Supporting Information

Intrinsic optical property and structural transition of $CsPbCl_3$ revealed by temperature dependent studies of single microplatelet

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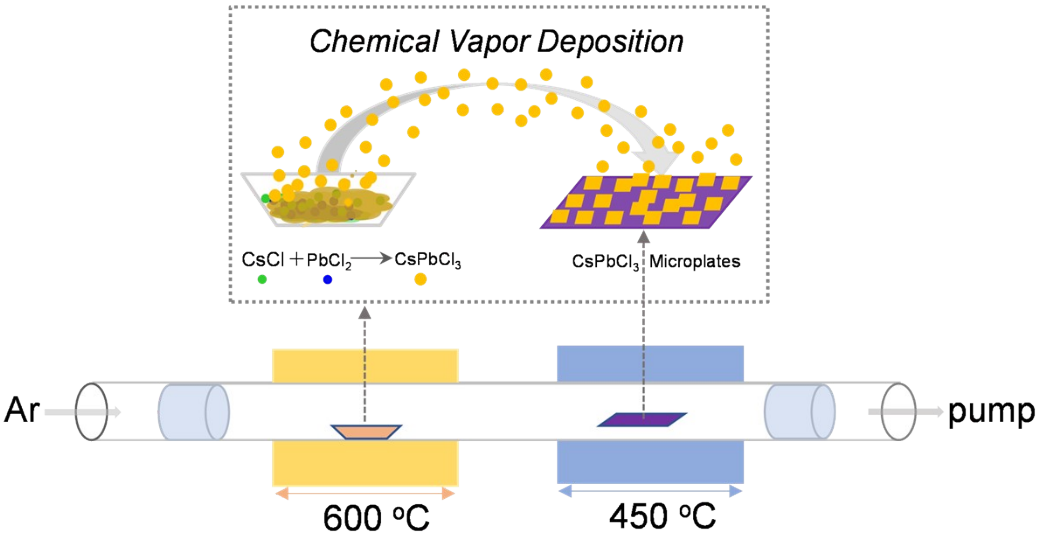

Fig. S1 Schematic illustration of fabrication of $CsPbCl_3$ MP by co-deposition method.

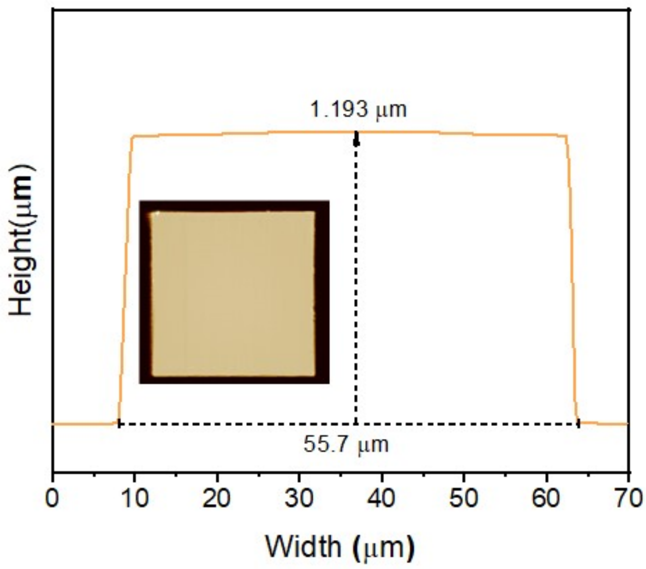

Fig. S2 The thickness and width of the $CsPbCl_3$ MP. Inset is the AFM picture of the $CsPbCl_3$ MP.

