Supplementary Material

Scalable fabrication of inch-sized $FAPbI_3$ perovskite wafers for highly sensitive near-infrared photodetection

Chao Li[#], Zuolin Zhang[#], Chenglin Wang, Mengjia Li, Jike Ding, Cong Chen*

State Key Laboratory of Reliability and Intelligence of Electrical Equipment, School of Materials Science and Engineering, Hebei University of Technology, Tianjin 300401, China.

[#]Authors contributed equally.

Correspondence to: Prof. Cong Chen, State Key Laboratory of Reliability and Intelligence of Electrical Equipment, School of Materials Science and Engineering, Hebei University of Technology, No. 5340, Xiping Road, Beichen District, Tianjin 300401, China. E-mail: chencong@hebut.edu.cn

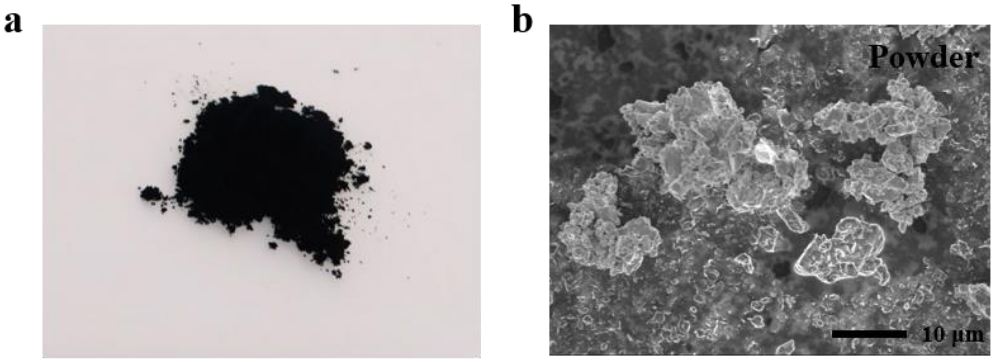

Fig. S1 (a) Photo and (b) SEM of $FAPbI_3$ powder.

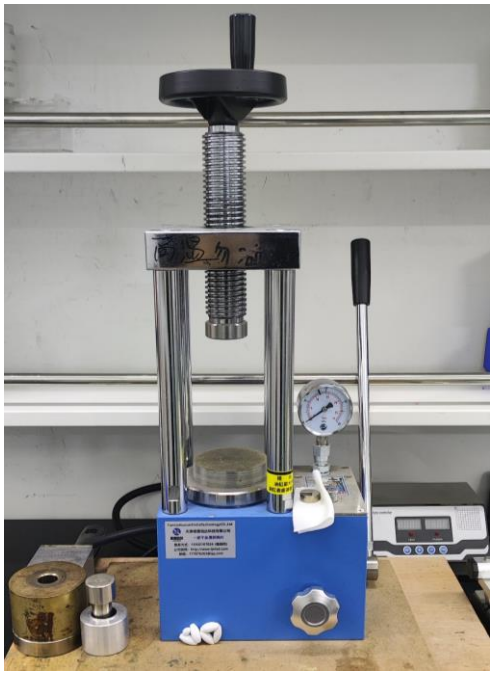

Fig. S2 Photos of hot-press device.

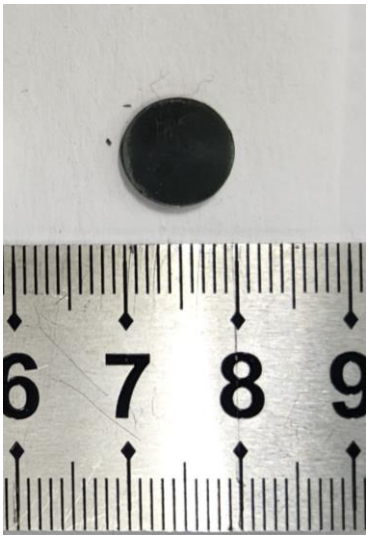

Fig. S3 Photos of wafer with a diameter of 1 cm.

