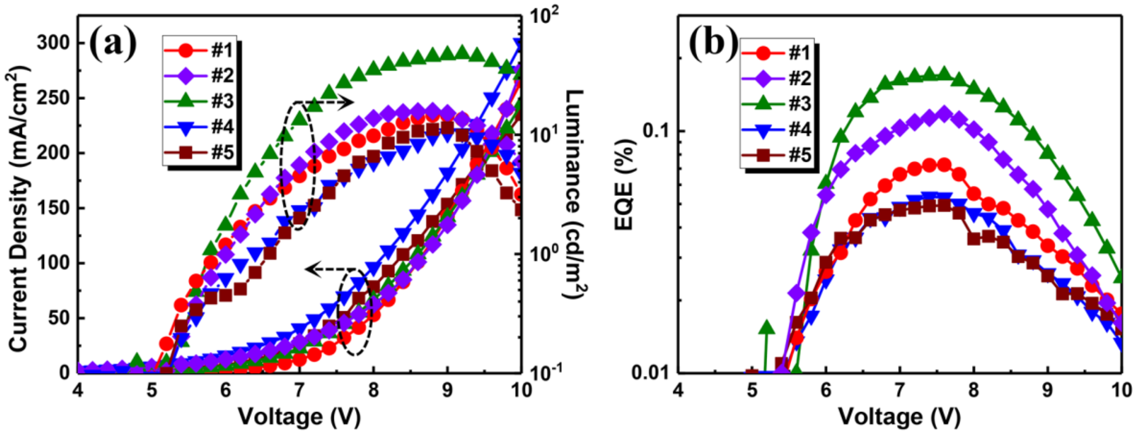

Figure S11. (a) Current density-voltage-luminance, and (b) EQE curves of the LEDs prepared with different dripping conditions of the $CsCu_2I_3$ thin films.

Assessment of the reproducibility of the studied LEDs

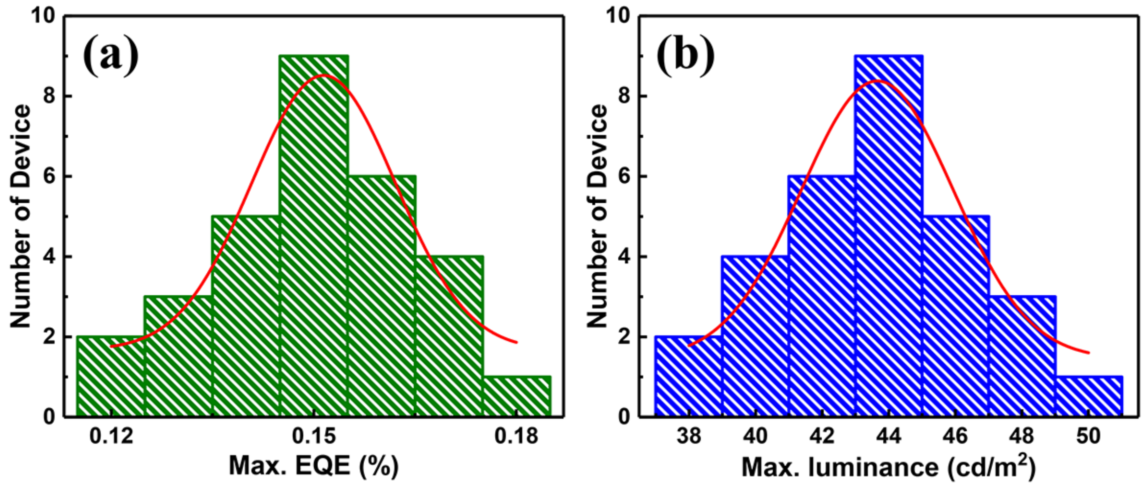

Figure S12. Statistical diagram of the (a) maximum EQE, and (b) maximum luminance measured from 30 devices with the same device structure.

Investigation on the storage stability of the $CsCu_2I_3$ thin films in air ambient

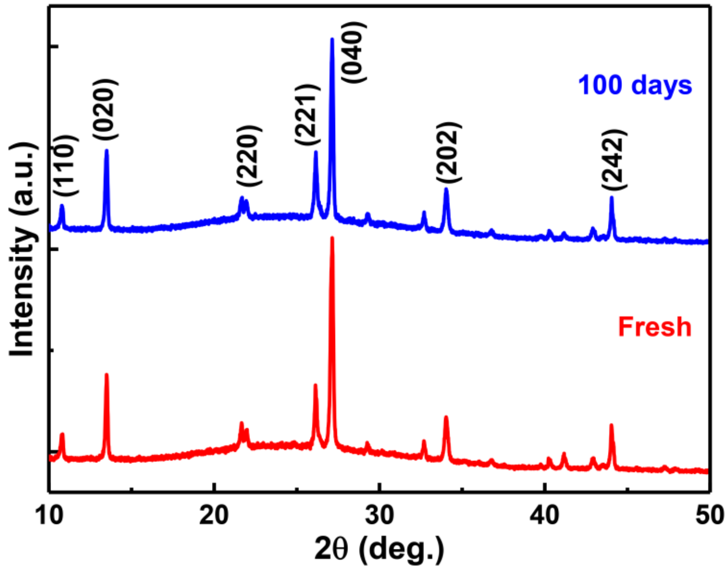

Figure S13. Comparison of the XRD patterns of the $CsCu_2I_3$ thin films before and after storage for 100 days in air ambient.

Table S1 The calculated bandgap, effective masses of electron and hole, excitation energy, emission energy, and the Stokes shift of $CsCu_2I_3$

	Bandgap (eV)	Effective mass (m_0)			Excitation energy (eV)	Emission energy (eV)	Stokes shift (nm)
$CsCu_2I_3$	4.02		m_e	m_h	4.02 (3.82[a])	2.37 (2.26[a])	213.03 (224.06[a])
		$\Gamma \rightarrow S$	0.22	0.55			

[a]The experimental values are also shown in parentheses for comparation.