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

Supporting Information

A wearable helical organic-inorganic photodetector with thermoelectric generators as power source

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Fig. S1. The fabrication process of the integral device. PU was coated on a screw and solidified. After solidification, ZnO and Au were sputtered on the opposite sides on the latter part of the PU substrate. Thermoelectric materials and Ag contacts were coated on the left part. A complete device was fabricated after solidification and peeling.

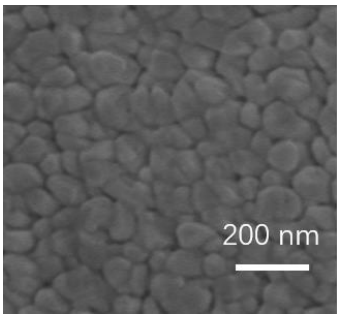

Fig S2. The SEM image of ZnO shows the compact structure of the sputtered ZnO.

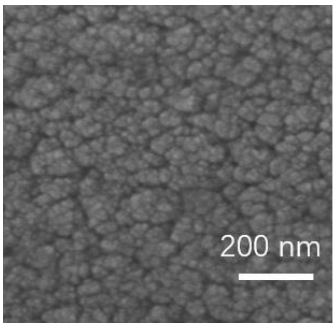

Fig. S3. The SEM image of Au shows the compact structure of the sputtered Au.

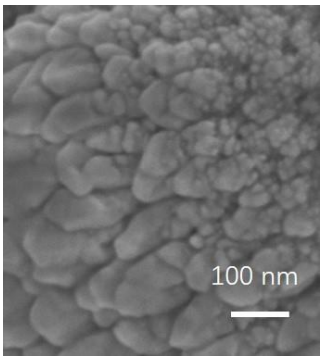

Fig. S4. The SEM image of ZnO-Au interface. There exists a robust interface between the sputtered ZnO and Au.

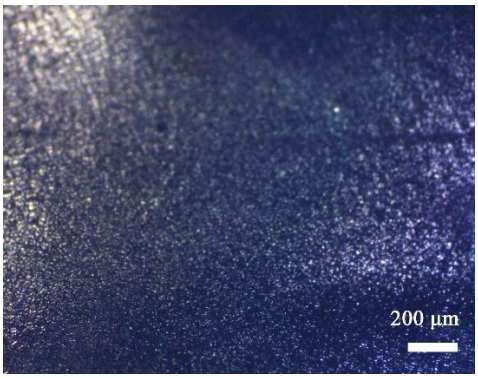

Fig. S5. The microscope image of ZnO-Au interface. There exists a robust interface between the sputtered ZnO and Au.

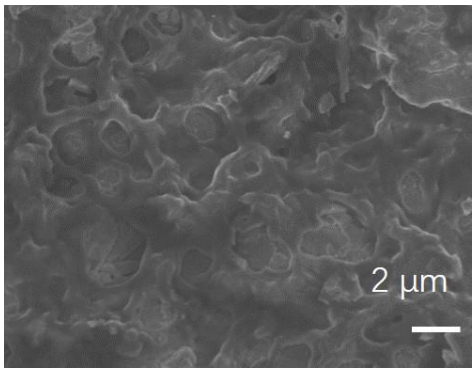

Fig. S6. the SEM image of Bi_2Te_3 on PU substrate. Bi_2Te_3 is evenly distributed in the binder.

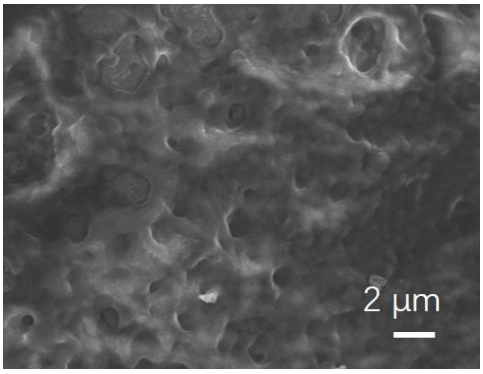

Fig. S7. the SEM image of Bi_2Se_3 on PU substrate. Bi_2Se_3 is evenly distributed in the binder.

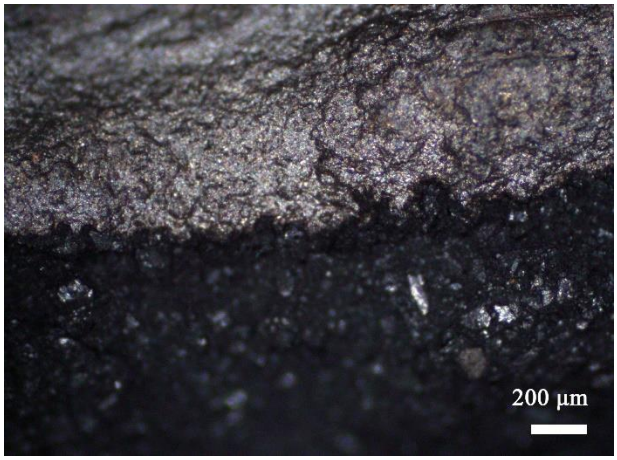

Fig. S8. the microscope image of Bi_2Se_3 and Ag. It indicates the great contact between Bi_2Se_3 and Ag.

