Supporting Information

Highly Transparent AgNWs/PDMS Stretchable Electrodes for Elastomeric Electrochromic Devices

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Characterization

Field emission scanning electron microscopy (FE-SEM, JEOL, JSM-6700F) was used to examine the surface morphology and microstructure of the AgNWs and hybrid films. UV-vis spectra of the polymers and hybrid films were recorded by Hitachi U-4100 UV-vis-NIR spectrophotometer in the wavelength range of 400–800 nm. The resistance of the transparent electrodes was measured by the handheld LCR meter (Agilent U1732C). The sheet resistance was obtained by the four point probes (Keithlink Technology 2000) measured values which multiply by 4.532. The diameter of probes is 100 μm and the space of each probe is 1.6 mm. The resistance was obtained by Digital multimeter (YF-1002) during the resistance test. Thermogravimetric analysis (TGA) was conducted with a TA instrument Q50. Experiments were carried out on approximately 3-5 mg film samples heated in flowing nitrogen or air (flow rate = 20 cm^3/min) at a heating rate of 20 °C /min. Cyclic voltammetry (CV) was performed with a CH Instruments 611B electrochemical analyzer and conducted by using a two-electrode device (working area about 20 mm × 20 mm), or a conventional liquid cell in which measured electrodes (working area about 12 mm × 5 mm) was used as a working electrode and a platinum wire as an auxiliary electrode at a scan rate of 50 mV/s against a Ag/AgCl as reference electrode in anhydrous CH_3CN, using 0.1 M of TBAP as a supporting electrolyte in nitrogen atmosphere. Voltammograms are presented with the positive potential pointing to the left and with increasing anodic currents pointing downwards. The spectroelectrochemical cell was measured by using a two-electrode device (working area about 20 mm × 20 mm). Absorption spectra in spectroelectochemical analysis were measured with a HP 8453 UV-vis spectrophotometer.

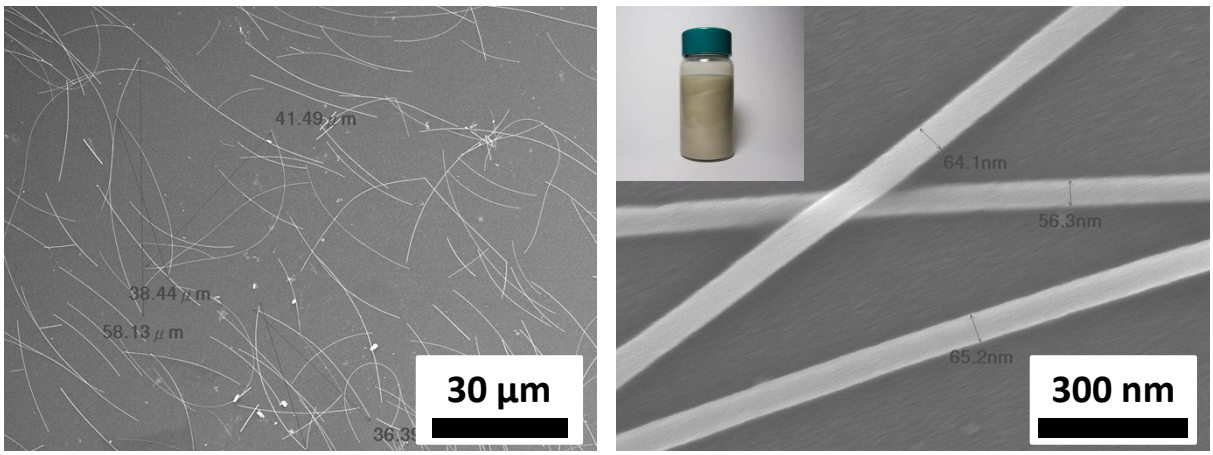

Figure S1. SEM of the AgNWs. Inset is the photograph of AgNWs dispersed in 20 mL of ethanol.

