Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

Dual-source vapor-processed blue-emissive cesium copper iodine microplatelets with high crystallinity and stability

Jing-Jing Yan, Jing-Li Ma, Meng-Yao Zhang, Ruo-Ting Yang, Xu Chen,* Di Wu, Yong-Tao Tian, Xin-Jian Li and Zhi-Feng Shi*

Key Laboratory of Materials Physics of Ministry of Education, School of Physics and Microelectronics, Zhengzhou University, Daxue Road 75, Zhengzhou 450052, China

*Correspondence and requests for materials should be addressed to Z.S. (email: shizf@zzu.edu.cn) or to X.C. (email: xchen@zzu.edu.cn).

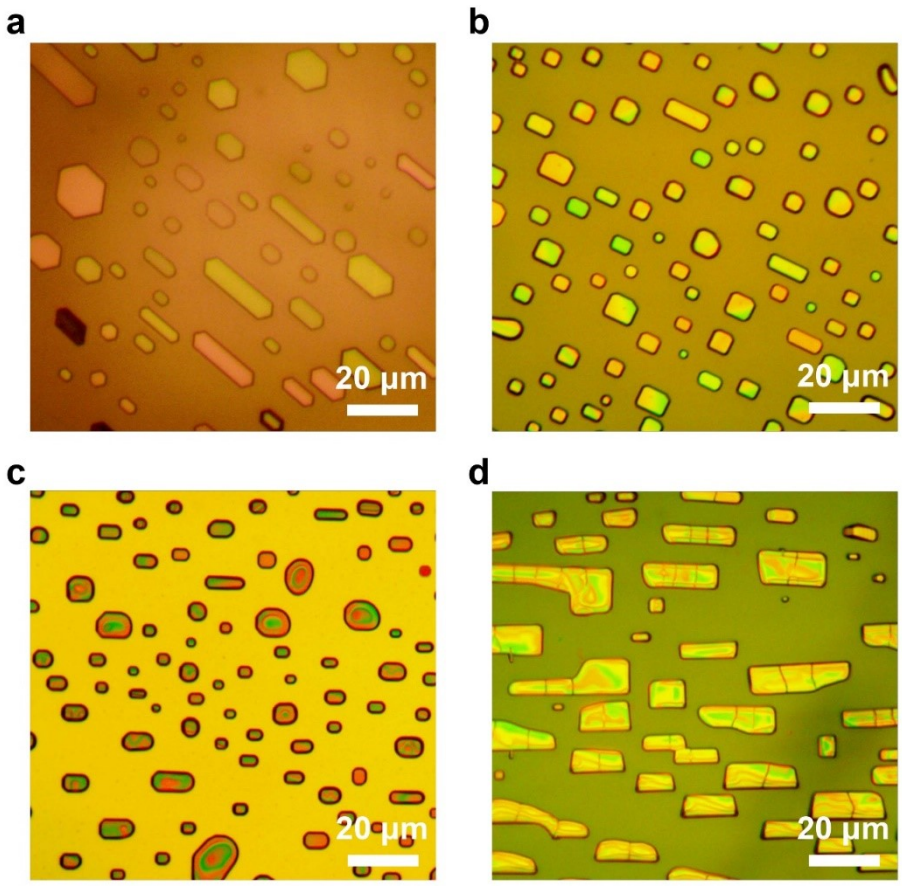

Fig. S1. Optical images of the $Cs_3Cu_2I_5$ microplatelets grown on (a) mica, (b) glass, (c) Si, and (d) SiO_2/Si substrates, respectively.