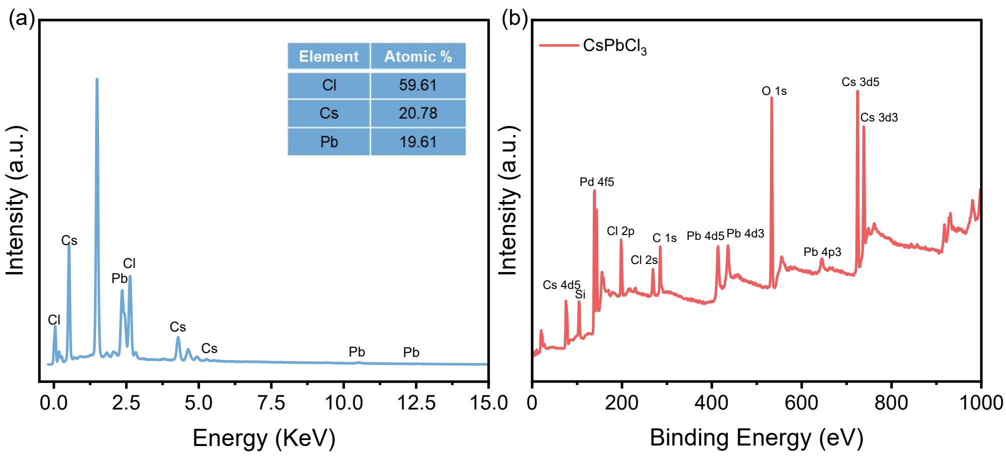

Fig. S3 (a) The EDS spectrum of a single microplate along with the corresponding elemental ratio. MP. (b) The XPS full spectrum of $CsPbCl_3$ microplate.

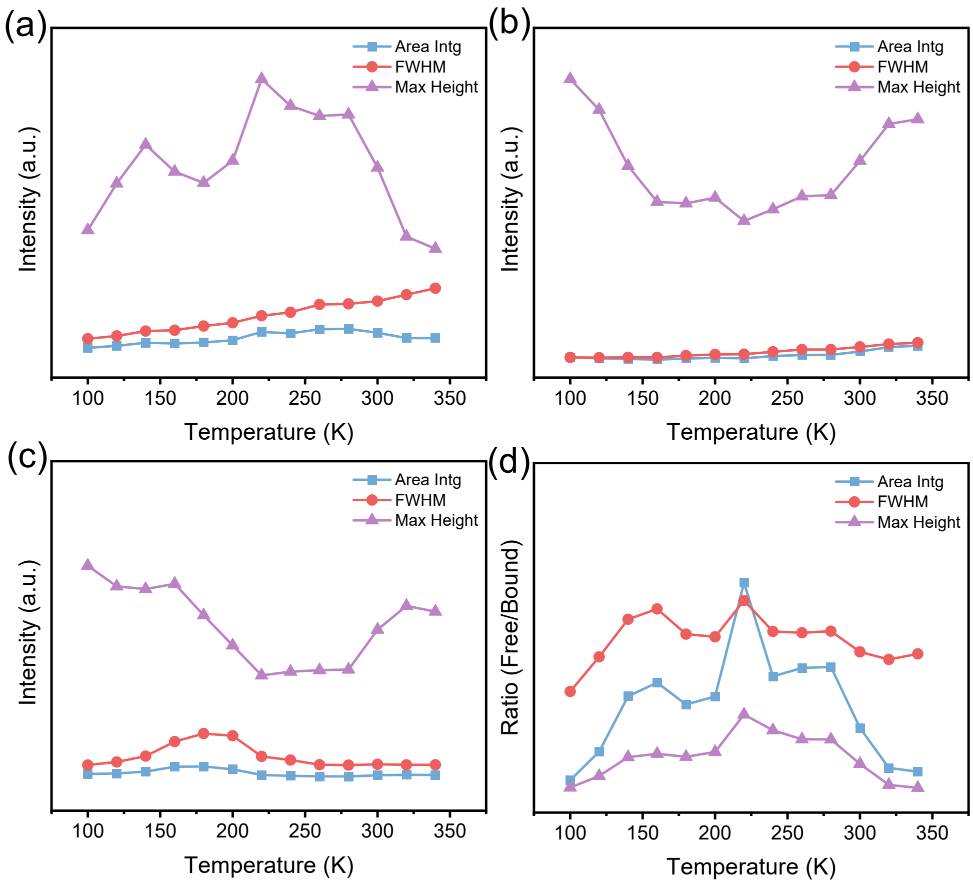

Fig. S4 The intensity, half-width, and peak area of the radiative recombination features corresponding to (a) Free excitons, (b) Bound excitons and (c) Defect state 1 in the PL spectrum change with temperature. (d) The ratio of parameters for free exciton and bound exciton emission peaks obtained from (a) and (b).

