

Supporting Information

Direct Conversion of Perovskite Thin Films into Nanowires with Kinetic Control for Flexible Optoelectronic Devices

Pengchen Zhu,[†] Shuai Gu,[†] Xinpeng Shen,[†] Ning Xu,[†] Yingling Tan,[†] Shendong Zhuang,[†] Yu Deng,[†] Zhenda Lu[†], Zhenlin Wang[†] and Jia Zhu^{†}*

[†]National Laboratory of Solid State Microstructures, College of Engineering and Applied Sciences, School of Physics, and Collaborative Innovation Center of Advanced Microstructures, Nanjing University, Nanjing 210093, China

* E-mail: jiazhu@nju.edu.cn (J. Z.)

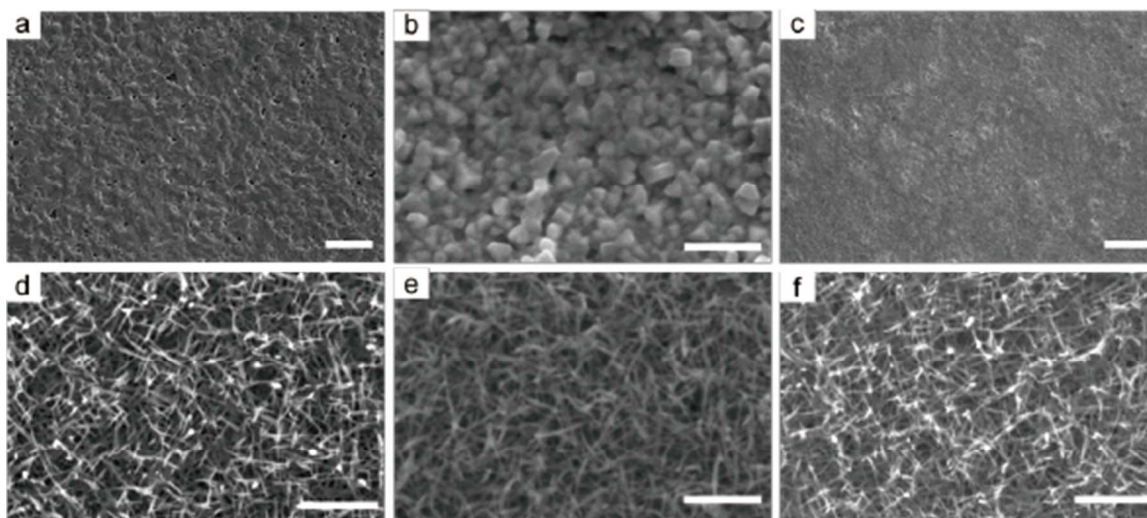


Figure S1. Perovskite films with different components and fabrication processes and their corresponding NWs. (a) $\text{CH}_3\text{NH}_3\text{PbI}_{3-x}\text{Cl}_x$ film with a one-step method (PbCl_2 :MAI=1:3), (b) $\text{CH}_3\text{NH}_3\text{PbI}_3$ film with a two-step method (c) $\text{CH}_3\text{NH}_3\text{PbI}_3$ film with a one-step method (PbI_2 :MAI=1:1), (d) (e) (f) are corresponding NWs to (a) (b) (c), respectively. The scale bars in (a) (c) (d) (f) are $5\mu\text{m}$, the scale bars in (b) and (e) are 500nm and $2.5\mu\text{m}$.

