Supplementary Materials

A broadband self-powered and stable photothermoelectric detector based on Ag_2Se/MWCNTs composite fabricated via screen printing

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MATERIALS AND METHODS

Preparation of Se nanorods

0.5 g of selenium dioxide (SeO_2) and 0.5 g of β-cyclodextrin were added into a beaker containing 100 mL of deionised water and magnetically stirred to form solution A. 2 g of L-ascorbic acid was added into another beaker containing 100 mL of deionised water and magnetically stirred to form solution B. In the magnetically stirred state of solution B, the solution A was slowly added into solution B and magnetically stirred. Solution A was slowly added to solution B with magnetic stirring and stirred for 4 h until the solution was completely reacted. The supernatant was removed by centrifugation at 8,500 rpm for 5 min, and then washed by centrifugation twice with deionised water and anhydrous ethanol. Selenium nanorods were collected after drying the deposited material in a desiccator at 60 °C for 6 h.

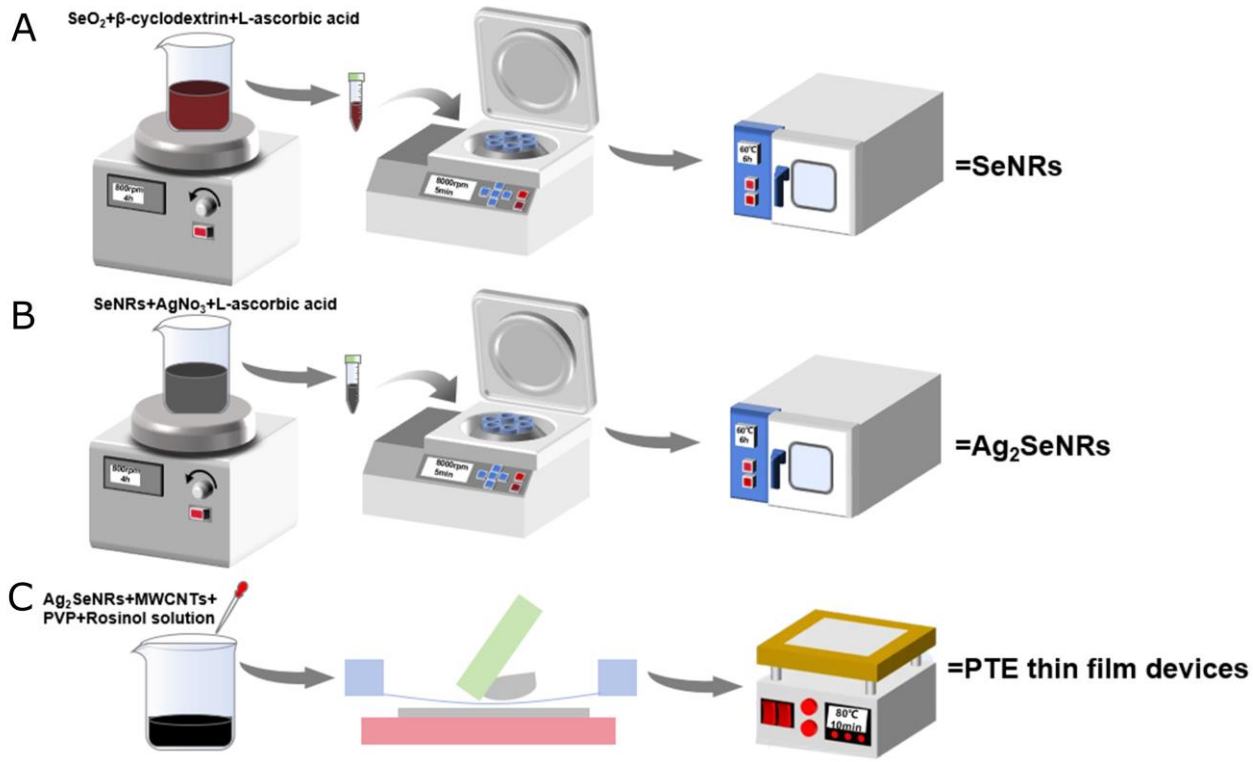