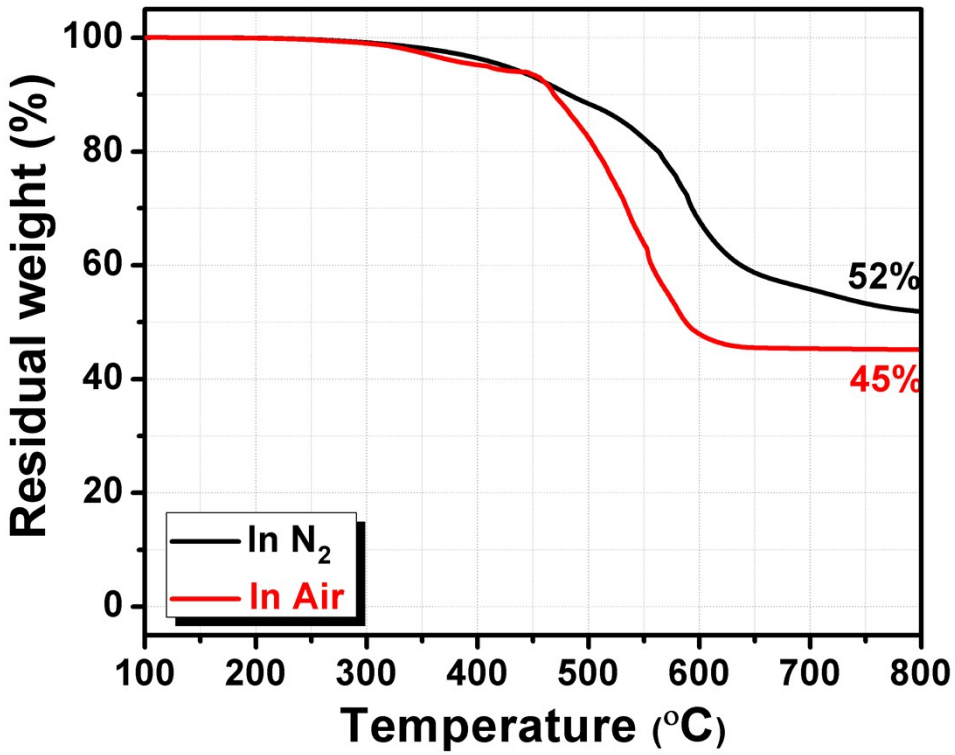

Figure S2. TGA traces of PDMS.