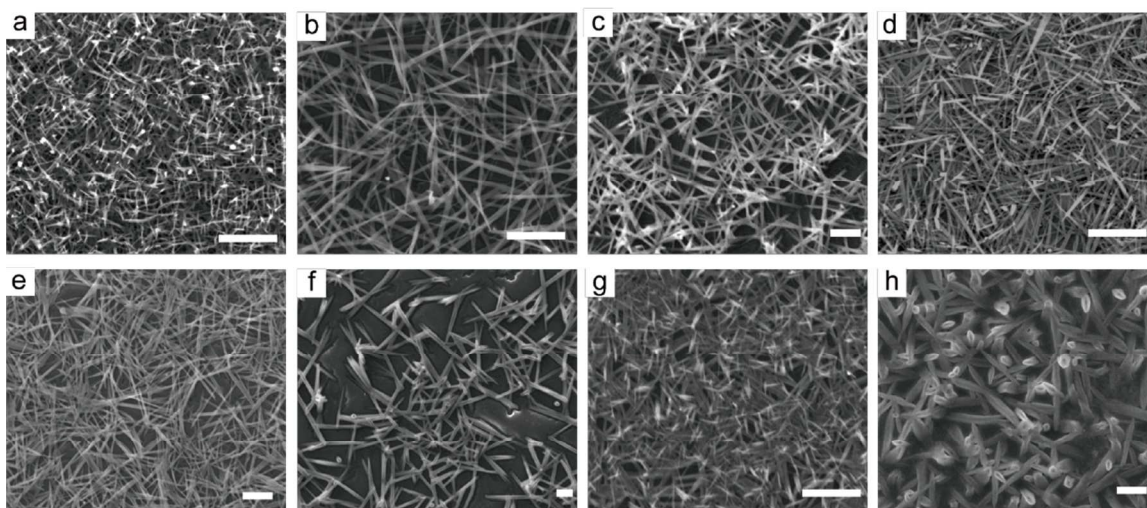


Figure S2. Perovskite NWs from different poor solvent and the same good solvent DMF. (a)-(h) correspond to isopropanol, chlorobenzene, chloroform, 1-butanol, ethyl acetate, cyclohexane, toluene, diethyl ether. The scale bars are $5\mu\text{m}$.

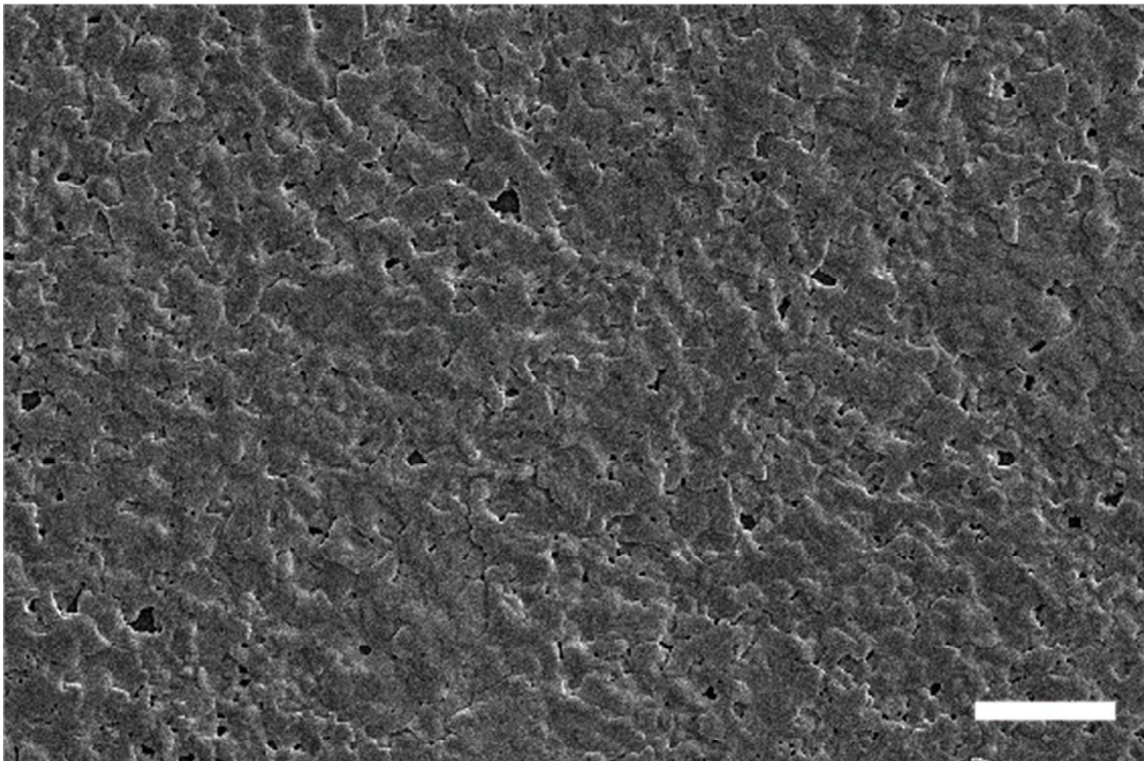


Figure S3. The initial $\text{CH}_3\text{NH}_3\text{PbI}_{3-x}\text{Cl}_x$ film, the scale bar represents 5 μm .