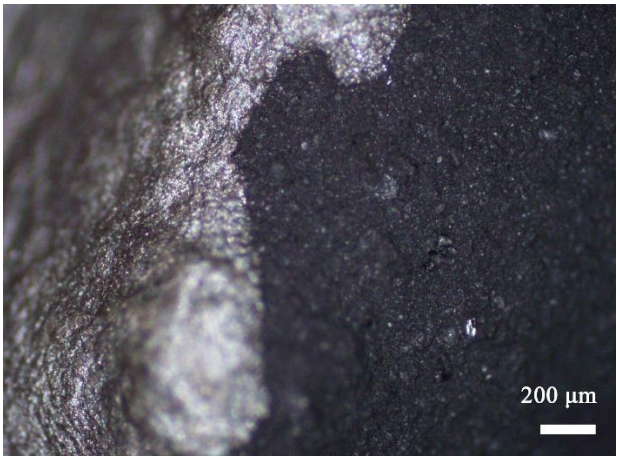

Fig. S9. the microscope image of Bi_2Te_3 and Ag. It indicates the great contact between Bi_2Te_3 and Ag.

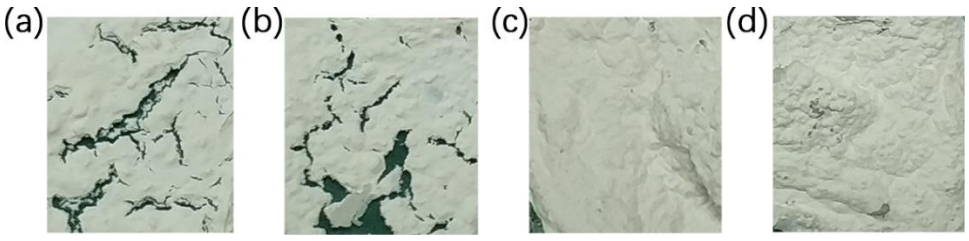

Fig. S10. The photograph of ZnO: PVDF nanocomposite of different ratio. a) 0.15g ZnO: 0.18 g PVDF. b) 0.15g ZnO: 0.27 g PVDF. c) 0.15g ZnO: 0.36 g PVDF. d) 0.15g

ZnO: 0.45 g PVDF.

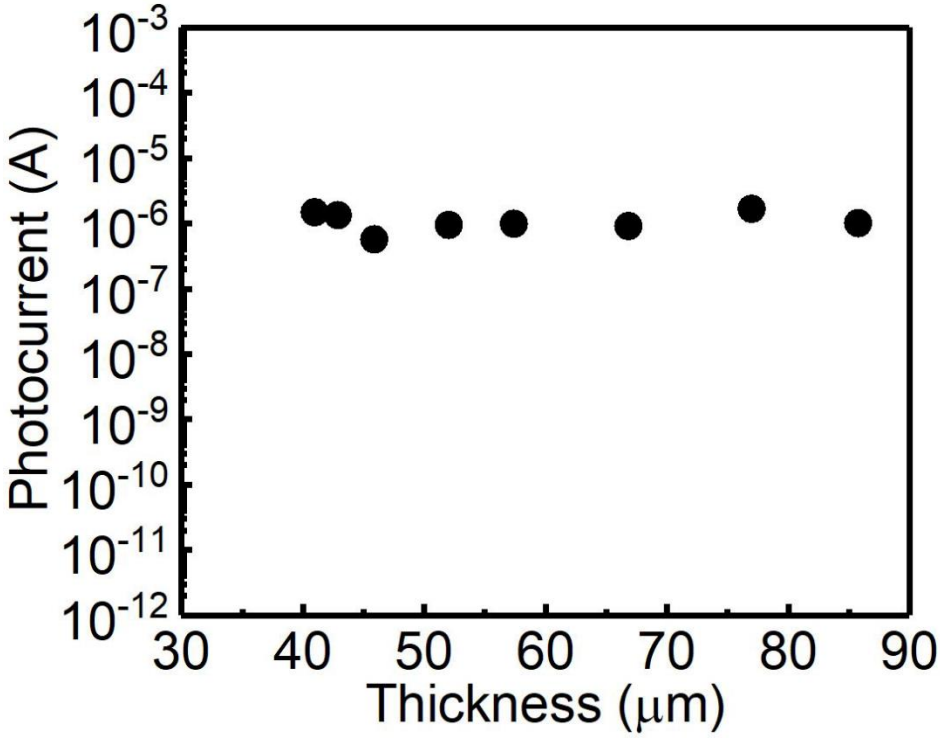

Fig. S11. Photocurrents of ZnO：PVDF composite of different thicknesses. It shows that the thickness of the coated ZnO：PVDF merely influence its photodetection in a certain thickness range.

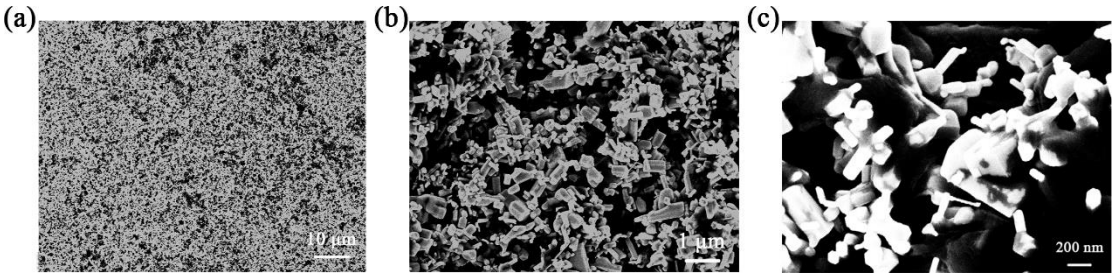

Fig. S12. The SEM image of ZnO: PVDF in a) low magnification. b) middle magnification. c) high magnification.