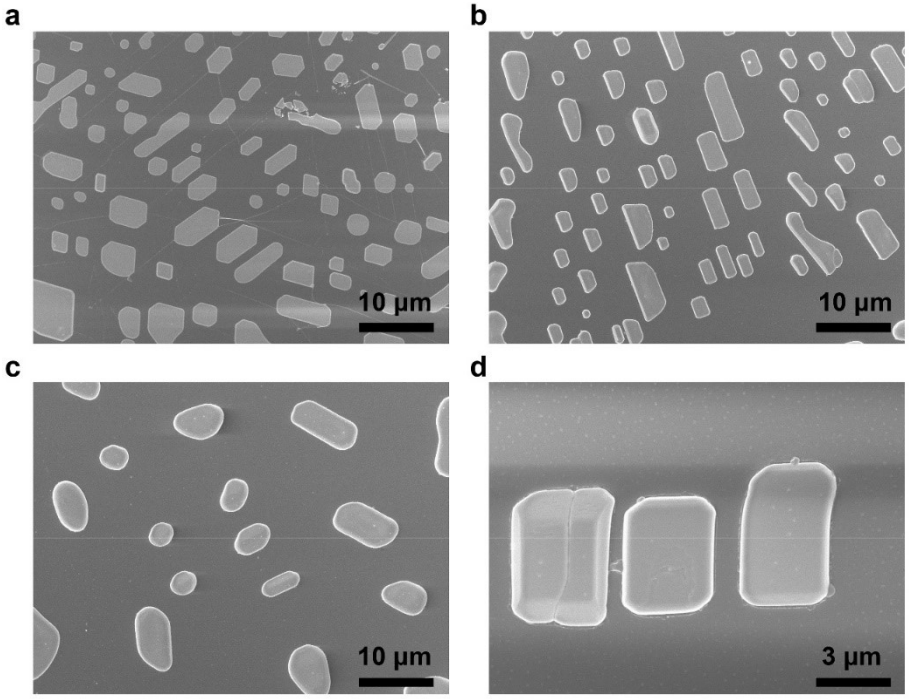

Fig. S2. SEM images of the $Cs_3Cu_2I_5$ microplatelets grown on (a) mica, (b) glass, (c) Si, and (d) SiO_2/Si substrates, respectively.

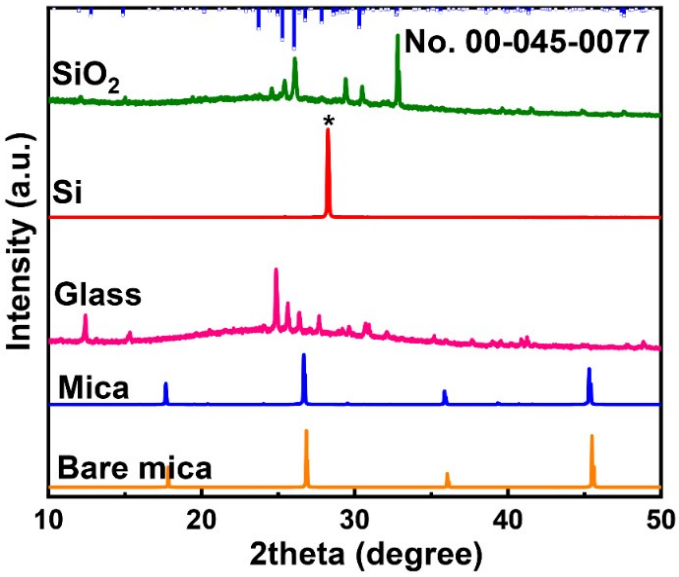

Fig. S3. XRD patterns of $Cs_3Cu_2I_5$ microplatelets grown on mica, glass, Si (* represents the diffraction peak of Si) and SiO_2/Si substrates.