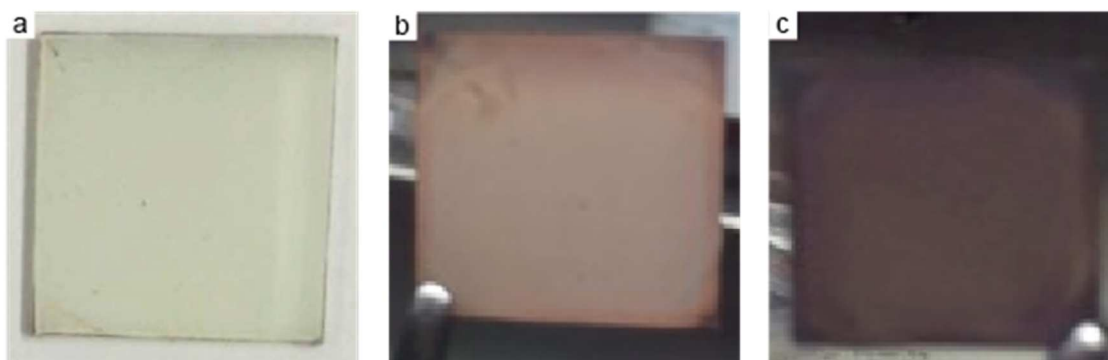


Figure S4. Perovskite NWs under different conditions. (a) After 5 seconds' spin-coating, (b) After 30s' spin-coating. (c) After 30s' spin-coating and 3min-95°C annealing.

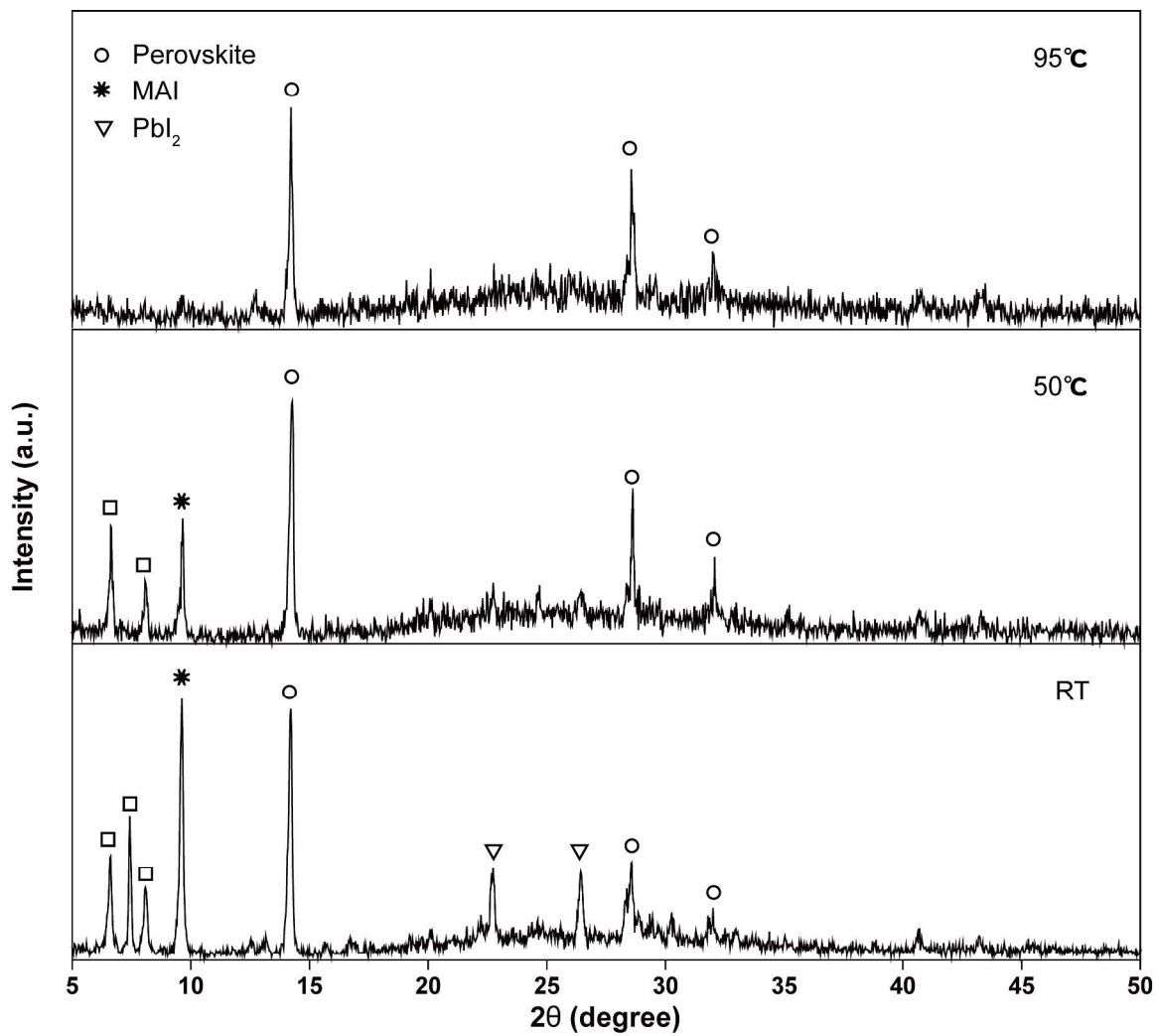


Figure S5. XRD images of perovskite NWs under different conditions.