Preparation of Ag_2Se nanorods

0.3 g of Se nanorods was added into 10 mL of ethylene glycol and ultrasonically dispersed to form solution C. A certain amount of silver nitrate ($AgNO_3$) was added into 10 mL of anhydrous ethanol and magnetically stirred to form solution D. Then, a certain amount of L-ascorbic acid was added into 20 mL of deionised water and magnetic stirring was performed to form solution E. Firstly, solution D was slowly dripped into solution C under magnetic stirring. Subsequently, solution E was slowly added to the above mixture of solution C. The molar ratio of L-ascorbic acid to $AgNO_3$ was 3:1. After complete reaction with continuous stirring for 4 h at room temperature, the material was centrifuged at 8,500 rpm for 5 min, and the supernatant was poured out, and then centrifuged and washed with deionised water and anhydrous ethanol alternately for two times. Ag_2Se NRs were collected after the deposited material was dried in a desiccator at 60 °C for 6 hours.

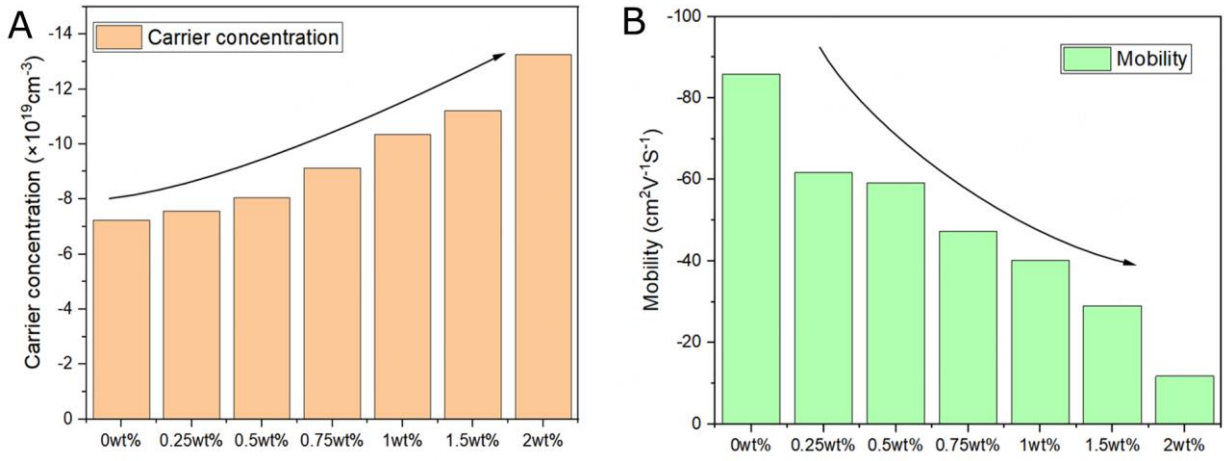
Supplementary Table 1. FWHM variation with MWCNTs content

