

Supporting Information

High Performance Perovskite $\text{CH}_3\text{NH}_3\text{PbCl}_3$ Single Crystal Photodetector: Benefiting from Evolutionary Preparation Process

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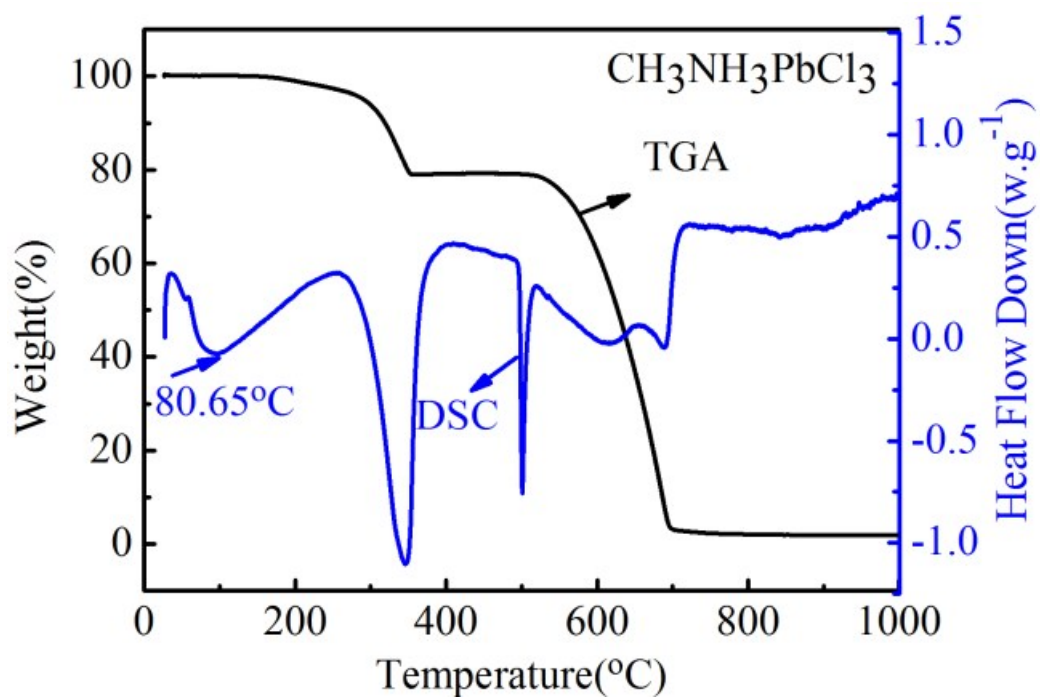


Figure S1. TGA-DSC curves of $\text{CH}_3\text{NH}_3\text{PbCl}_3$ single crystal

In order to learn about the thermal stability of $\text{CH}_3\text{NH}_3\text{PbCl}_3$ single crystal, differential scanning calorimetry/thermogravimetric analysis (DSC/TGA) was employed, which was carried out under nitrogen flow from room temperature to 1000°C. (Figure S1)