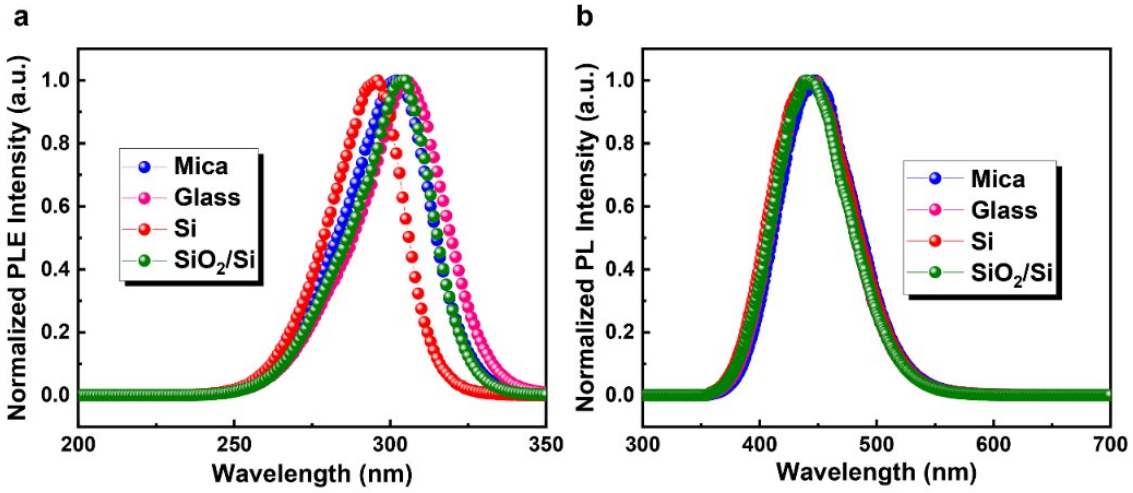

Fig. S4. (a) PL excitation spectra and (b) PL, of the $Cs_3Cu_2I_5$ microplatelets grown on mica, glass, Si, and SiO_2/Si substrates, respectively.

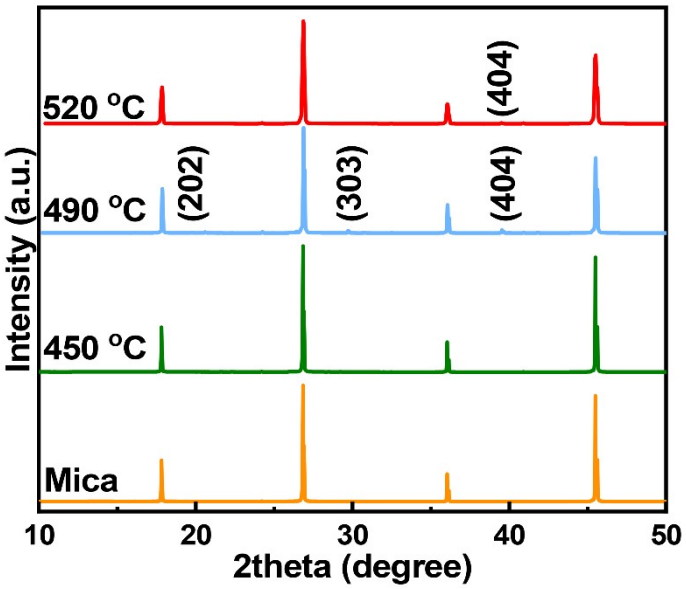

Fig. S5. XRD patterns of $Cs_3Cu_2I_5$ microplatelets prepared at different growth temperatures.

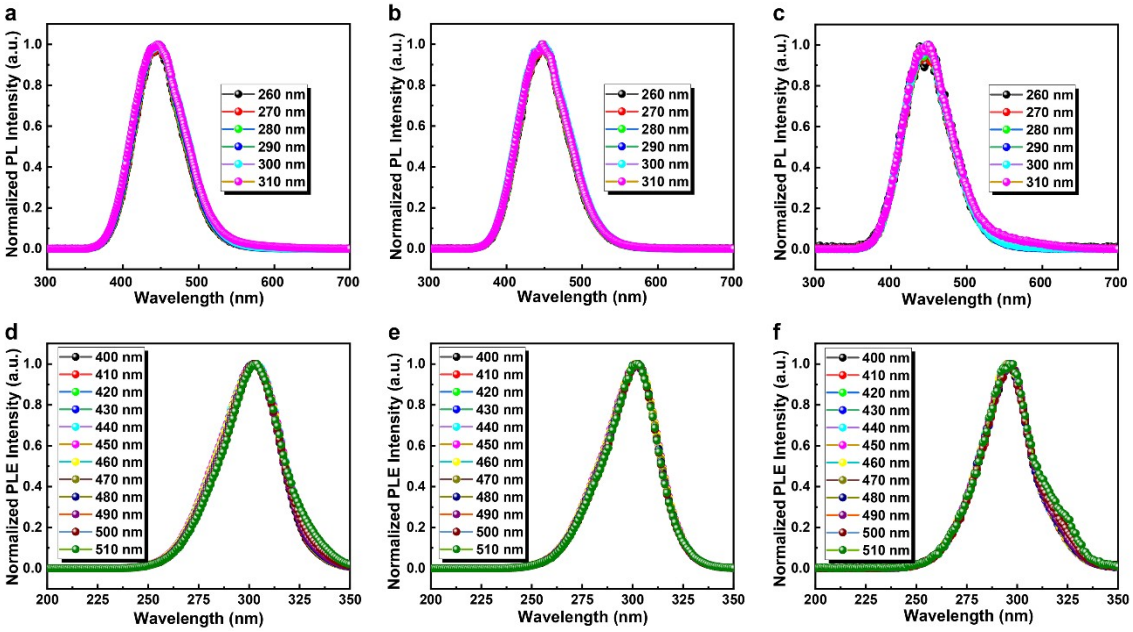

Fig. S6. PL spectra and PL excitation spectra of $Cs_3Cu_2I_5$ microplatelets grown at different temperatures measured at different excitation and emission wavelengths, respectively. (a, d), 450 °C; (b, e) 490 °C; (c, f) 520 °C.

