Electronic Supplementary Information for

High-Performance Stretchable Transparent Electrodes based on Silver Nanowires Synthesized *via* an Eco-Friendly Halogen-Free Method

Tao Cheng, Yi-Zhou Zhang, Wen-Yong Lai,* Yao Chen, Wen-Jin Zeng, Wei Huang*

Key Laboratory for Organic Electronics & Information Displays (KLOEID), Institute of Advanced Materials (IAM), Nanjing University of Posts and Telecommunications, Nanjing 210023, China

Email: iamwylai@njupt.edu.cn; iamwhuang@njupt.edu.cn

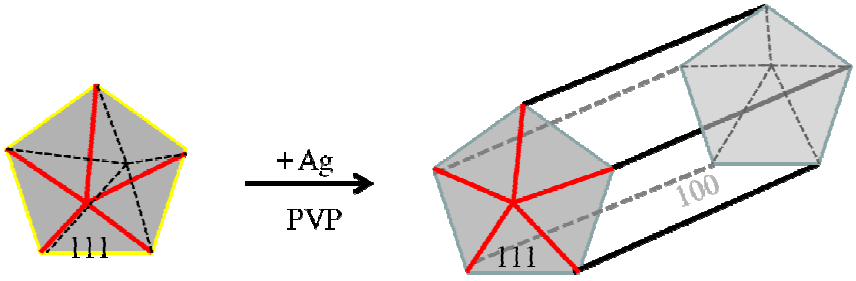

Fig. S1 Evolution of a nanowire from a multiply twinned nanoparticle of silver under the confinement of five twin planes and with the assistance of PVP. The ends of this nanowire are terminated by (111) facets, and the side surfaces are bounded by (100) facets.

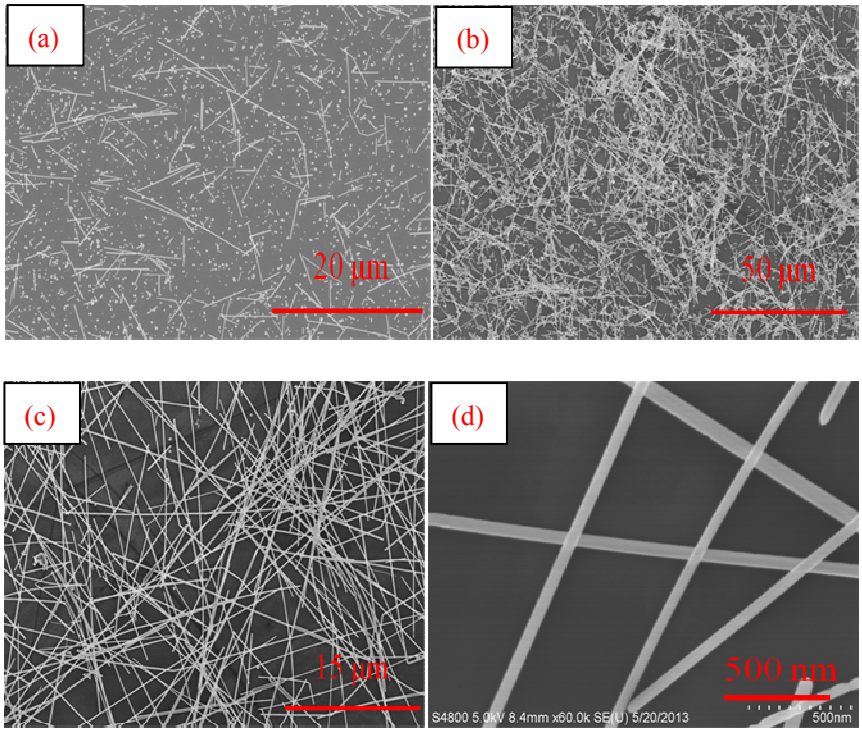

Fig. S2 Scanning electron microscopic (SEM) images of the silver nanowires prepared with different volume of silver nitrate solution to generate crystal seeds: (a) 2 mL; (b) 0.5 mL and (c) 1

mL. (d) The amplifying image of (c).