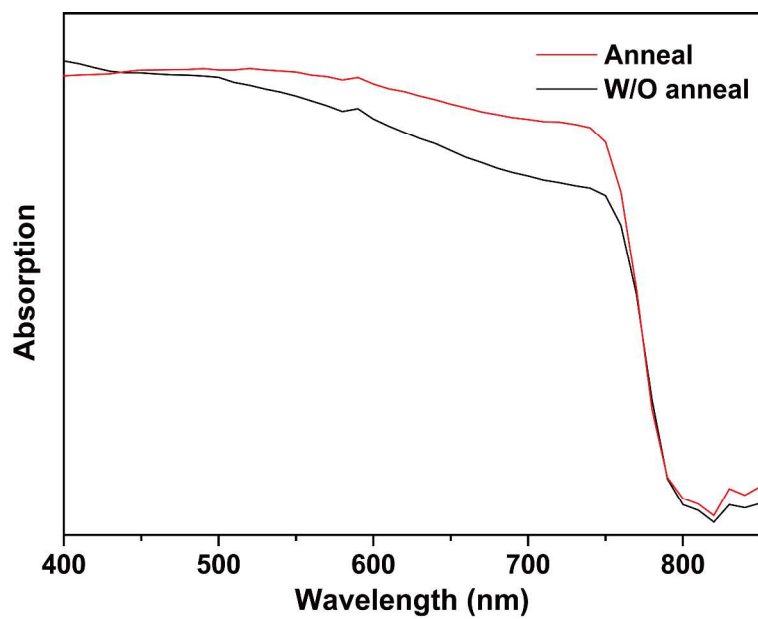


Figure S6. Absorption of perovskite NWs before and after annealing.