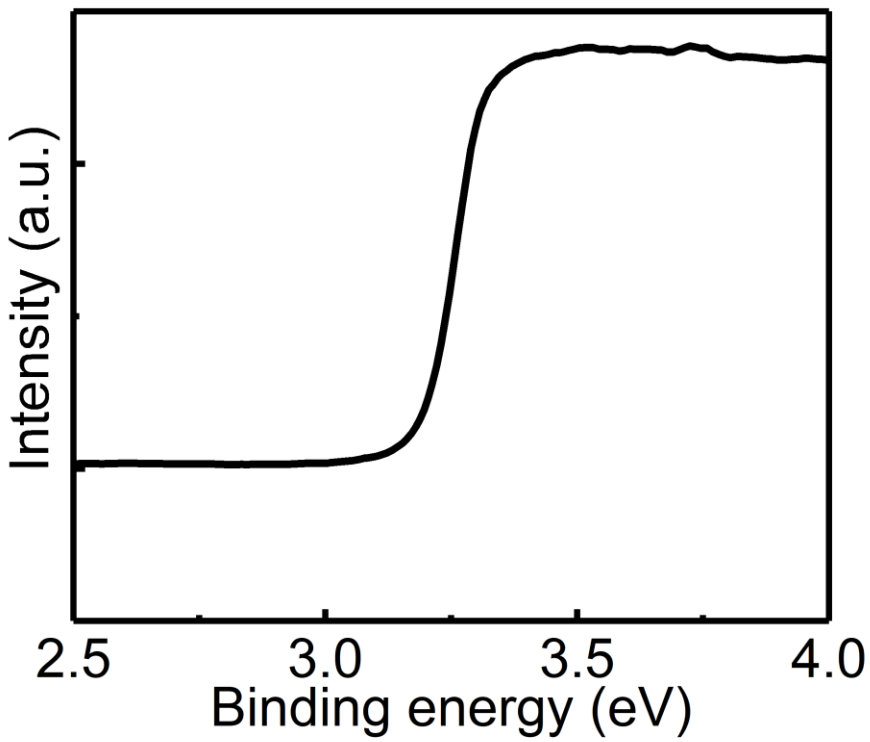

Fig. S13. Ultraviolet photoelectron spectroscopy (UPS) results of ZnO: PVDF, indicating its high absorption of UV light.

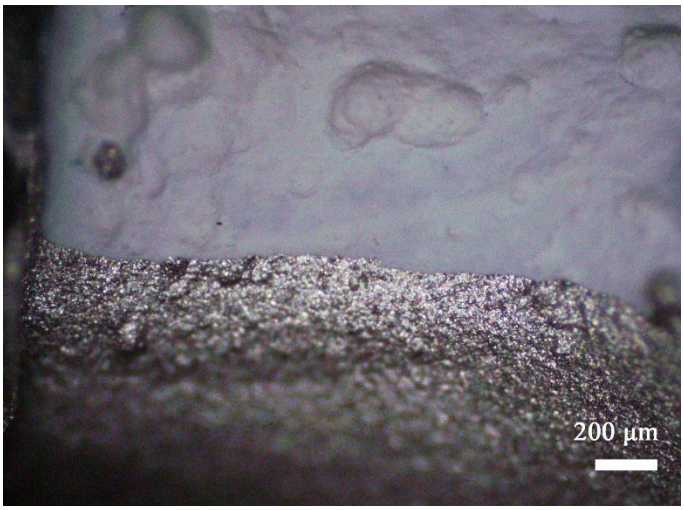

Fig. S14. the microscope image of ZnO: PVDF and Ag. It indicates the great contact between ZnO: PVDF and Ag.

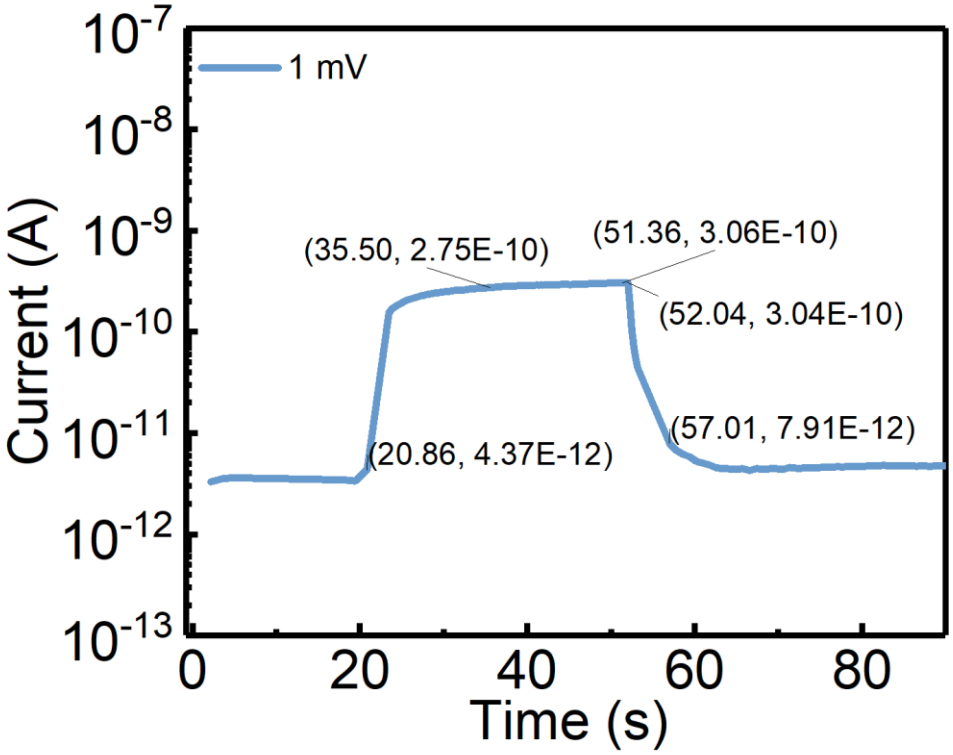

Fig. S15. The partially enlarged I-T characteristics of Ag/ZnO: PVDF/Ag under 1 mV bias. The rising time (time it takes from 10% to 90% of maximum photocurrent) and decay time (time it takes from 90% to 10% maximum photocurrent) are less than 14.64 s and 4.97s, respectively.