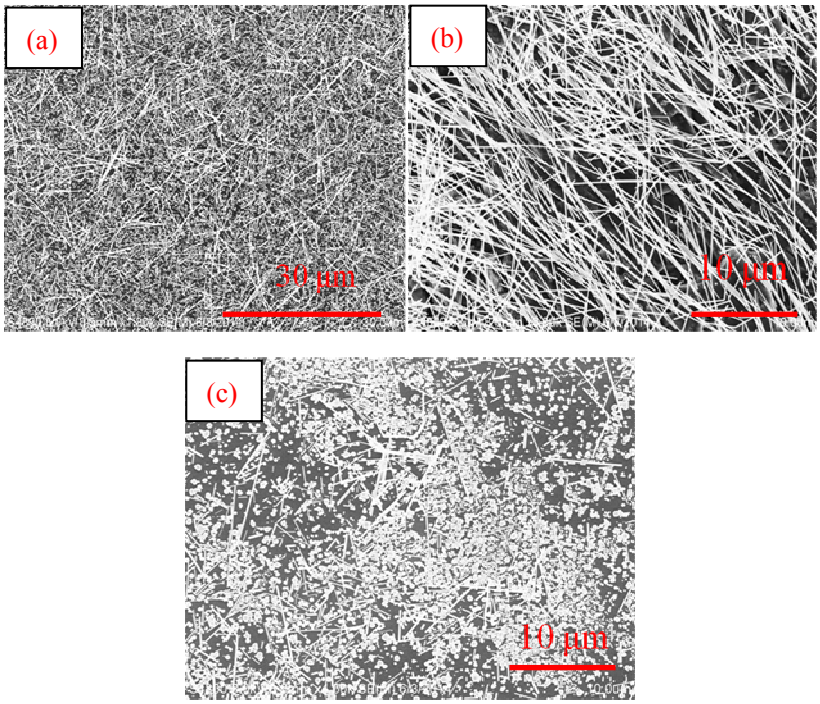

Fig. S3 SEM images of silver nanowires prepared at different temperatures: (a) 160°C; (b) 170°C and (c) 180°C.

Note: Highly pure and long (~30 μm) silver nanowires were successfully synthesized at 170°C, as illustrated in Figure S3b. When the reaction temperature was much below 170°C, the products were impure containing a large number of silver nanoparticles (Figure S3a). Similar phenomenon was observed when the temperature was much higher than 170°C (Figure S3c).

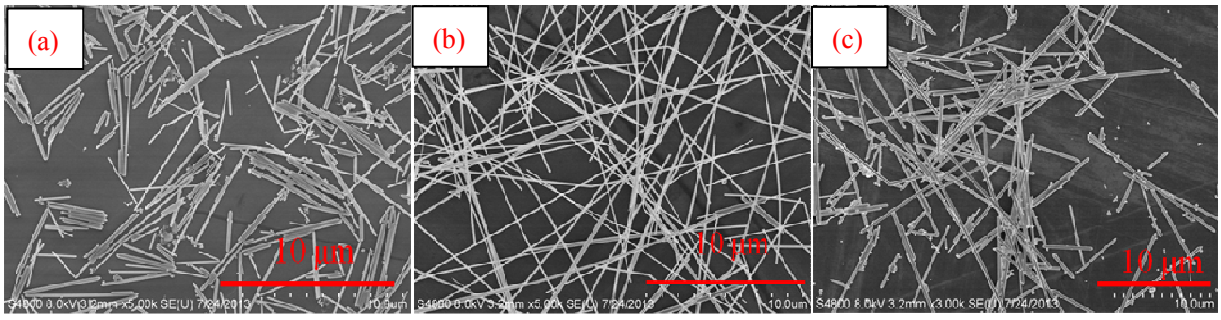

Fig. S4 SEM images of the silver nanowires synthesized with different molar ratio of PVP to $AgNO_3$: (a) 6.5:1; (b) 6:1 and (c) 5.5:1.

Note: The molar ratio of PVP to $AgNO_3$ significantly affects the aspect ratio and the purity of the silver nanowires. As can be seen in Figure S4, when the molar ratio of PVP to $AgNO_3$ was 6:1, silver nanowires with high aspect ratio and high purity were fabricated. However, when the ratio

was increased to 6.5:1 and decreased to 5.5:1, respectively, little nanoparticles formed together with shorter silver nanowires. If the ratio were 8:1 and 5:1, the solution turned into black emulsion, indicating the accumulation of the nanoparticles. If the molar ratio was larger than 6:1, the surfactant PVP not only capped the (100) facets, the extra PVP also capped the (111) facets which prevented the isotropic growth of the silver nanowires, resulting in the formation of nanoparticles. If the molar ratio was much lower than 6:1, the PVP could not completely cap the (100) facets which restrained the growth of the nanowires along (111) facets, also forming nanoparticles. Once the isotropic growth of the silver nanowires was prohibited, silver nanoparticles easily accumulated.