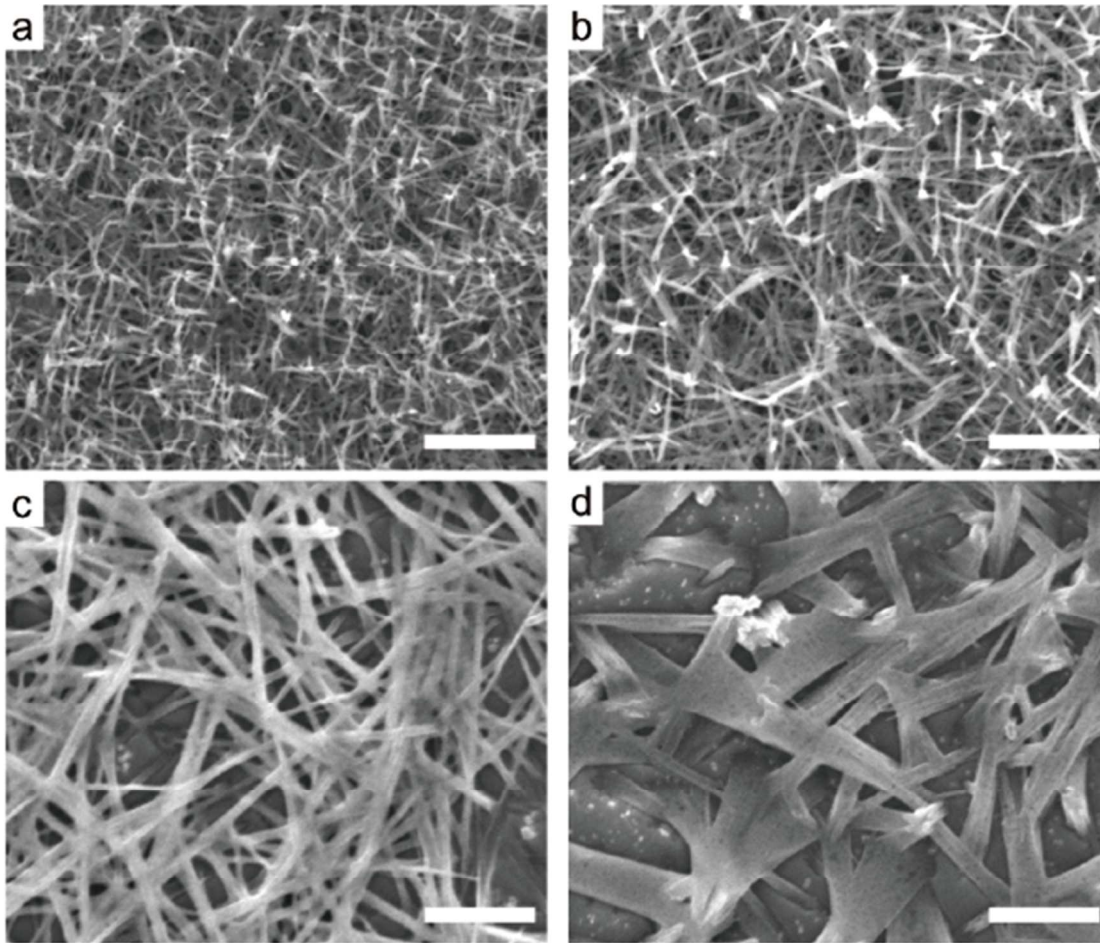


Figure S7. Different morphologies of perovskite NWs. (a) (b) (c) (d) are NWs formed by 200 μ L, 300 μ L, 400 μ L, 650 μ L DMF in 3mL IPA. The scale bars are 5 μ m.

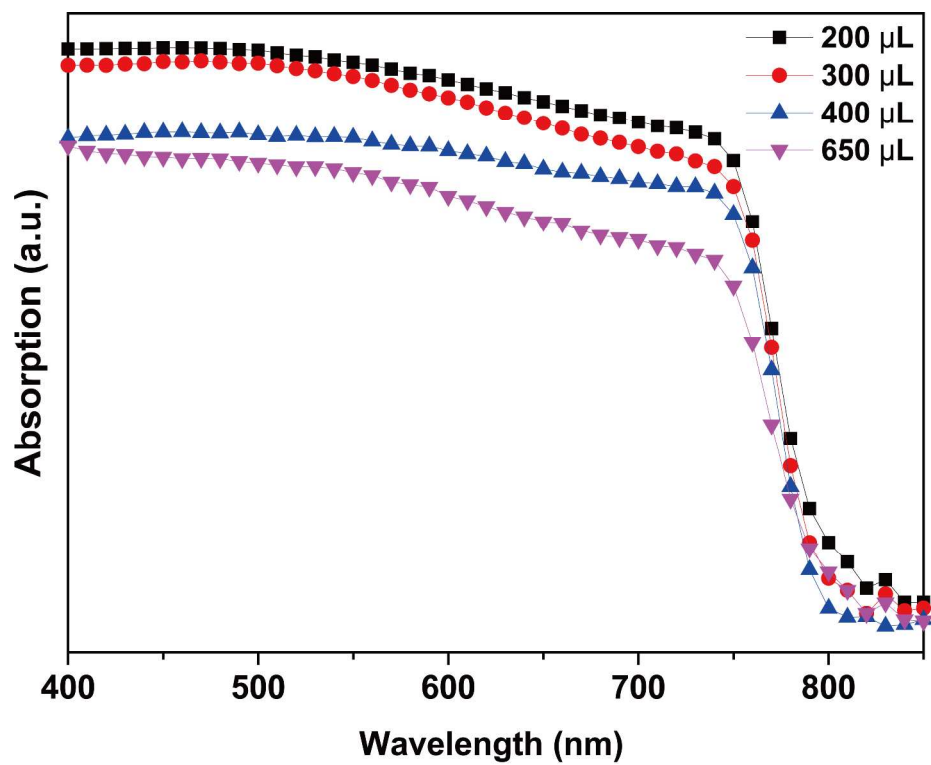


Figure S8. Absorption of perovskite NWs with different morphologies.