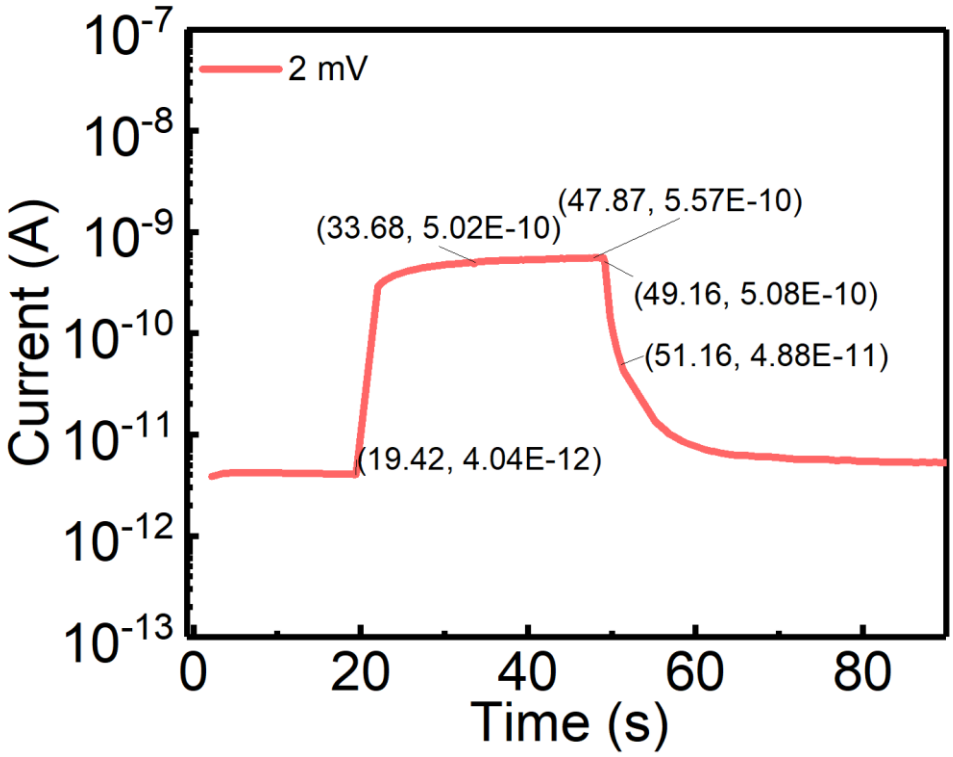

Fig. S16. The partially enlarged I-T characteristics of Ag/ZnO: PVDF/Ag under 2 mV bias. The rising time (time it takes from 10% to 90% of maximum photocurrent) and decay time (time it takes from 90% to 10% maximum photocurrent) are less than 14.26 s and 2 s, respectively.

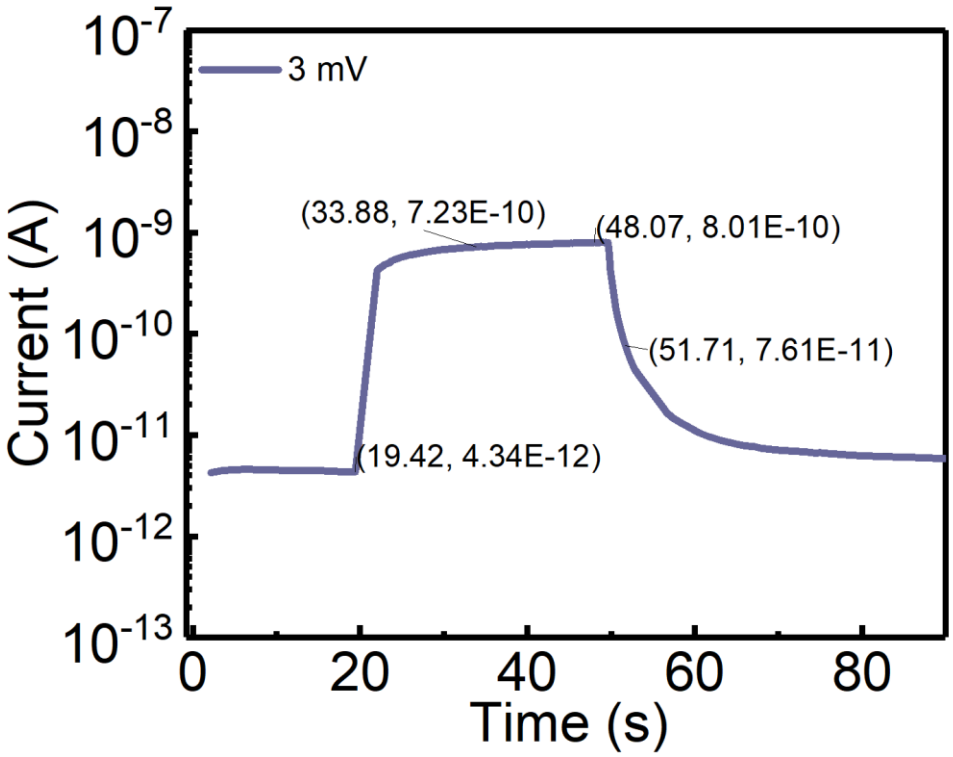

Fig. S17. The partially enlarged I-T characteristics of Ag/ZnO: PVDF/Ag under 3 mV bias. The rising time (time it takes from 10% to 90% of maximum photocurrent) and decay time (time it takes from 90% to 10% maximum photocurrent) are less than 14.46 s and 3.64s, respectively.