x wt%	**FWHM**
0	0.176
0.25	0.165
0.5	0.164
0.75	0.160
1	0.158
1.5	0.156
2	0.154

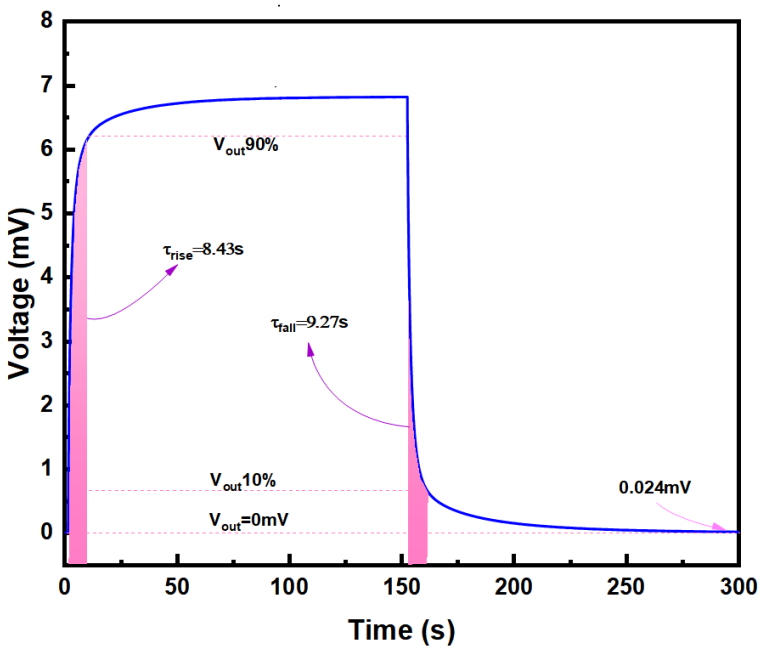
Supplementary Figures



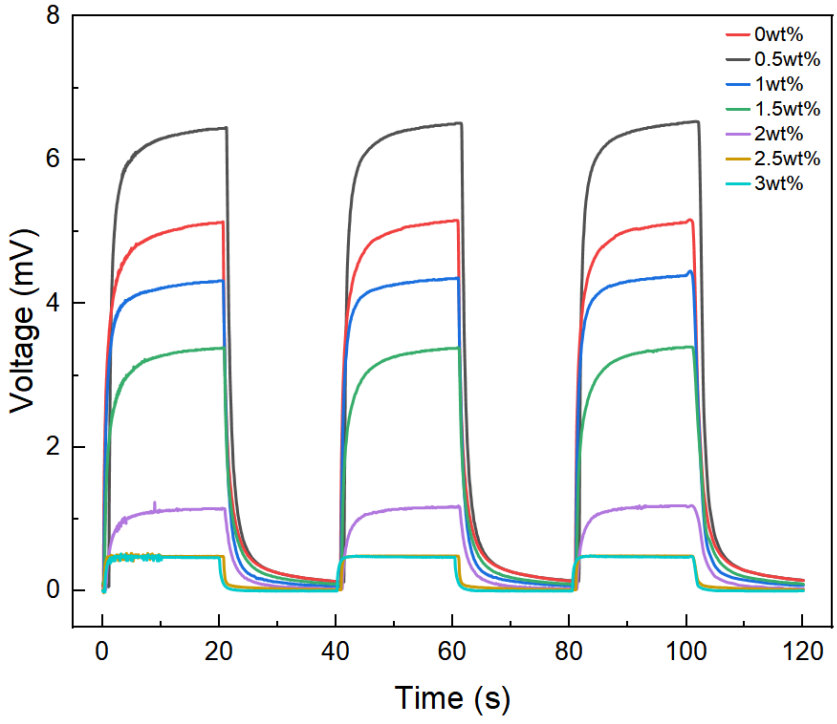
Supplementary Figure 1. (A) SeNRs preparation method; (B) Ag_2Se NRs preparation method; (C) PTE detector preparation method.