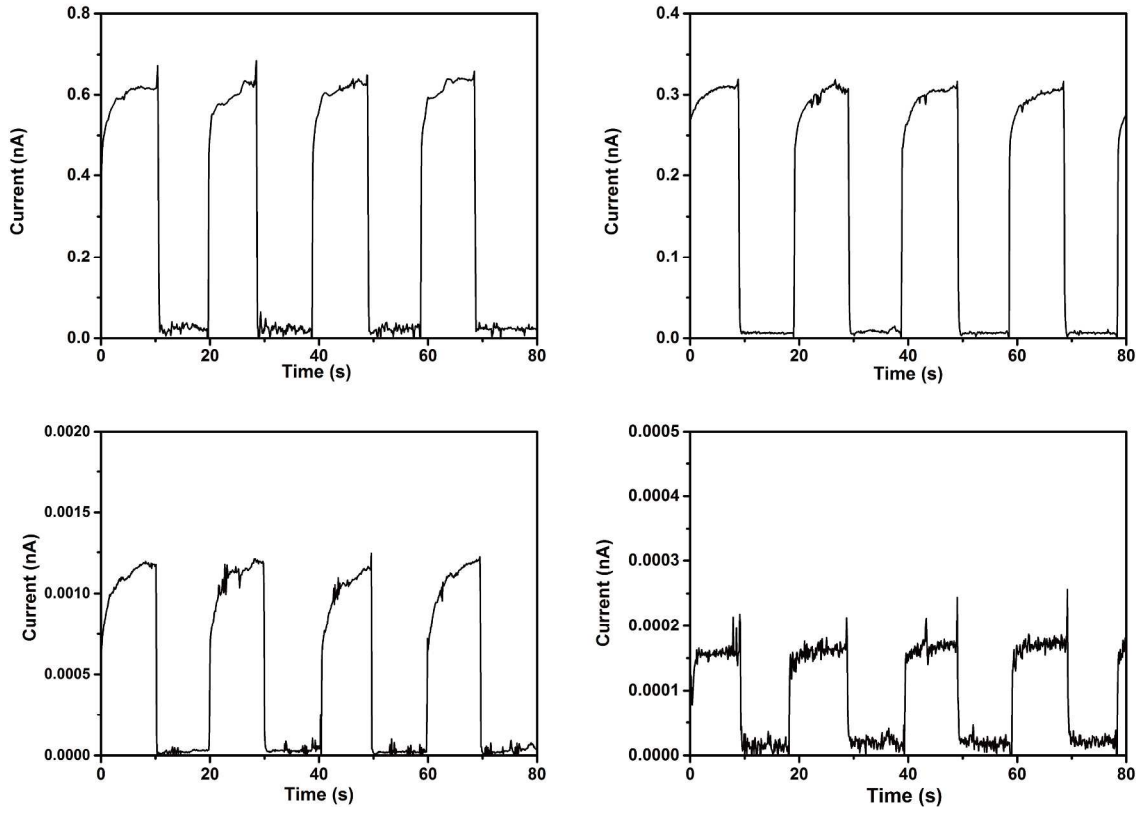


Figure S9. On/off curves of different photodetectors. (a) (b) (c) (d) correspond to (a) (b) (c) (d) in figure S7.