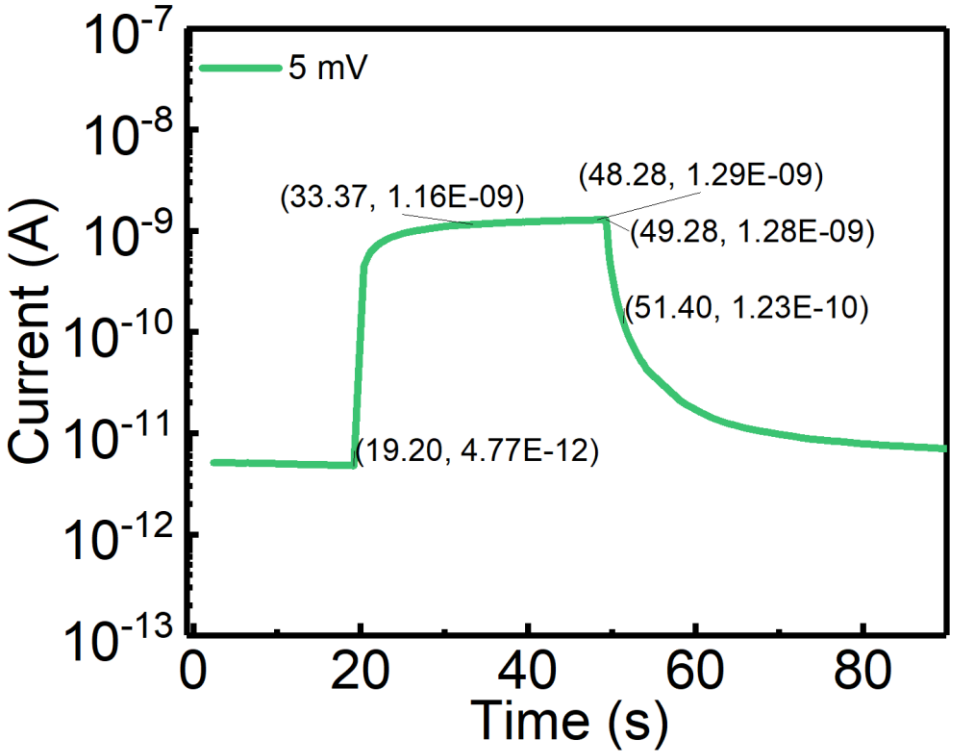

Fig. S18. The partially enlarged I-T characteristics of Ag/ZnO: PVDF/Ag under 5 mV bias. The rising time (time it takes from 10% to 90% of maximum photocurrent) and decay time (time it takes from 90% to 10% maximum photocurrent) are less than 14.17 s and 2.12 s, respectively.

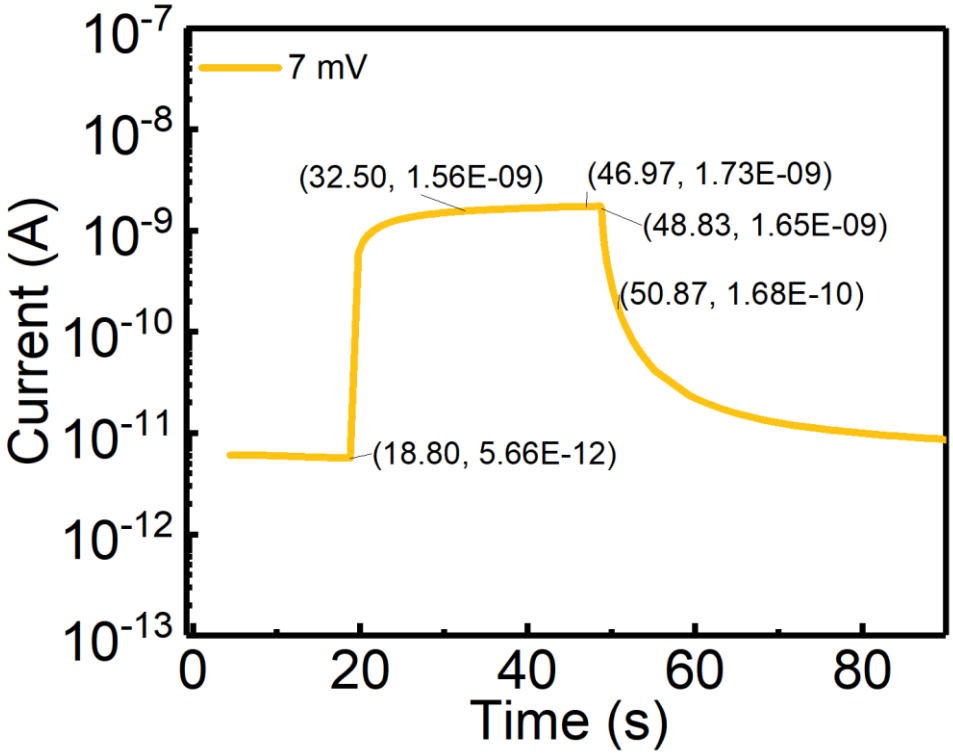

Fig. S19. The partially enlarged I-T characteristics of Ag/ZnO: PVDF/Ag under 7 mV bias. The rising time (time it takes from 10% to 90% of maximum photocurrent) and decay time (time it takes from 90% to 10% maximum photocurrent) are less than 13.7 s and 2.04 s, respectively.