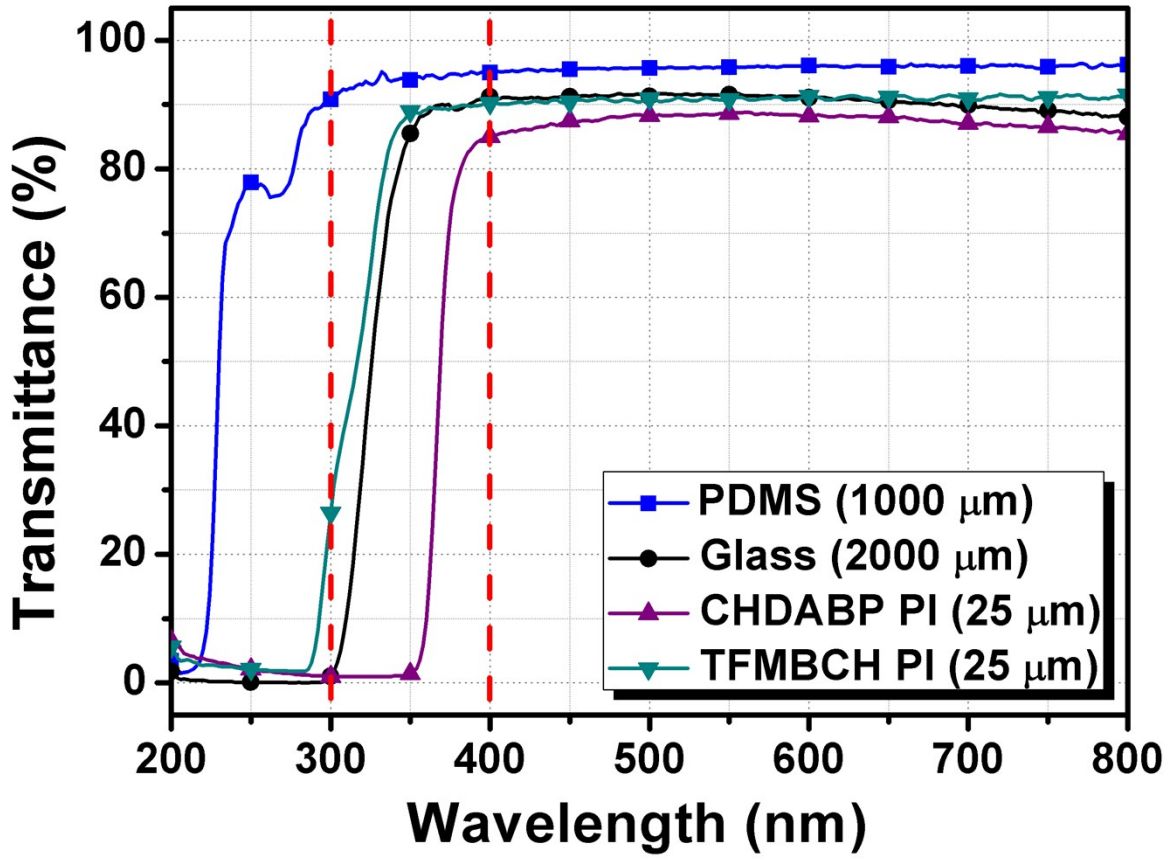

Figure S3. UV-Vis spectra of the substrates. (The structures of PIs could be check at ref. 1)

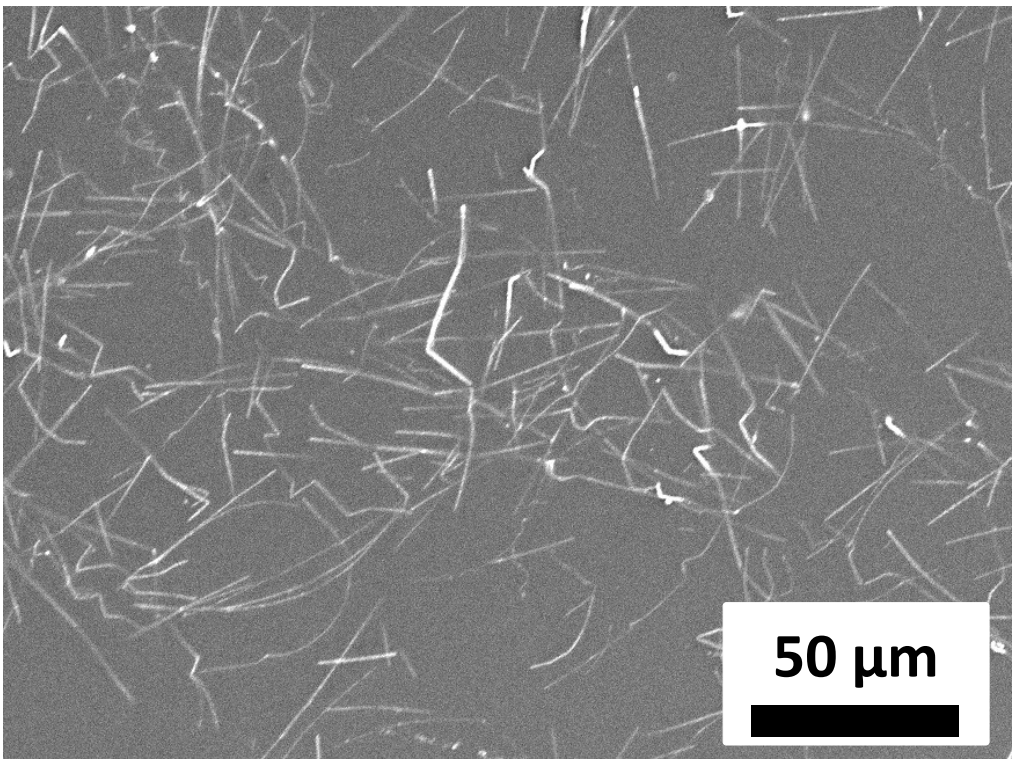

Figure S4. SEM morphology of the AgNWs/PDMS hybrid electrode.

