SUPPLEMENTARY INFORMATION

Evaporation-Induced Self-Assembled Ultrathin AgNW Networks for Highly Conformable Wearable Electronics.

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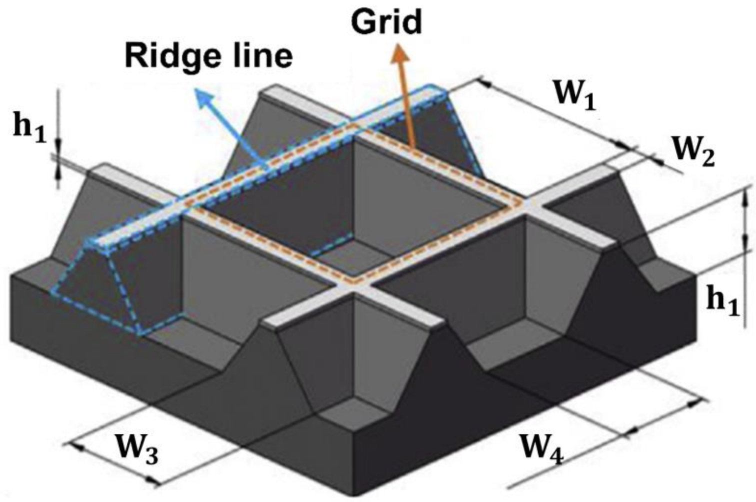
Supplementary Note 1. The details of silicon mold

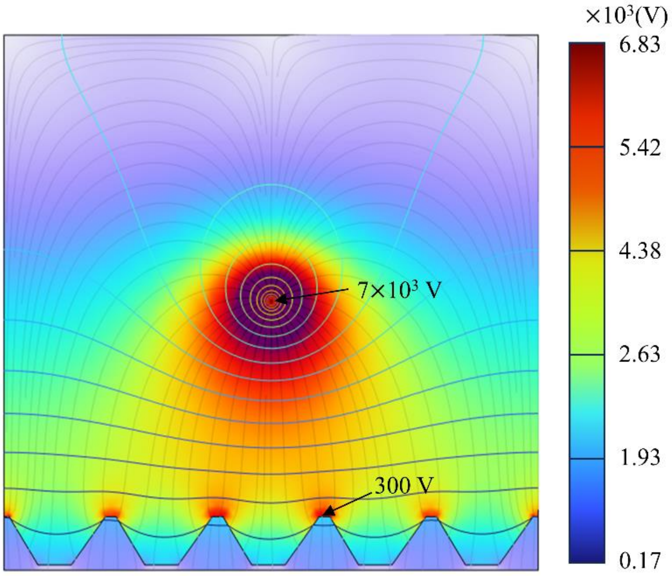
The silicon mold consists of the orthogonal ridge lines and inverted pyramidal frustum arrays. The ridge line consists of an upper silica layer and a silicon layer of trapezoid cross section. The grid width is W_1 200 μm, the top width of the ridge line is W_2 4 μm, the bottom width of the grid line is W_3 30 μm, the height of the grid line is h1 39.6 μm, the distance between the grid lines is W_4 144 μm.



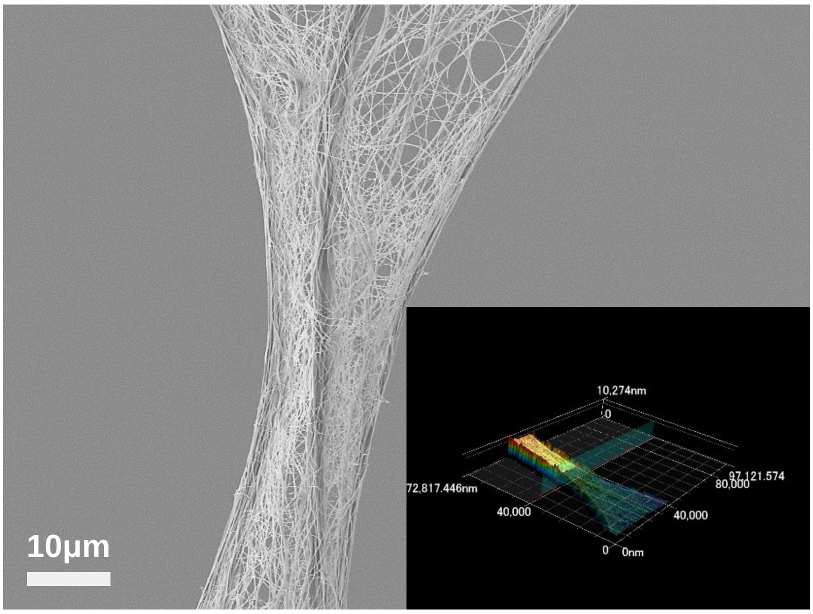
Supplementary Figure 1. Morphology of silicon mold

