Supporting Information

High-Efficiency Transfer of Percolating Nanowire Film for Stretchable and Transparent Photodetectors

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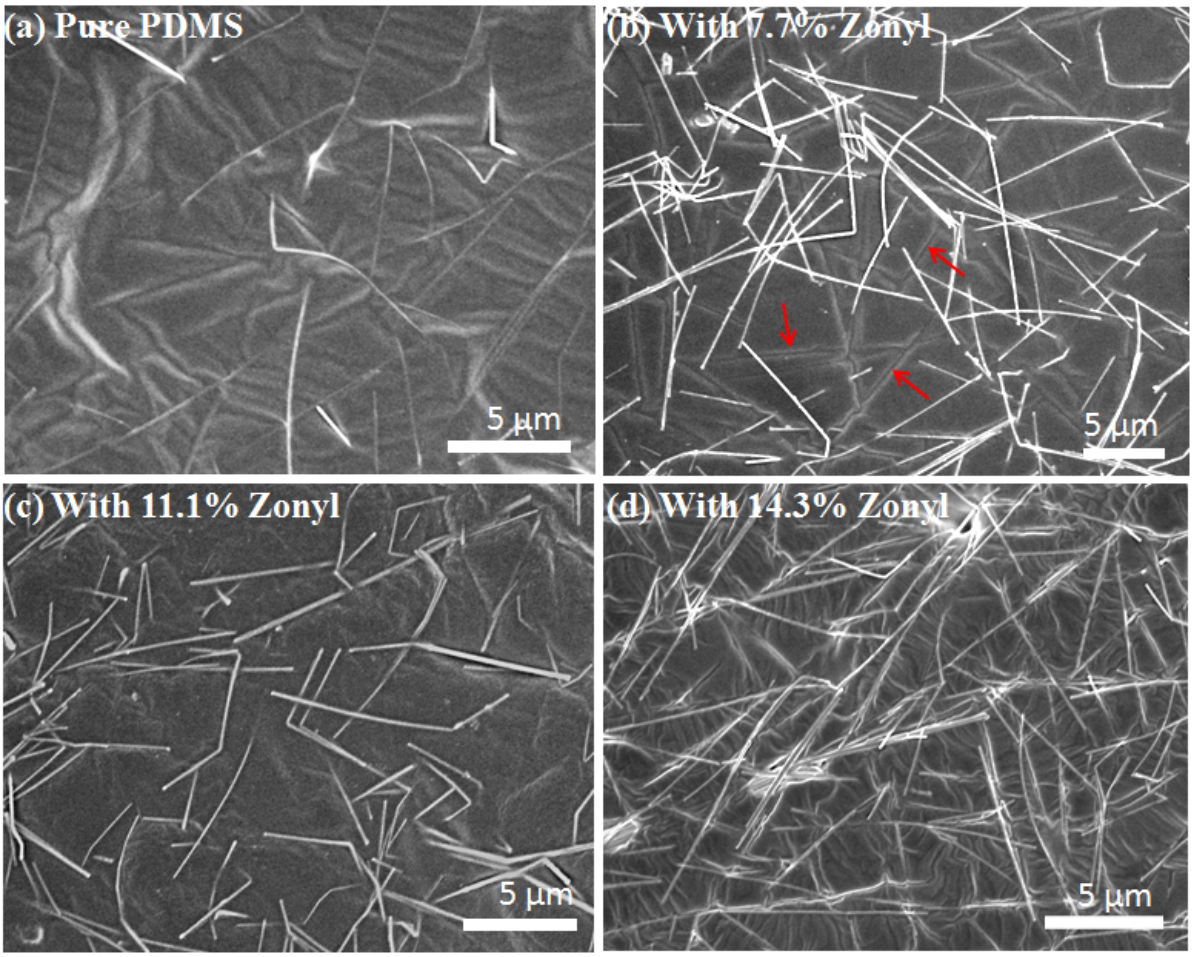

Fig. S1 SEM image of the surface of AgNWs in PDMS mixed with different weight ratio of Zonyl: (a) 0%; (b) 7.7%; (c) 11.1%; (d) 14.3%.

Compared to Fig. S1a, with the addition of 7.7% Zonyl, the transfer efficiency of the AgNWs was significantly improved with more NWs transferred into the polymer matrix, Fig. S1b. However, the transfer efficiency is still not ideal for the NW transfer. Conductivity degradation in the AgNW film existed after the transfer process with NW exfoliation sites

observed in the SEM image (Fig S1, red arrows). After the Zonyl ratio increase to 11.1%, excellent transfer of AgNWs was achieved which maintained good conductivity of the AgNW film coated on glass substrates. Plenty of AgNWs were observed on the surface of the polymer and no exfoliation sites were observed, as shown in Fig. S1c. Continue to increase the Zonyl ratio may not further improve the transfer efficiency of AgNWs. On the contrary, the excess of Zonyl will affect PDMS curing process and reduce the Young's modulus. Consequently, the resultant polymer had a lot of wrinkles on the surface leading to an inferior surface roughness, as presented in Fig S1d.