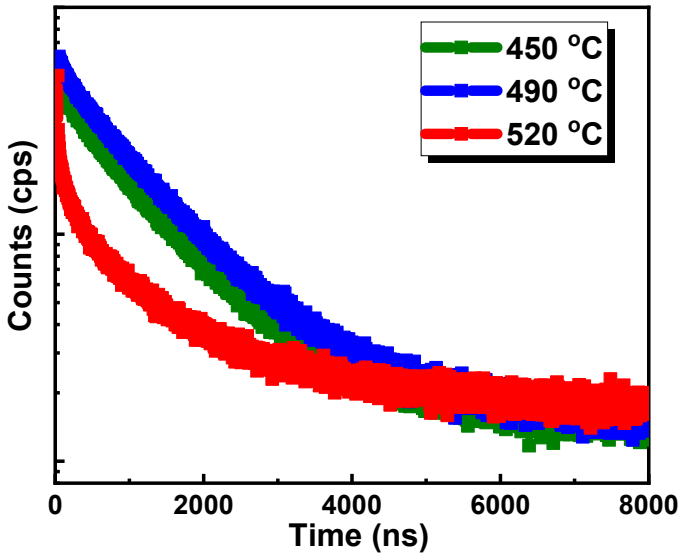

Fig. S7. PL decay curves of the $Cs_3Cu_2I_5$ microplatelets prepared at different growth temperatures.

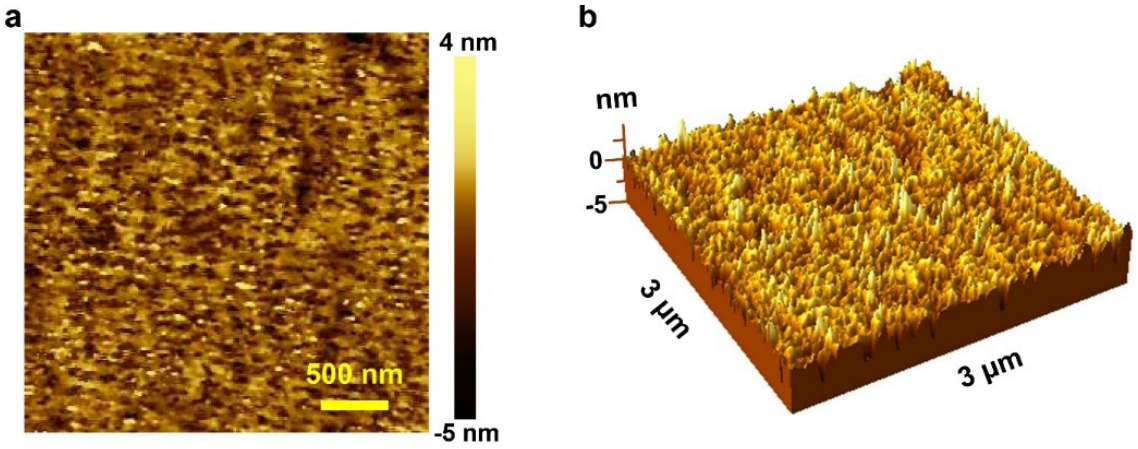

Fig. S8. AFM images of $Cs_3Cu_2I_5$ microplatelet on mica substrate.