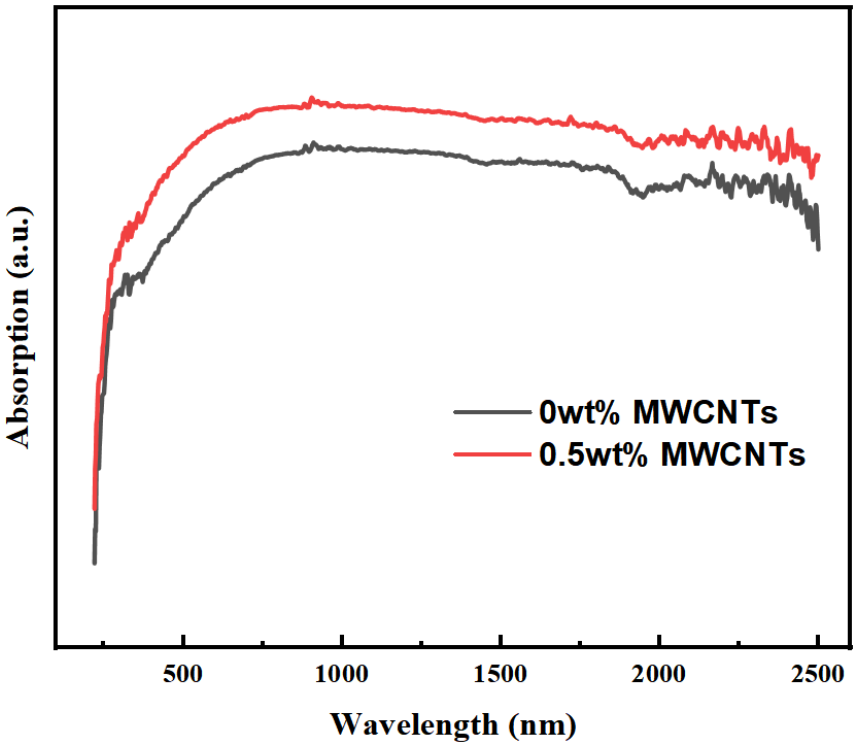
Supplementary Figure 2. (A) Variation of carrier concentration with MWCNTs content; (B) Variation of mobility with MWCNTs content.



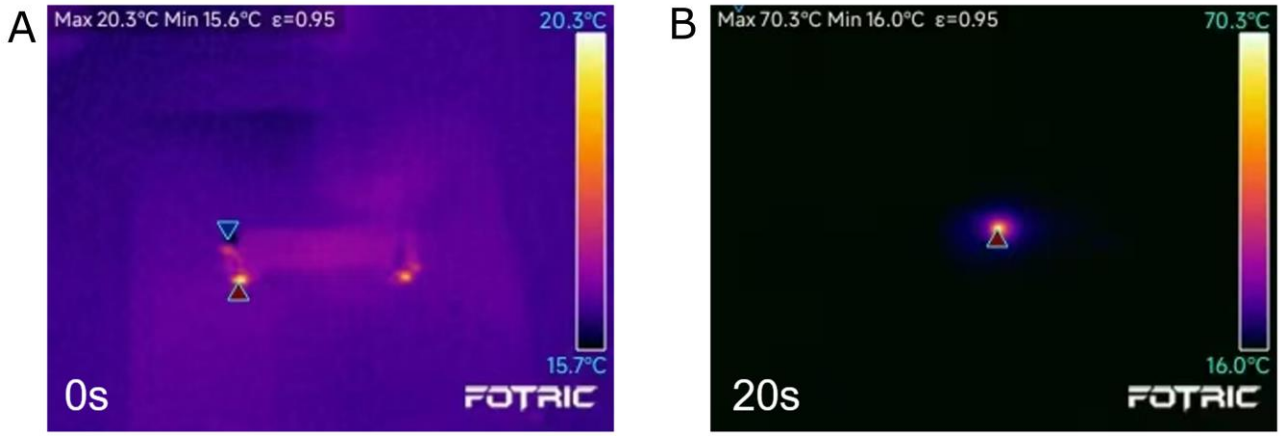
Supplementary Figure 3. Taking a single cycle in Figure 3B to calculate the rise time, fall time and end of cycle thickness final voltage value.



Supplementary Figure 4. PTE output voltage curves for MWCNTs from 0-3 wt% at 650 nm 100 mW laser.



Supplementary Figure 5. Absorption spectra of APM films with 0 wt% MWCNTs *vs.* 0.5 wt% MWCNTs.



Supplementary Figure 6. (A) Image taken by the thermal imaging camera at 0 s; (B) Image taken by the thermal imaging camera at 20 s.