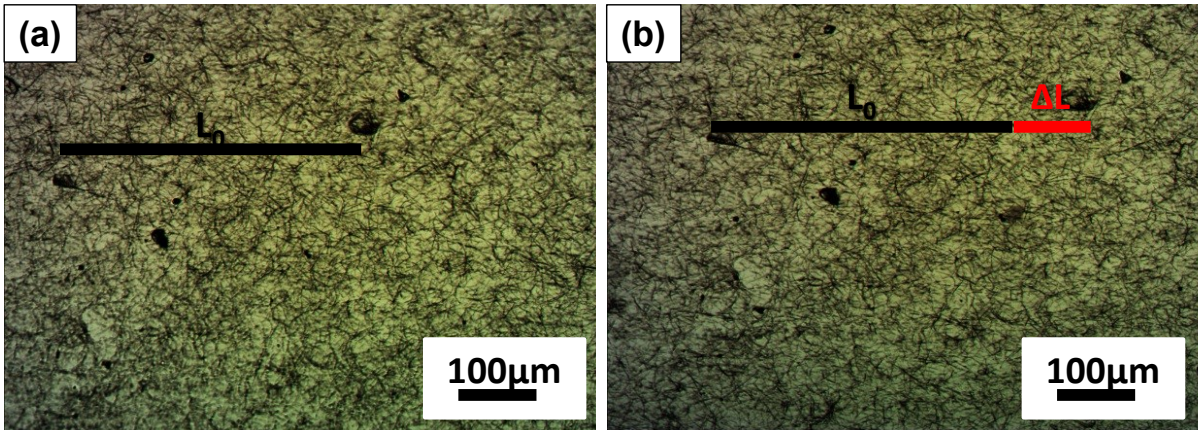

Figure S5. Optical microscope images of the AgNWs/PDMS hybrid electrode at (a) releasing, and (b) 25% strain.

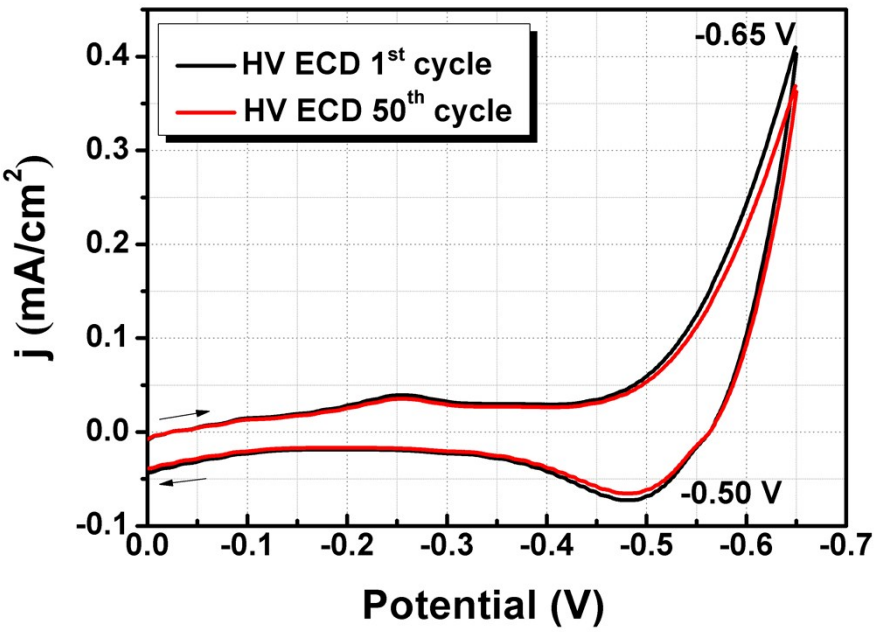

Figure S6. Cyclic voltammetric diagrams of HV ECD based on AgNWs/PDMS electrodes (electrochromic material: 1 mg, working area: 20 mm × 20 mm, gap thickness: 1 mm) in 0.1 M TBAP/CH_3CN at scan rate of 50 mV s^{-1}.

Table S1. Thermal properties of PDMS

Polymer[a]	T_g (°C)	T_d^5(°C)[b]		T_d^{10}(°C)[b]		R_{w800}[c] (%)	LOI[d]
		N_2	Air	N_2	Air		
SYLGARD® 184 PDMS	-120[a]	425	410	480	470	52	38.3

[a] The data was from reference 2.

[b] Temperature at which 5 % and 10 % weight loss occurred, respectively, recorded by TGA at a heating rate of 20 °C/min and a gas flow rate of 20 cm^3/min.

[c] Residual weight percentages at 800 °C under nitrogen, also called as char yield.

[d] LOI = Limiting Oxygen Index = (17.5+0.4×char yield).

Table S2. Solubility Behaviors of PDMS

Code	Solubility in various Solvents[a]						
	DMAc	NMP	DMF	DMSO	$CHCl_3$	Acetone	THF
PDMS	—	—	—	—	—	—	—

[a] Qualitative solubility was tested with 5 mg of a sample in 1 mL of solvent. —, insoluble even on heating.

REFERENCES AND NOTES

1. C. Y. Chou, H. S. Liu and G. S. Liou, *RSC Advances*, 2016, **6**, 61386-61392.
2. J. J. Richardson, D. Estrada, S. P. DenBaars, C. J. Hawker and L. M. Campos, *Journal of Materials Chemistry*, 2011, **21**, 14417-14419.