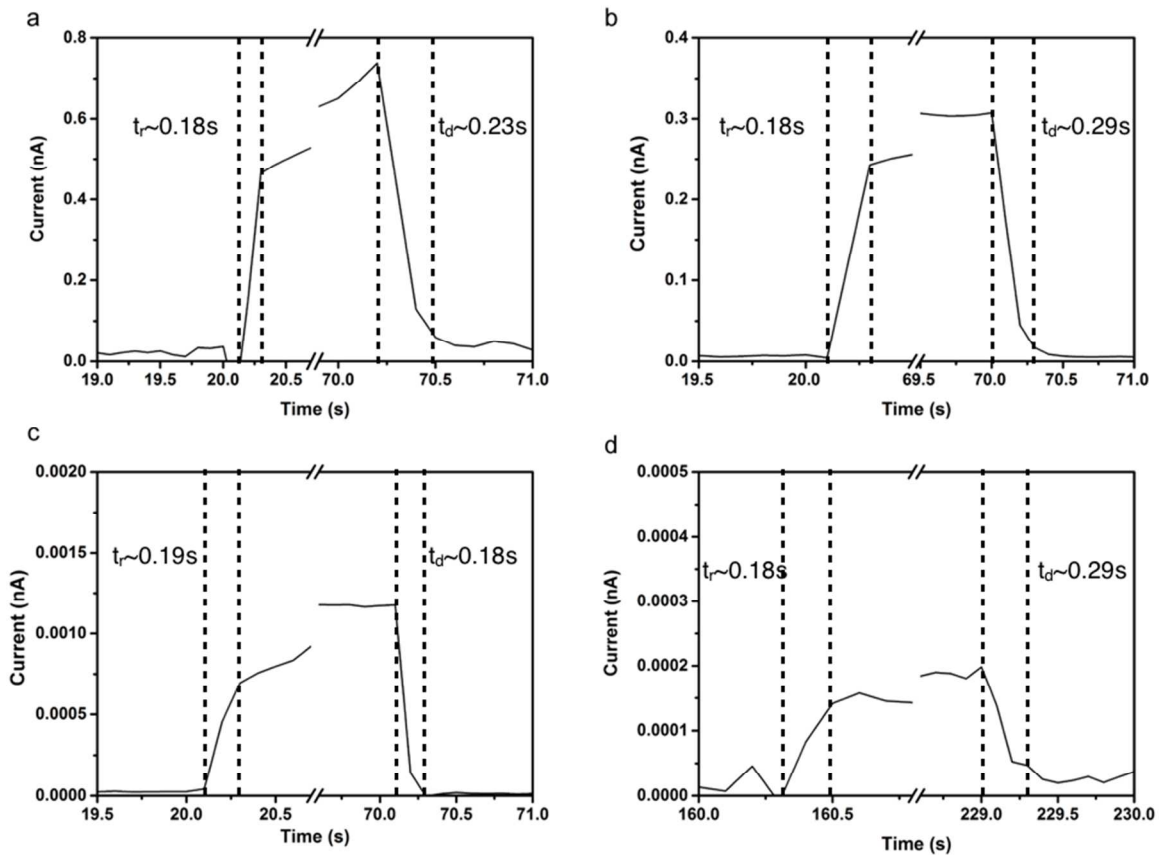


Figure S10. Rise and fall times of photodetectors with different morphologies.

(a) (b) (c) (d) correspond to (a) (b) (c) (d) in figure S7.

All these four photodetectors were fabricated using the same method mentioned in the manuscript except for the different DMF amount and measured under the white light in a microscope with an intensity of about $45\text{mw}/\text{cm}^2$.

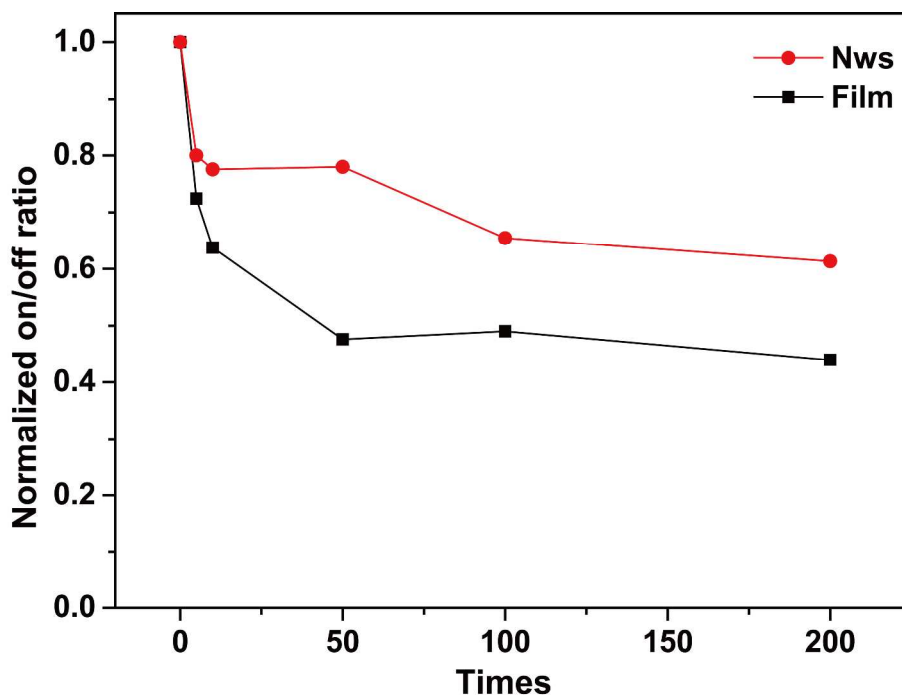


Figure S11.The on/off ratio decay of photodetectors made of NWs and film.

The only difference of perovskite film detector with the nanowire one is that the film detector employed perovskite film instead of nanowires. The other parameters are all the same with the nanowire one. And the perovskite film was formed by spin-coating the 40 w.t.% mixed solution ($\text{PbCl}_2:\text{MAI}=1:3$) on as-cleaned PET substrates at 3000rpm for 30s and annealing at 95 °C for 40 min. The decay of detectors were measured under the same bending condition and AM 1.5G illumination with a light intensity of 20 mW/cm^2 .