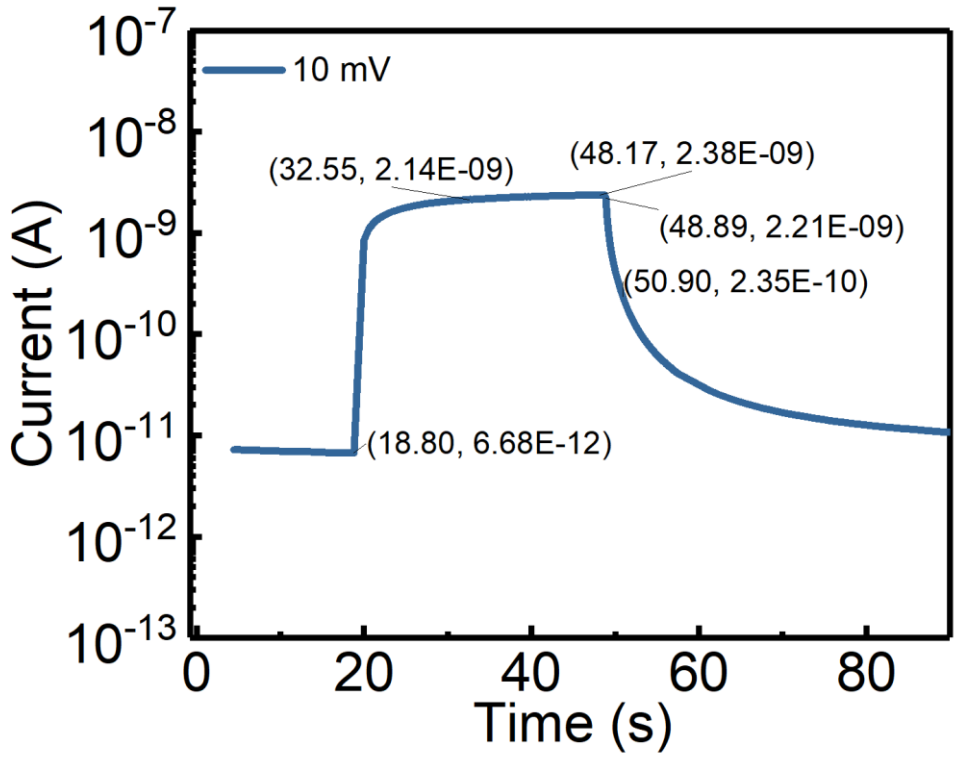

Fig. S20. The partially enlarged I-T characteristics of Ag/ZnO: PVDF/Ag under 10 mV bias. The rising time (time it takes from 10% to 90% of maximum photocurrent) and decay time (time it takes from 90% to 10% maximum photocurrent) are less than 13.75 s and 2.01 s, respectively.

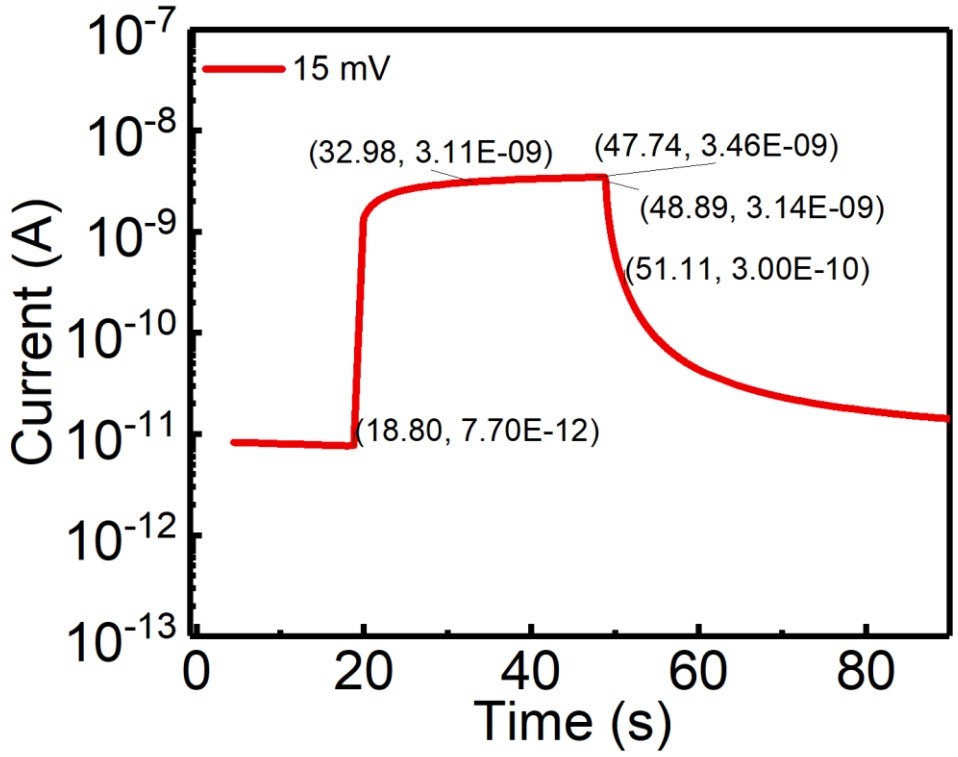

Fig. S21. The partially enlarged I-T characteristics of Ag/ZnO: PVDF/Ag under 15 mV bias. The rising time (time it takes from 10% to 90% of maximum photocurrent) and decay time (time it takes from 90% to 10% maximum photocurrent) are less than 14.18 s and 2.22 s, respectively.