Supplementary Note 2. The simulation of electric field near patterned collector

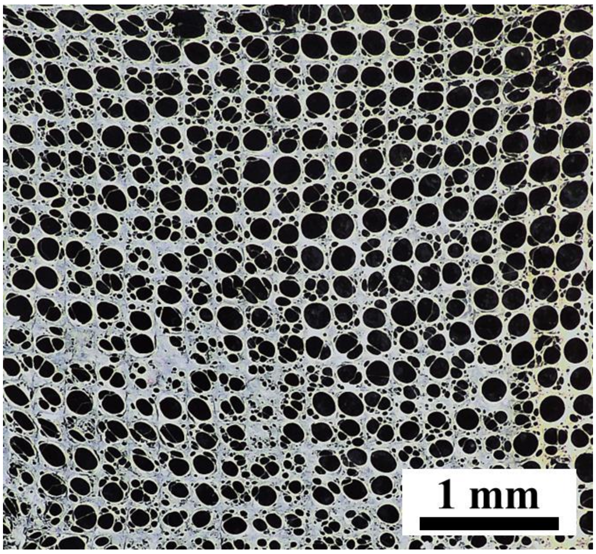
The introduction of a patterned collector results in a change in the static electric field distribution near the collector due to the topography of the collector. The electric field lines in the vicinity of the collector are non-uniform for the electric fields of a metal grid conducting substrate. Most of them focus on protuberances. As shown in Supplementary Figure 2, the electric field simulation of COMSOL depicts that the potential distribution forms a clustering phenomenon on the 300 V grid surface. The PVDF-TrEE nanofibers tend to fall onto the silicon grid under the action of the electric field as a result.



Supplementary Figure 2. FEM simulation of electric potential and field distribution for the selective deposition electrospinning process



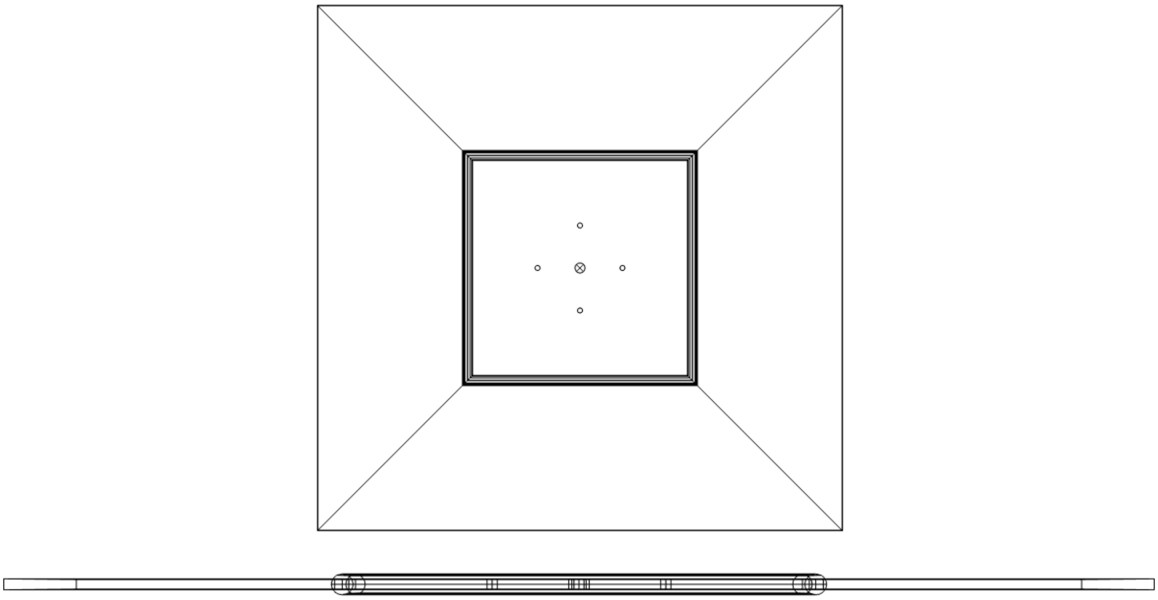
Supplementary Figure 3. Thickness and morphology of the electrode observed by confocal microscopy