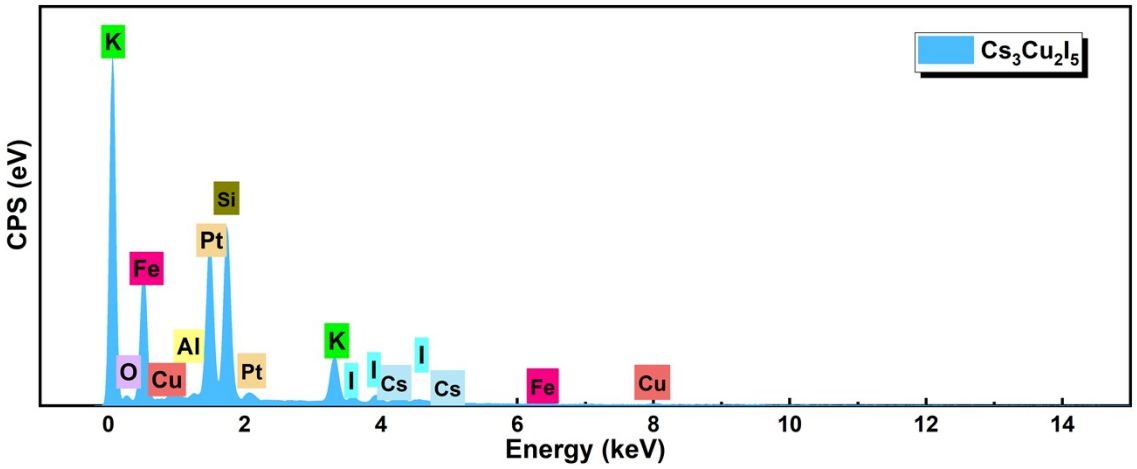

Fig. S9. EDS spectrum of the $Cs_3Cu_2I_5$ microplatelets.

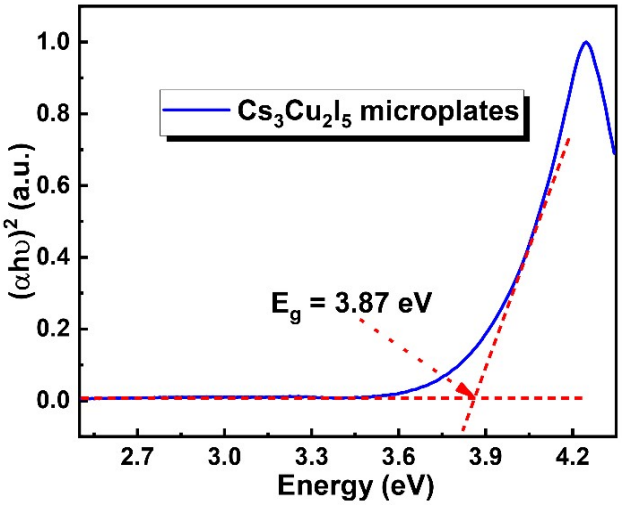

Fig. S10. Tauc curve of the $Cs_3Cu_2I_5$ microplatelets corresponding to the absorption spectrum.