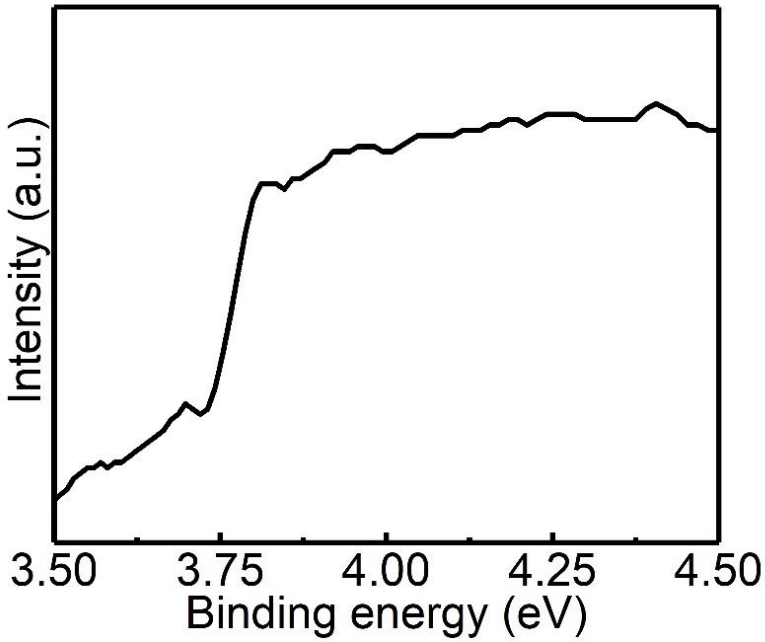

Fig. S22. Ultraviolet photoelectron spectroscopy (UPS) results of sputtered ZnO, indicating its absorption of UV light.

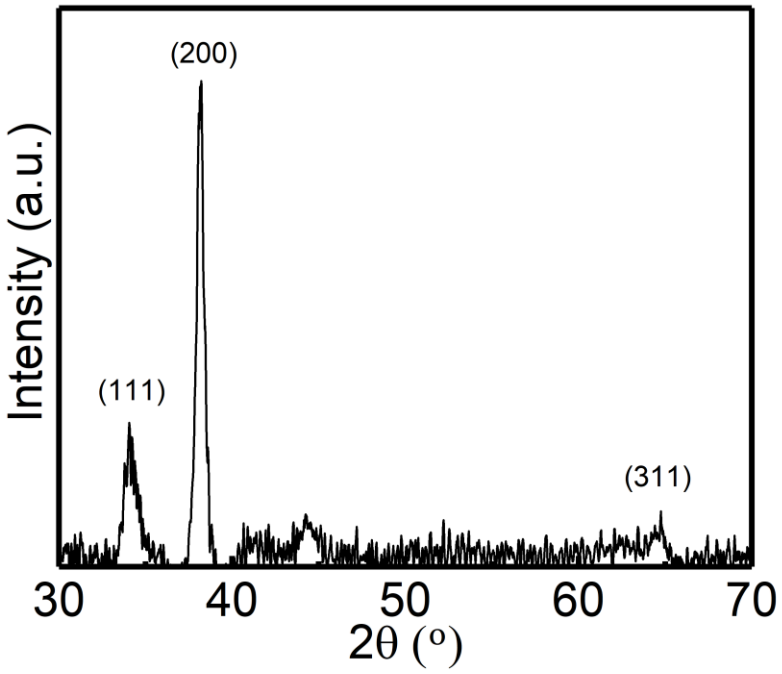

Fig. S23. The XRD of sputtered ZnO, indicating the structure of ZnO.

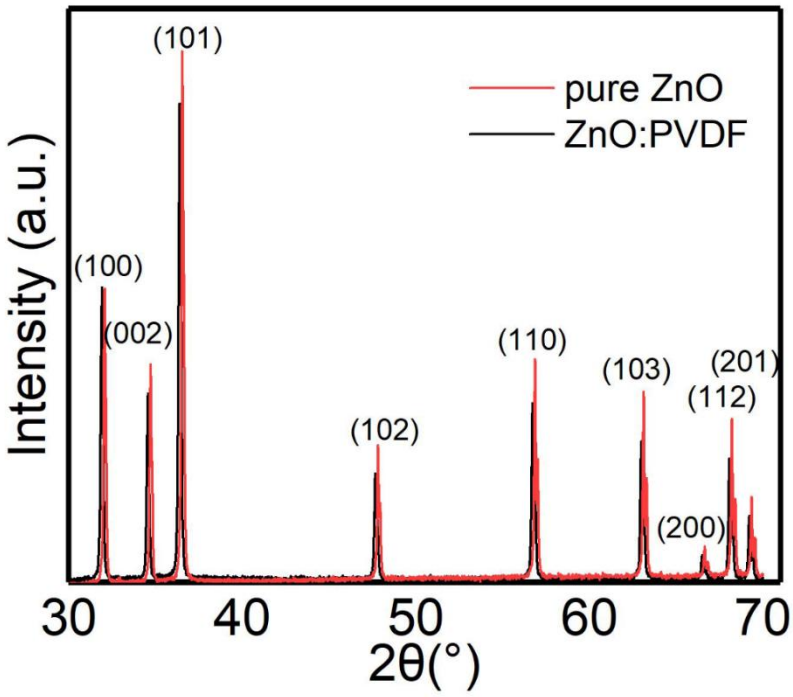

Fig. S24. The XRD of pure ZnO nanoparticle (red line) and ZnO: PVDF (dark line), indicating the hexagonal structure of ZnO and showing high crystallinity. It can be seen that the mixing with PVDF merely affects the structure of ZnO. Thus, in the facile mixture method, the final crystal structure of ZnO is determined by its original crystal structure.