Supplementary Figure 4. Morphology of hole array

Supplementary Note 3. The details of formula and governing equations used in the simulation

The fiber deformation of the device:



Supplementary Figure 5. Thickness and morphology of the electrode observed by confocal microscopy

The simulation based on the following equation:

For liner elastic material:

$$\rho\frac{\partial^2 \mathbf{u}_{\mathbf{solid}}}{\partial^2 t^2} = \nabla\cdot(FS)^T + \mathbf{F}_v,\ F = I + \nabla\mathbf{u}_{\mathbf{solid}} \tag{1}$$

$$S = S_{\text{inel}} + S_{\text{el}},\ \epsilon_{\text{el}} = \frac{1}{2}(\ F_{\text{el}}^T F_{\text{el}} - I\ ),\ F_{\text{el}} = FF_{\text{inel}}^{-1} \quad (2)$$

$$S_{\text{el}} = J_{\text{i}} F_{\text{inel}}^{-1}\ (\mathbf{c}{:}\,\epsilon_{\text{el}})\ F_{\text{inel}}^{-T} \quad (3)$$

$$S_{\text{inel}} = S_0 + S_{\text{ext}} + S_{\text{q}} \quad (4)$$

$$\epsilon = \frac{1}{2}[(\nabla \mathbf{u}_{\mathbf{solid}})^T + \nabla \mathbf{u}_{\mathbf{solid}} + (\nabla \mathbf{u}_{\mathbf{solid}})^T \nabla \mathbf{u}_{\mathbf{solid}} \quad (5)$$

$$\mathbf{c} = \mathbf{c}\ (E, v) \quad (6)$$

where the F represents the deformation gradient tensor, here the material is PVDF-TrFE, S is the second p-k stress tensor, $\mathbf{F}_{\boldsymbol{v}}$ is the body force, I is the unit tensor, $\mathbf{u}_{\mathbf{solid}}$ is the displacement, F is the force, ϵ is Lagrange strain tensor, $\mathbf{c}$ is material constant tensor, E is Yung's modulus, v is Poisson ratio. The bold font in the equations represents vector quantity.

For thin liquid film evaporation (in the ideal gas domains):

$$\rho C_p \frac{\partial T}{\partial t} + \rho C_p \mathbf{u} \cdot \nabla T + \nabla \cdot \mathbf{q} = Q + Q_p + Q_{vd} \quad (7)$$

$$\mathbf{q} = -k\, \nabla T \quad (8)$$

$$\rho = \frac{p_A}{R_s T} \quad (9)$$

where P_A is the absolute pressure, T is the temperature, $\mathbf{u}$ is the velocity field, k is the thermal conductivity, ρ is the density.

Supplementary Note 4. The calculation method of FOM

The figure of merit (FOM) is commonly used to compare the properties of the transparent electrodes[1-2], which characterize the relationship between the transmittance and the sheet resistance as follows:

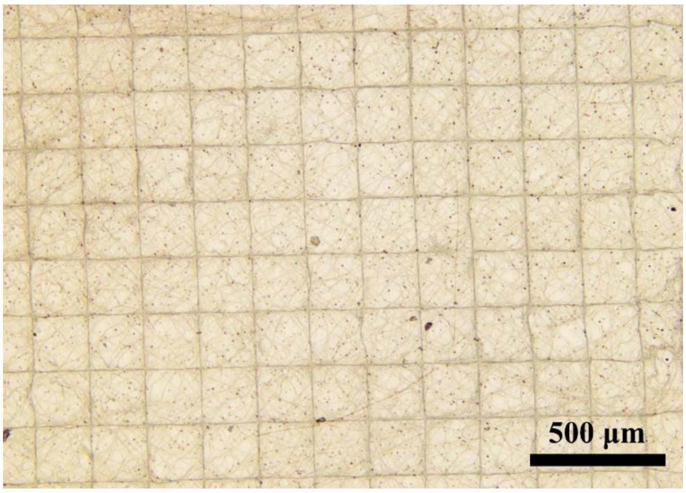
$$\frac{\sigma_{\text{dc}}}{\sigma_{\text{OP}}(\lambda)} = \frac{188.5}{R_s \cdot [T(\lambda)^{-1/2} - 1]} \quad (10)$$

where the ratio of DC conductivity to optical conductivity, $\sigma_{\text{dc}}/\sigma_{\text{OP}}$ (λ), is the figure of merit. σ_{OP} (λ) is the optical conductivity (λ = 550 nm), σ_{dc} is the DC conductivity of the electrode, R_{s} is the sheet resistance of the electrode, and $T(\lambda)$ is the transmittance (λ = 550 nm).

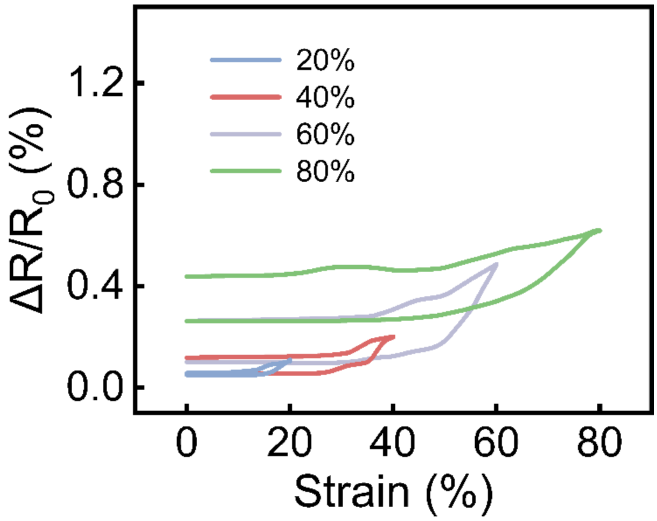
Supplementary References:

1 Han, J. H. *et al*. Highly conductive transparent and flexible electrodes including double-stacked thin metal films for transparent flexible electronics. *ACS Appl. Mater. Interfaces* **9**, 16343-16350 (2017).

2 De, S. *et al*. Silver nanowire networks as flexible, transparent, conducting films: extremely high DC to optical conductivity ratios. *ACS nano* **3**, 1767-1774 (2009).

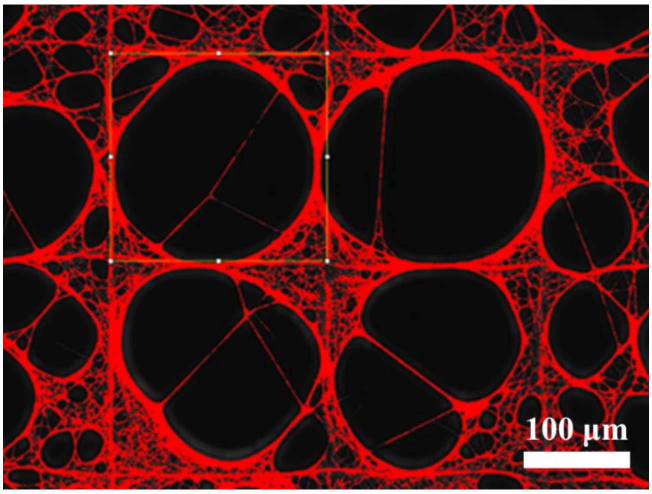


Supplementary Figure 6. Morphology of electrode after bending 50,000 cycles



Supplementary Figure 7. Hysteresis curve

Supplementary Note 5. The calculation of porosity



Supplementary Figure 8. Porosity Calculated by ImageJ

Porosity is the ratio of the area of the fiber portion to the area of the blank portion. The ratio was calculated using the ImageJ software.