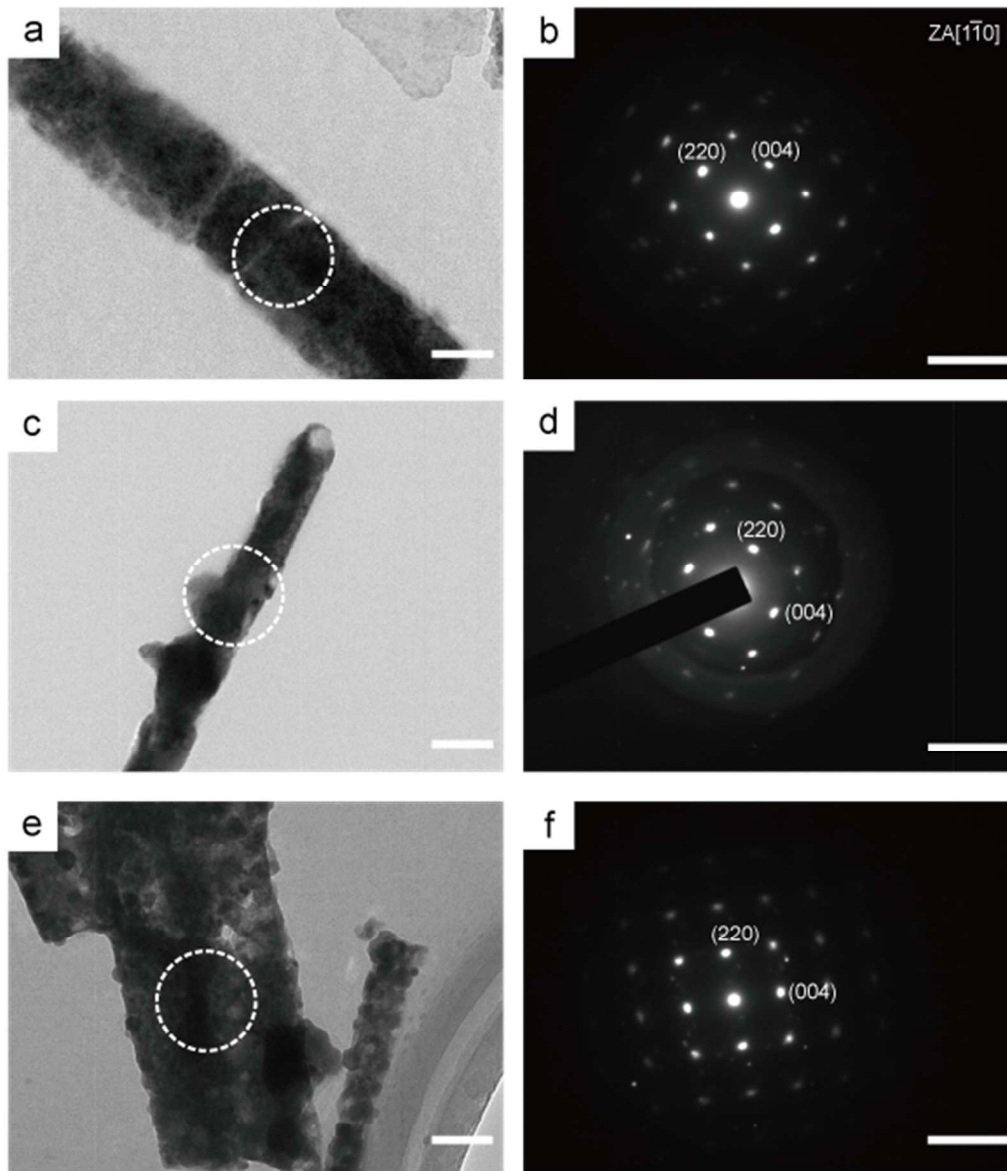


Figure S12. SAD patterns of different perovskite NWs. The scale bars in figure (a)(c)(e) are 100nm and in (b)(d)(f) are 5 1/nm.

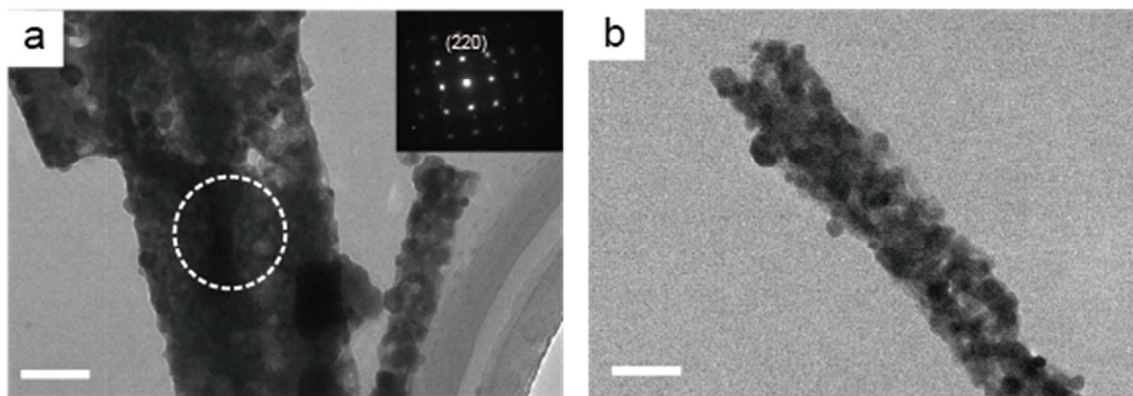


Figure S13. Perovskite nanowires consisting of self-assembly particles. The scale bars in (a) (b) are 100nm and 50nm.