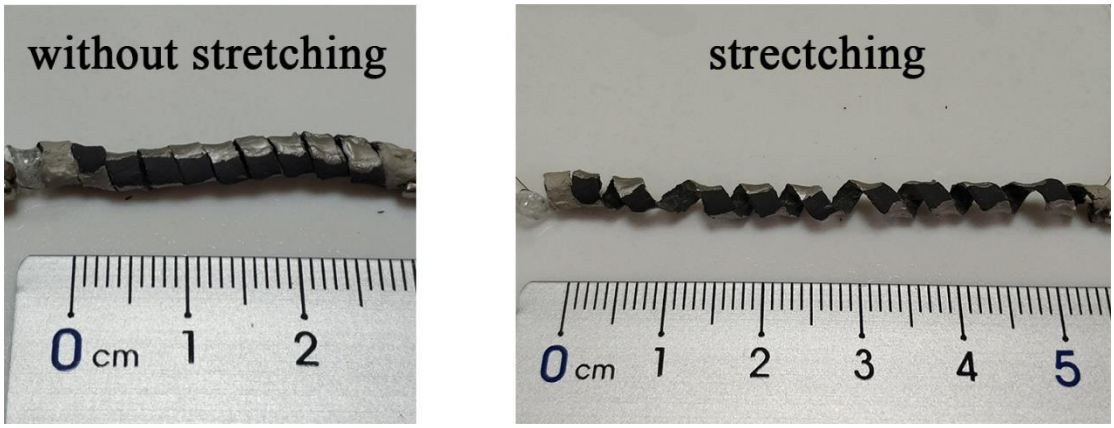

Fig. S25. The photographs of the thermoelectric part without stretching and under stretching.

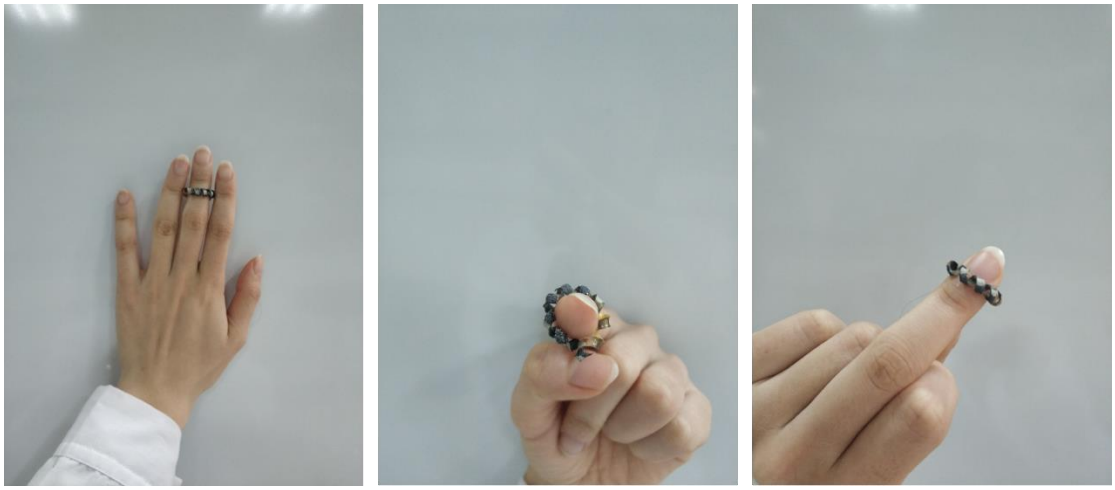

Fig. S26. The deformability and wearability of the integral device. The device can deform around finger, showing decent wearabity.

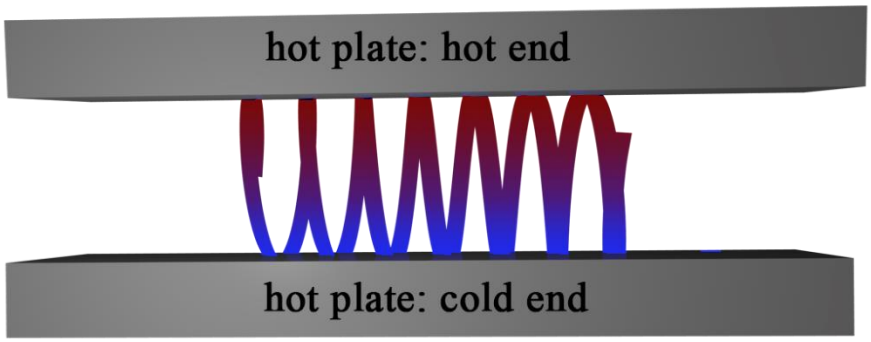

Fig. S27. The schematic diagram of the thermoelectric generators heating system. Two hot plates sever as a hot source and a cold source to generate temperature difference. The color on the thermoelectric generators represents the temperature gradient.