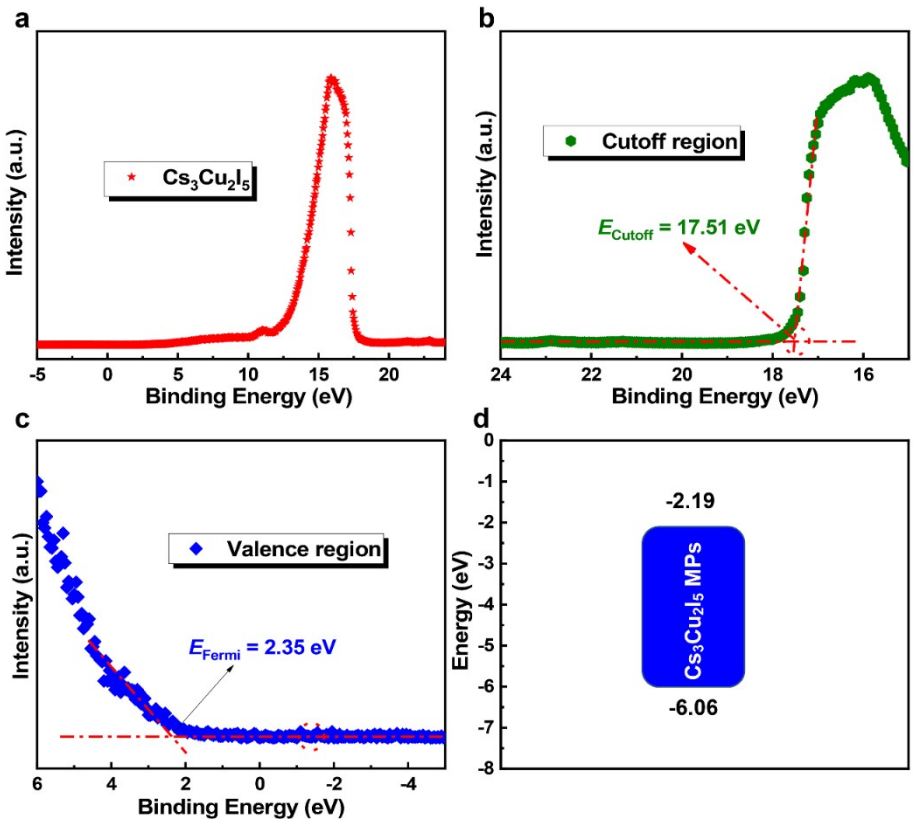

Fig. S11. UPS data of the $Cs_3Cu_2I_5$ microplatelets.

By means of the UV electronic energy spectrum (UPS), the E_{Cutoff} of the $Cs_3Cu_2I_5$ microplatelets is calculated as 17.51 eV and E_{Fermi} is 2.35 eV, and the formula is as follows:

$$E_{VBM} = h\nu - E_{Cutoff} + E_{Fermi} \quad (1)$$

$$E_{CBM} = E_{VBM} + E_g \quad (2)$$

where, E_{Cutoff} is the binding energy of the secondary cutoff in the spectrum, E_{Fermi} is the difference between the valence band and Fermi energy level, and $h\nu$ is the energy of a photon, E_{VBM} is the maximum price band, E_{CBM} is the minimum value of conduction band, E_g is the optical band gap of $Cs_3Cu_2I_5$. After detailed calculation, the E_{VBM} and E_{CBM} of $Cs_3Cu_2I_5$ is 6.06 eV and 2.19 eV, respectively.

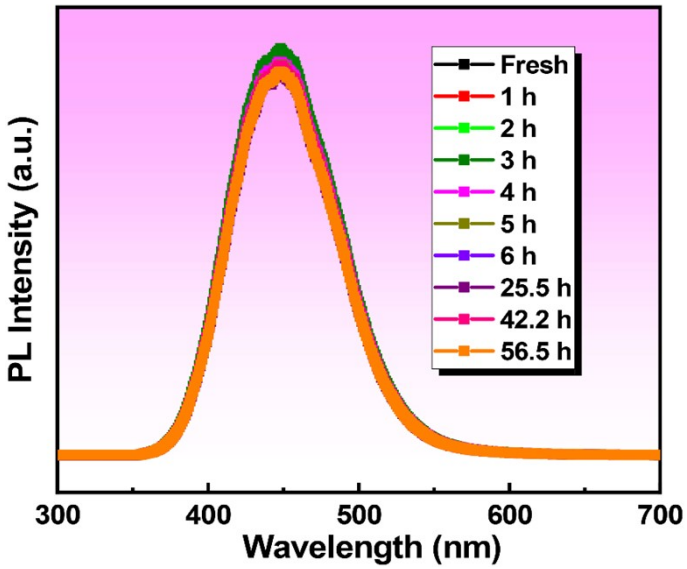

Fig. S12. Evolution of the PL spectra of the $Cs_3Cu_2I_5$ microplatelet recorded under continuous UV light excitation (265 nm, 3.4 mW/cm^2) in air ambient condition.

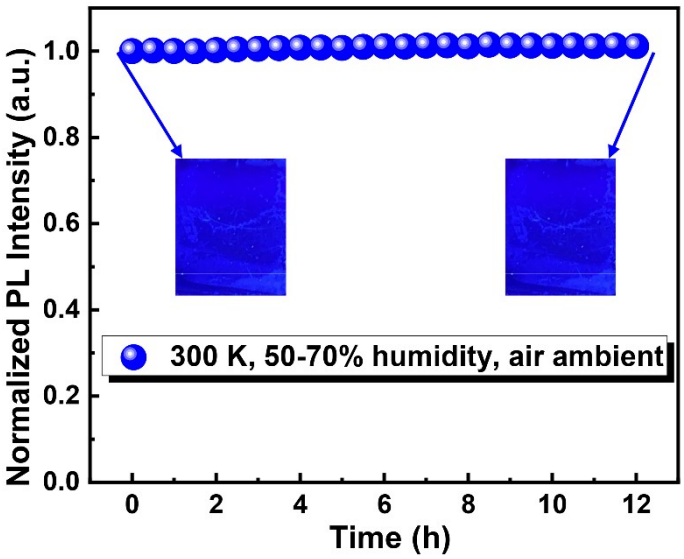

Fig. S13. Evolution of the PL intensity of the $Cs_3Cu_2I_5$ microplatelets over a continuous test for 12 h.