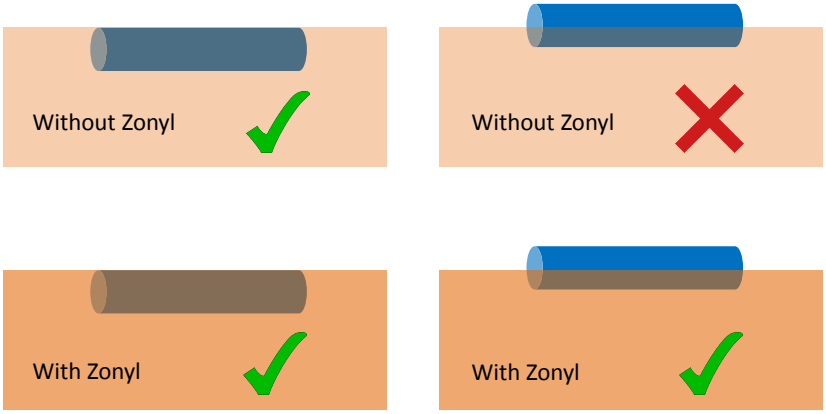

Fig. S2 A Schematic illustrating the transfer of AgNWs embedded in PDMS. Without Zonyl, the AgNWs can only be transferred from the substrate when most part of the NW is embedded within the PDMS matrix. With Zonyl, the AgNWs can be effectively transferred from the substrate facilitated by the strong chemical coupling between Zonyl and AgNWs.

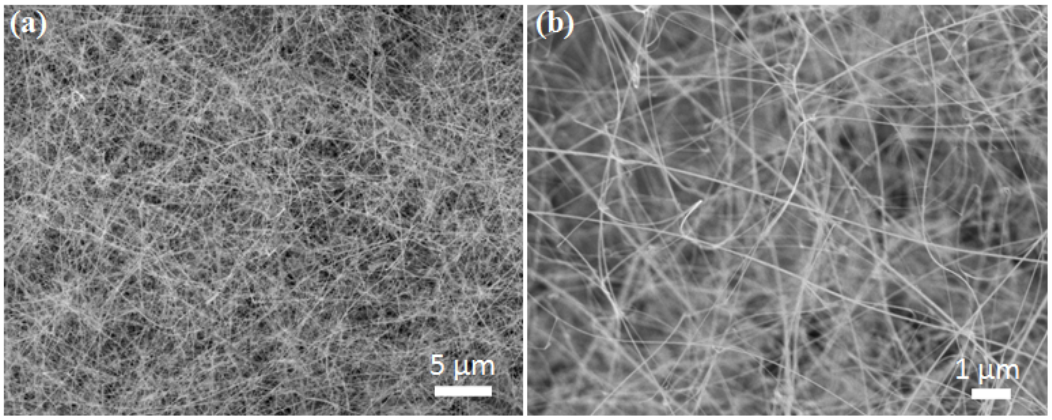

Fig. S3 (a) A low magnification of the SEM image of Zn_2SnO_4 nanowires. (b) A higher magnification of the SEM image of Zn_2SnO_4 nanowires. Diameter of the Zn_2SnO_4 nanowires is around 100 nm. The length of the nanowire is in the range of a few tens of micrometers.