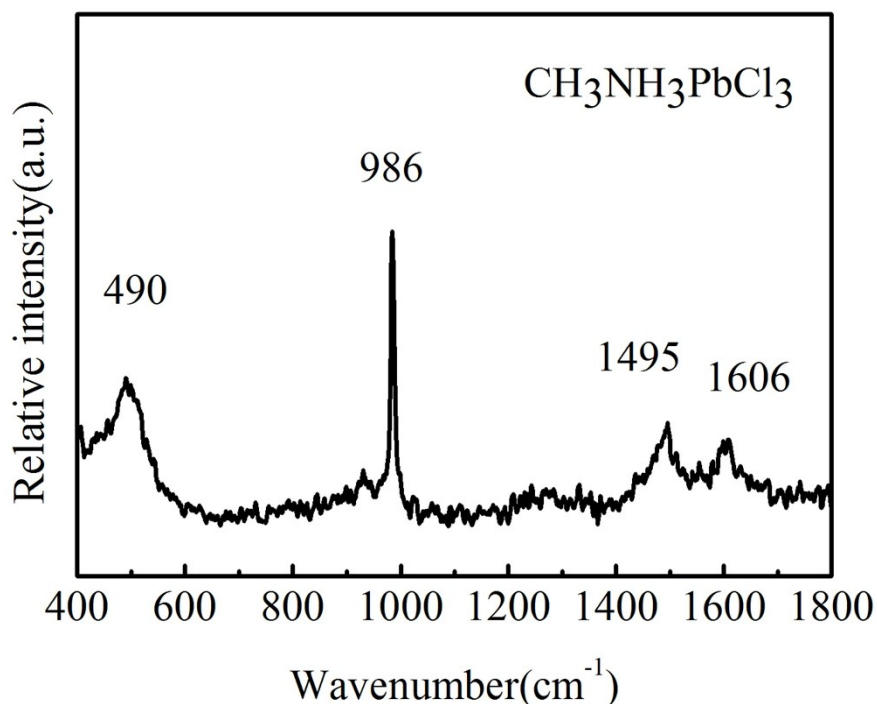


Figure S2. Raman spectrum of CH3NH3PbCl3 single crystal

As shown in Figure S2, the Raman spectrum was carried out under resonant conditions whose excitation wavelength was 633 nm. A series of intense Raman bands were exhibited precisely. Notably, two intense vibrational mode center bands located around 490 and 986 cm^{-1} , which can attribute to the orientation motion of organic cations(MA^+), among them, the 490 cm^{-1} peak was caused by N-H bending, while the peak of 986 cm^{-1} was attributed to C-N bending. As for another two bands, one was located around 1495 cm^{-1} , and another was around 1606 cm^{-1} . In fact, these two peaks were caused by different factors. The bonding of C-H bond can account for the 1495 cm^{-1} peak, nevertheless, the 1606 cm^{-1} peak can attribute to the stretching of C-N bond.

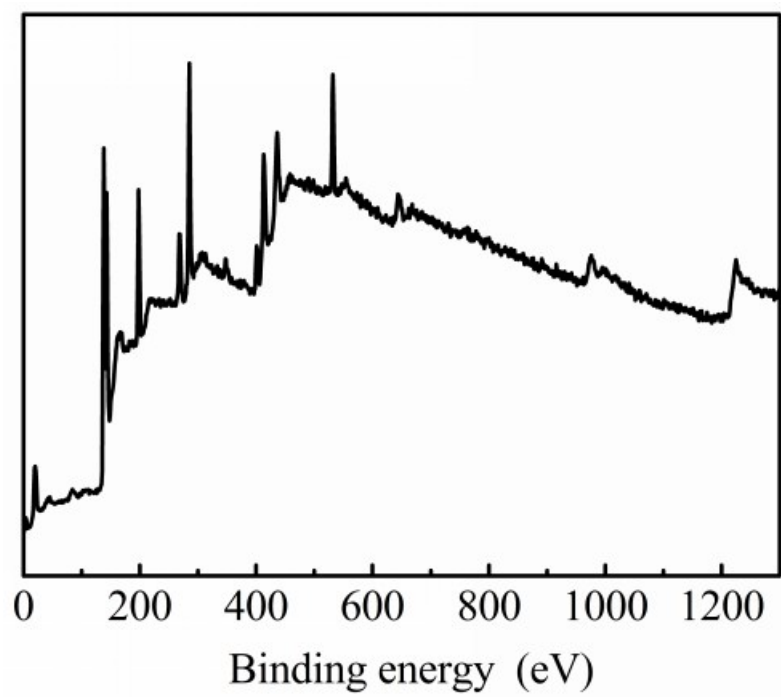


Figure S3. XPS spectrum of $\text{CH}_3\text{NH}_3\text{PbCl}_3$ single crystal

Table S1. The quantity and average size of $\text{CH}_3\text{NH}_3\text{PbCl}_3$ single crystals prepared under different temperatures.

<i>Temperature(°C)</i>	<i>Quantity(num)</i>	<i>Average size(mm²)</i>
60	0	0
70	2	22.75
80	21	6.21
100	41	2.66
120	94	1.09

Table S2. The performance comparison of similar perovskitephotodetectors employing single crystals, thin films, and nanocrystals reported in the literatures.

<i>References</i>	<i>Materials</i>	<i>Responsivity</i>	<i>Response time (rise/fall time)</i>	<i>On/Off ratio</i>
1	CH ₃ NH ₃ PbCl ₃ (Single Crystal)	46.9mA/W @-15V (365nm)	24ms/62ms	1.1×10 ³
2	CH ₃ NH ₃ PbCl ₃ (Single Crystal)	0.60mA/W@10V (405nm)	_____	111
3	CH ₃ NH ₃ PbCl ₃ (thin film)	7.56A/W@4V (360nm)	170μs/220μs	64
4	CH ₃ NH ₃ PbCl ₃ (thin film)	0.047A/W@0V (398nm)	_____	9840
5	CH ₃ NH ₃ PbCl ₃ (thin film)	297μA/W@10V (367±2nm)	_____	_____
6	CH ₃ NH ₃ PbI _{3-x} Cl _x (thin film)	620A/W@-0.7V (550nm)	~100ms	_____
7	CH ₃ NH ₃ PbI _{3-x} Cl _x (thin film)	7.85A/W@10V (254nm)	0.2μs/0.7μs	2235
8	CsPbCl ₃ (nanocrystal)	1.89A/W@5V (365nm)	41ms/43ms	10 ³
9	CsPbCl ₃ (nanocrystal)	0.9A/W@5V (365nm)	47ms/52ms	1.9×10 ³
Ours	CH ₃ NH ₃ PbCl ₃ (Single Crystal)	7.97A/W@1V (350nm)	1.27ms/1.84ms	10 ³

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