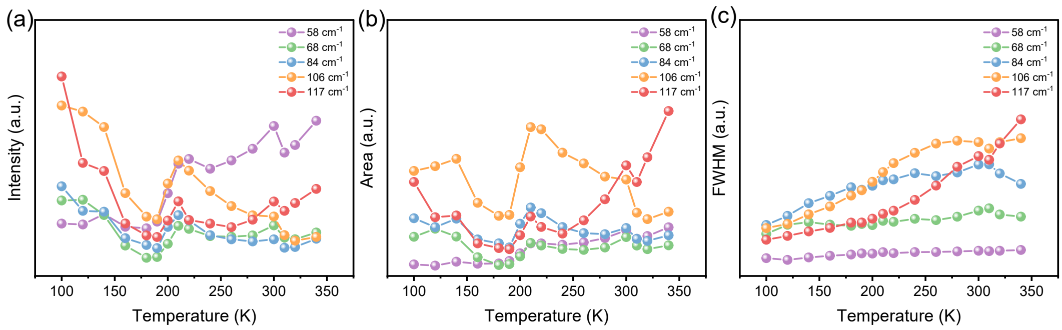

Fig. S5 (a) The peak intensity, (b) half-width, and (c) peak area of various peaks in the Raman spectrum change with temperature.

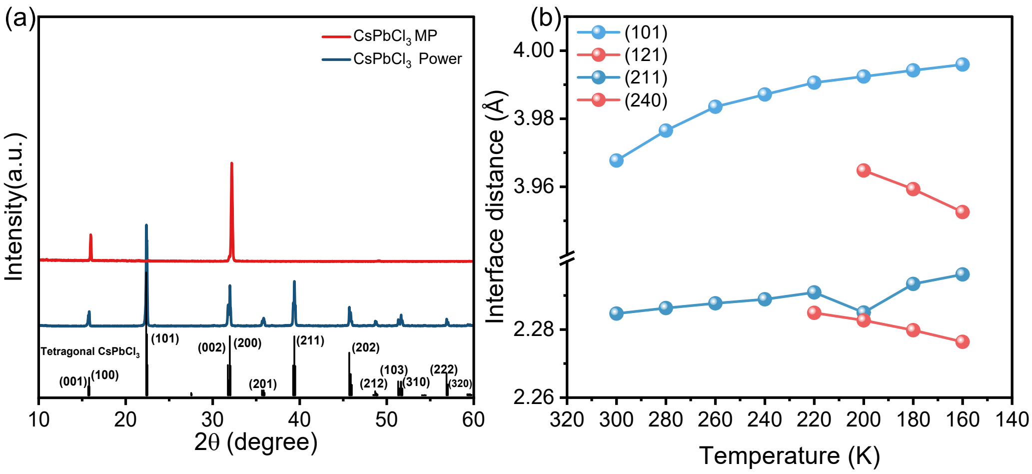

Fig. S6 (a) The XRD patterns of $CsPbCl_3$ powder and MP at 300 K. (b) The variation trend of certain interplanar spacings d for the tetragonal phase (blue line) and orthorhombic phase (red line) with temperature.