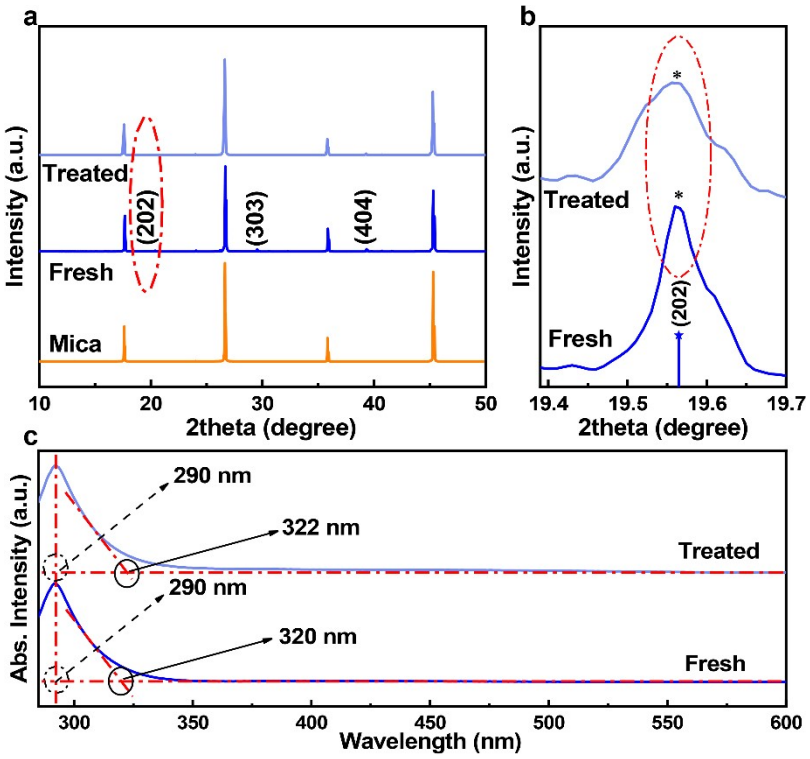

Fig. S14. Comparison on (a, b) the XRD patterns, and (c) UV-visible absorption spectra of the $Cs_3Cu_2I_5$ MPs before and after humidity treatment in high humidity (90−95%) condition for 60 min.

Table S1. Fitting parameters of the PL decay curves for the $Cs_3Cu_2I_5$ microplatelets grown at different temperatures.

Growth temperature	$\tau_{ave.}$ (ns)	τ_1 (ns)	τ_2 (ns)	Percent (τ_1)	Percent (τ_2)	R^2
450 °C	1012 ns	122.5 ns	1034.2 ns	17.2 %	82.8 %	0.999
490 °C	1072 ns	154.7 ns	1092.7 ns	13.5 %	86.5 %	0.999
520 °C	921 ns	104.8 ns	1081.0 ns	67.0 %	33.0 %	0.992

Table S2. Element compositions of the $Cs_3Cu_2I_5$ microplatelets with different morphologies.

$Cs_3Cu_2I_5$ microplatelets	Element	Weight (%)	Atomic (%)
	Cu K	2.35	0.93
3a-I	I L	11.32	2.26
	Cs L	6.43	1.22
	Cu K	1.61	0.59
3a-II	I L	7.15	1.32
	Cs L	3.74	0.66
	Cu K	3.24	1.40
3a-III	I L	14.6	3.16
	Cs L	8.41	1.73
	Cu K	3.15	1.34
3a-IV	I L	14.39	3.07
	Cs L	7.88	1.60

Table S3. Element compositions of the $Cs_3Cu_2I_5$ microplatelet.

Element	Weight (%)	Atomic (%)
Cu K	0.59	0.20
I L	3.48	0.58
Cs L	1.85	0.30