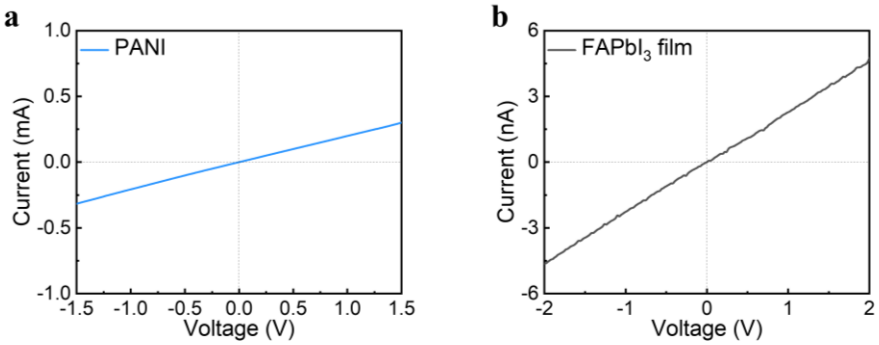

Fig. S4 The *J-V* curves of (a) PANI and (b) $FAPbI_3$ film.

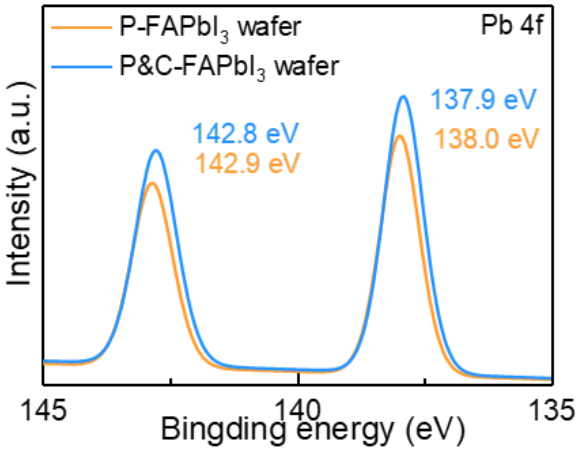

Fig. S5 Pb 4f XPS spectra of P-$FAPbI_3$ wafer and P&C-$FAPbI_3$wafer.

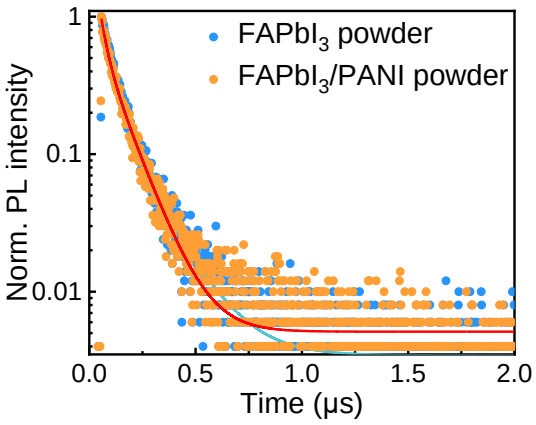

Fig. S6 TRPL spectra of $FAPbI_3$ and $FAPbI_3$/PANI powder.

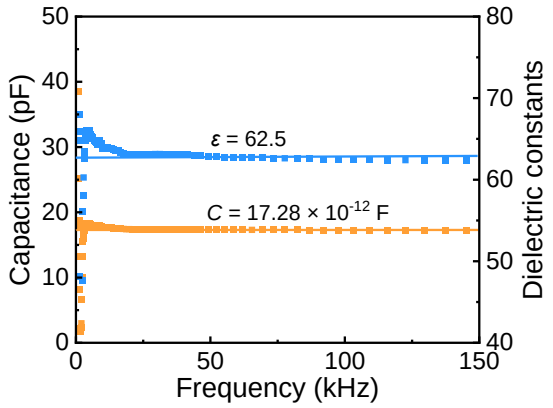

Fig. S7 Frequency-dependent electrical curves of P&C-FAPbI$_3$ wafer detector.

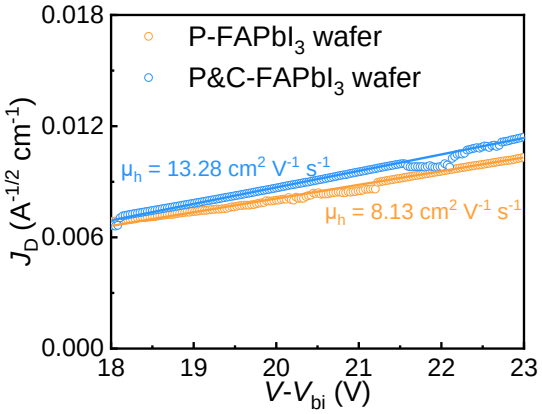

Fig. S8 Hole mobility of the wafer detectors with or without PANI modification.