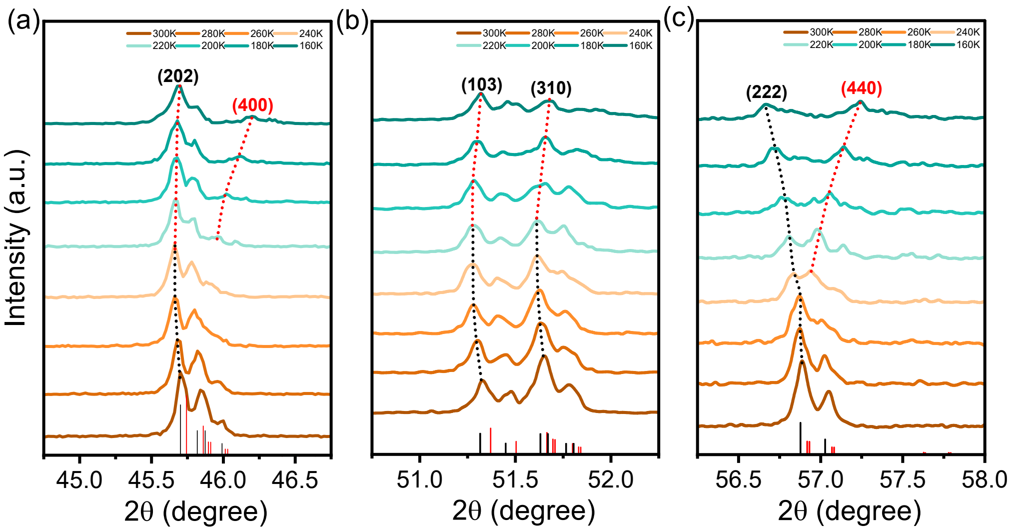

Fig. S7 The magnified local XRD patterns obtained from Fig. 8a.

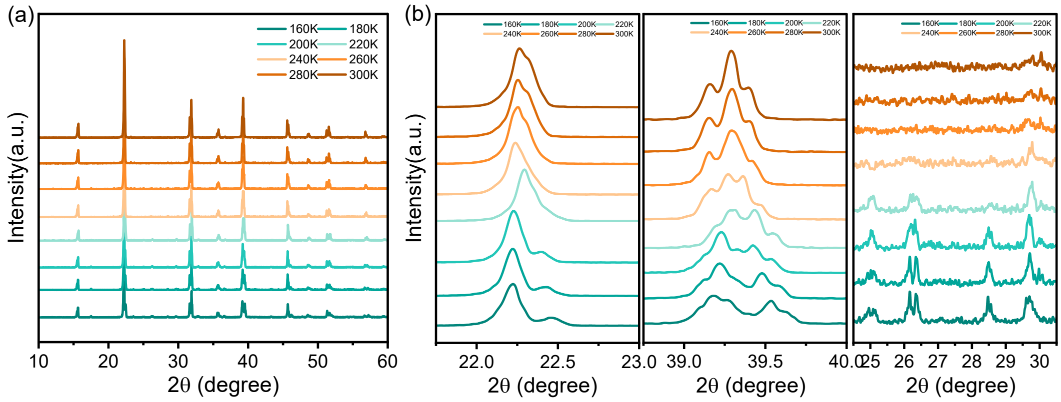

Fig. S8 (a) The temperature-dependent XRD patterns of the $CsPbCl_3$ powder from 160 K to 300 K. (b) the magnified local XRD patterns obtained from (a).

Table. S1 The detailed fitting parameters in Fig.3,b by the Arrhenius equation.

Ea (meV)	R^2	I_0	A
62.0	0.9947	146993.86	913.66

Table. S2 Assignments of Raman Bands of $CsPbCl_3$ at Cryogenic Temperatures (ω LO > ω TO, where ω are the frequency of the phonon modes) [1].

Raman mode	TO_1	TO_2	TO_3	LO_1	LO_2	LO_3
Raman shift (cm^{-1})	(32,52)	(72,89)	(110,121)	115	200	375

References:

1 M. Liao, B. Shan and M. Li, *The Journal of Physical Chemistry Letters.*, 2019, **10**, 1217-1225.