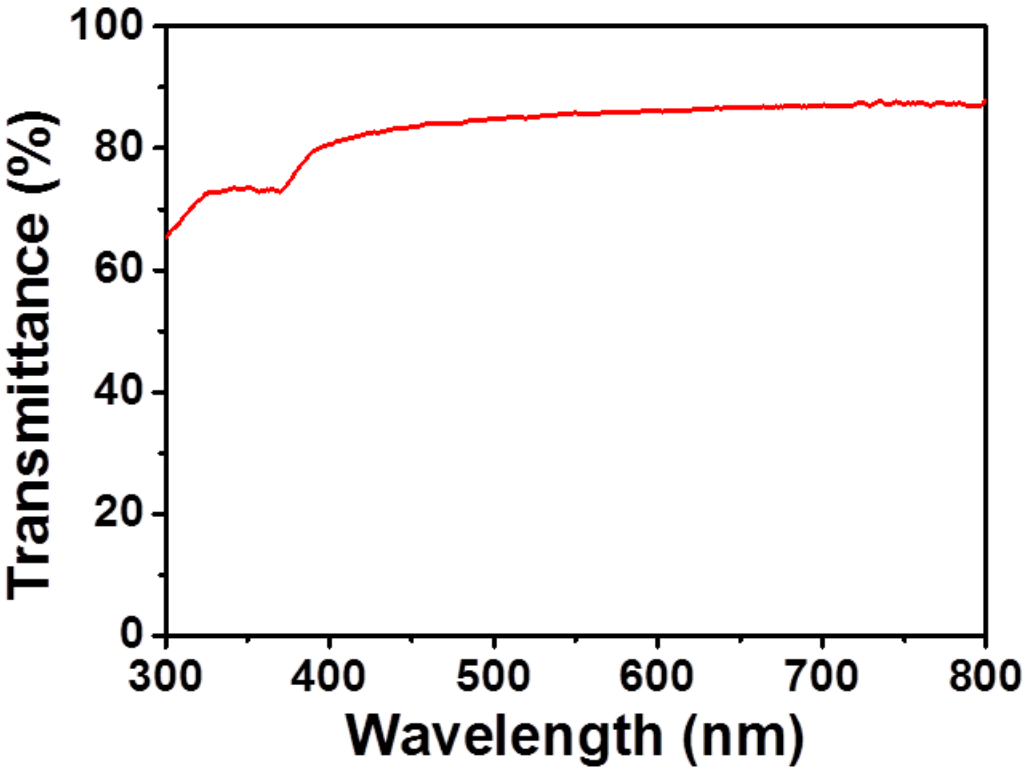

Fig. S4. Transmittance spectra of the stretchable photodetector.

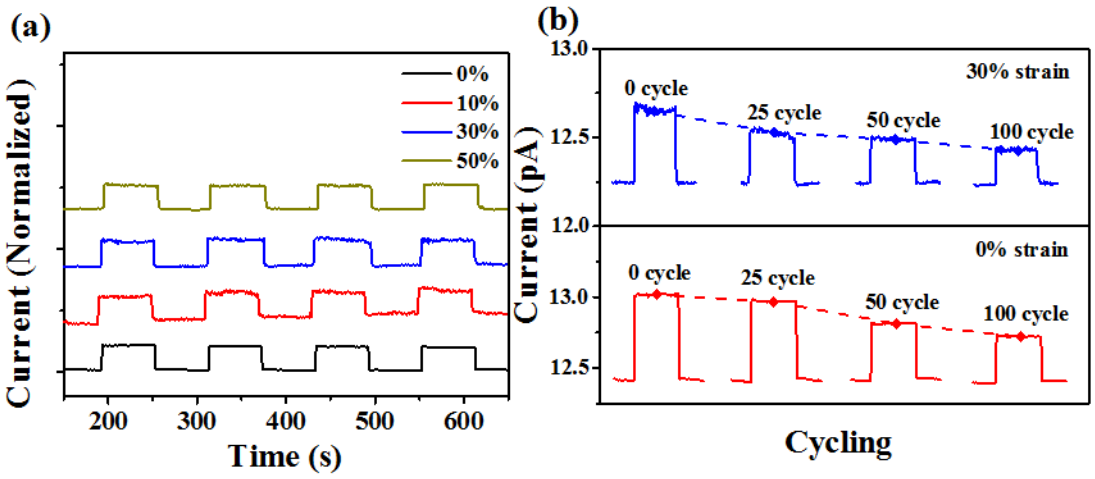

Fig. S5. (a) Respond of the device at tensile strains of 0%, 10%, 30%, and 50%. (the device was stretched along the channel width of the photodetector). (b) Stability test of the stretchable photodetector after different cycling numbers.

Fig. S5a shows performance of the stretchable photodetector when stretched to different tensile strains along the channel width. Compared to device stretched along the channel length, the photodetector demonstrates stable performance and almost no change in the photocurrent and photoresponse times under stretching. As discussed in the manuscript (page 5, line 8), the sensitive behavior of the photodetector when stretched along the channel length was attributed to the change of the channel length which affected transport behavior of the photo-generated carriers. In contrast, the device channel length was constant when stretched along its channel width without affecting the carrier transport. Consequently, a stable photoresponse behavior was observed. Fig. S5b presents the cycling test of the stretchable photodetector with peak strain of 30% along the channel length. Photocurrent of the device at 0% strain decreased from 0.72 pA to 0.39 pA after 100 cycles. Photocurrent of the device at 30% strain changed at a similar rate with photocurrent decreased from 0.48 pA to 0.24 pA. The photocurrent decrease is probably due to that partial of the NWs which have weak bonding to the polymer matrix will cause sliding and loss interconnection in the NW network during the initial stretching cycles. As the stretching cycles increase, the device performance become more stable as the photoresponse mainly contributed from the NWs which are strongly bonded to the polymer matrix and maintain good interconnection under the reversibly stretching cycles.