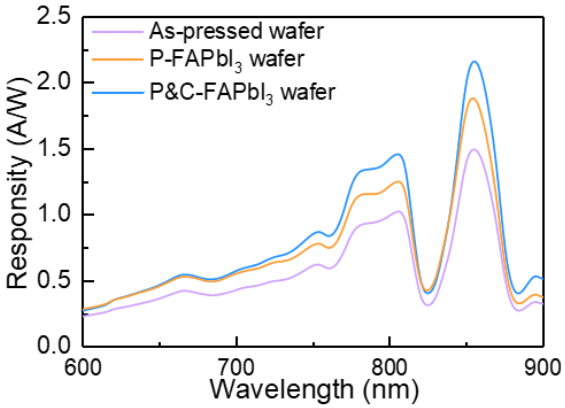

Fig. S9 Responsivity of the photodetectors.

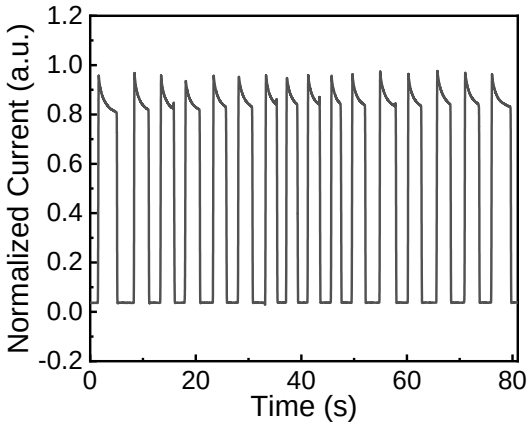

Fig. S10 The photocurrent response curves of the P&C-$FAPbI_3$ wafer detector under an 520 nm light source at 5 V bias.

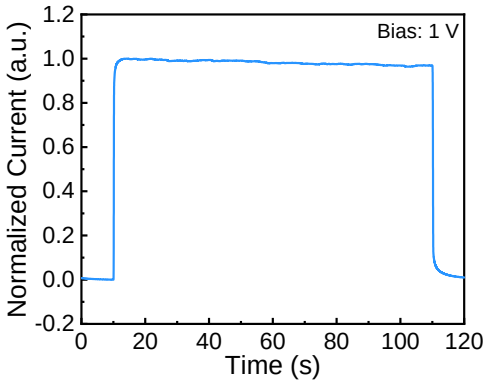

Fig. S11 Operational stability of the P&C-$FAPbI_3$ wafer photodetector under an 845 nm wavelength at 1 V bias.

Table S1 Physical properties of all chemicals such as $FAPbI_3$ and PANI.

Samples	Melting point	Density	Solubility
$FAPbI_3$ powder	387 °C	4.32 g/cm^3	Soluble in polar solvents
Polyaniline (PANI)	>330 °C	1.36 g/mL	

Table S2 Fitting data of TRPL curve in Figure 2h based on double exponential function.

Samples	τ_1 (μs)	A_1	τ_2 (μs)	A_2	τ_{ave} (μs)
As-pressed wafer	0.71	0.94	3.31	0.06	1.34
P-$FAPbI_3$ wafer	1.02	0.95	5.11	0.05	1.86
P&C-$FAPbI_3$ wafer	1.64	0.87	6.74	0.13	3.62

Table S3 Response time of different type photodetectors.

Materials	Crystal	τ_{rise}	τ_{fall}	Reference
$MAPbI_3$	Film	~10 ms	~10 ms	[1]
$MAPbI_3$	Film	12.7 ms	6.9 ms	[2]
$FAPbI_3$	Film	13 ms	11 ms	[3]
$MAPb(Br_{0.78}I_{0.22})_3$	Single crystal	3.4 ms	3.6 ms	[4]
$FAPbI_3$	Single crystal	17 ms	21 ms	[5]
$FAPbI_3$	Single crystal	8.3 ms	7.5 ms	[6]
$FAPbI_3$	Single crystal	214 μs	227 μs	[7]
$FAPbI_3$	Wafer	810 μs	6.1 ms	This work

Reference

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