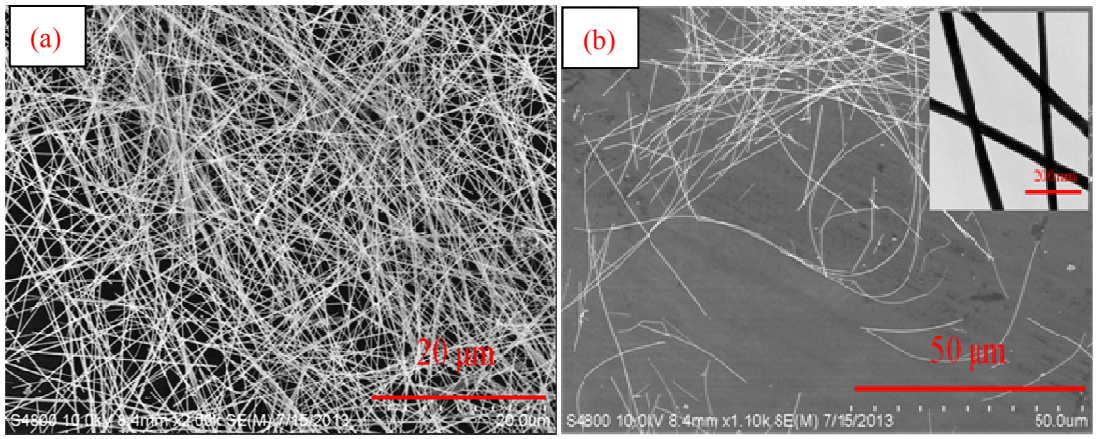

Fig. S5 Images of the silver nanowires prepared *via* adding the subsequent silver nitrate solution 1 mL by 1 mL. (a) The SEM of silver nanowires with average length 40~50 μm and average diameter ~50 nm; (b) The SEM of some silver nanowires with length as long as 80 μm, while retaining a diameter of ~50 nm. Inset is the amplifying TEM image.

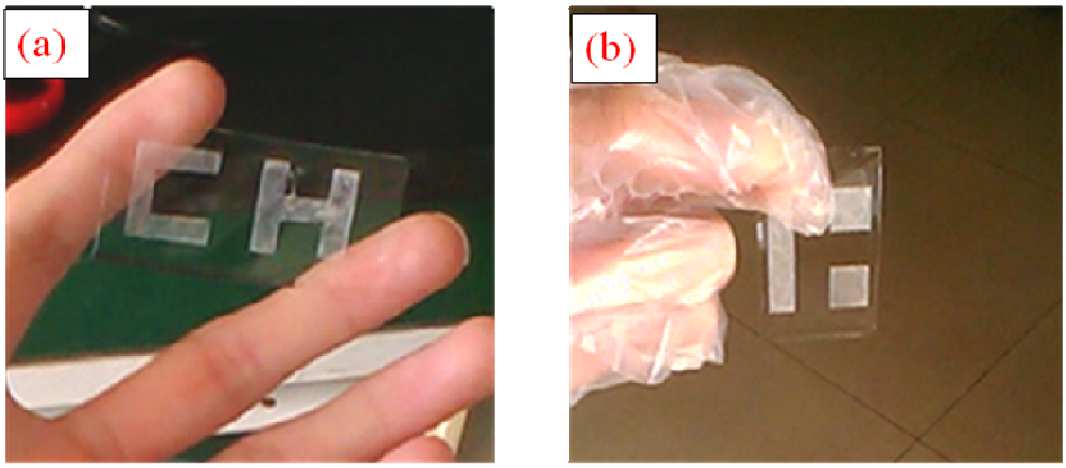

Fig. S6 Stretchable transparent electrodes with other patterns fabricated through burying silver nanowires at the surface of PDMS.

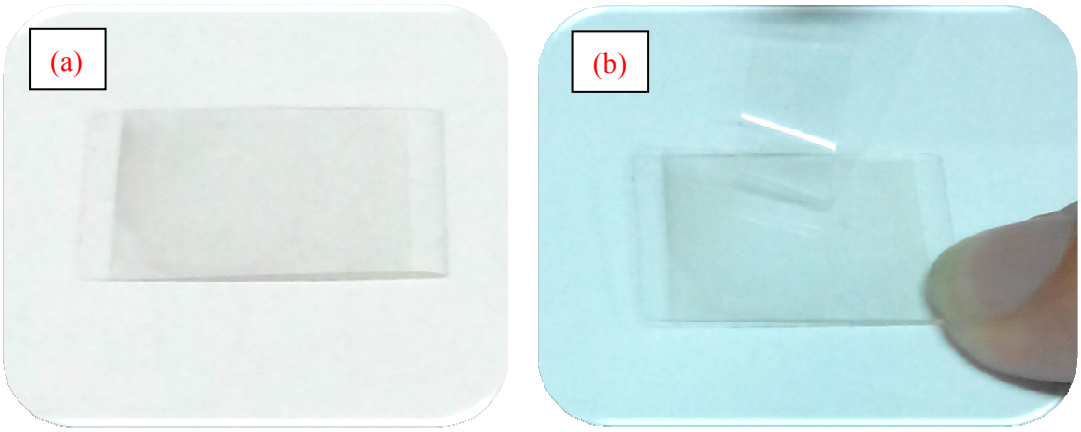

Fig. S7 The photographs of the AgNWs/PDMS film before (a) and after tap test (b). After the adhesion, the conductive layer was almost undamaged.