Supporting Information

Prepolymerization-Assisted Fabrication of Ultrathin Immobilized Layer to Realize Semi-Embedded Wrinkled AgNW Network for Smart Electrothermal Chromatic Display and Actuator

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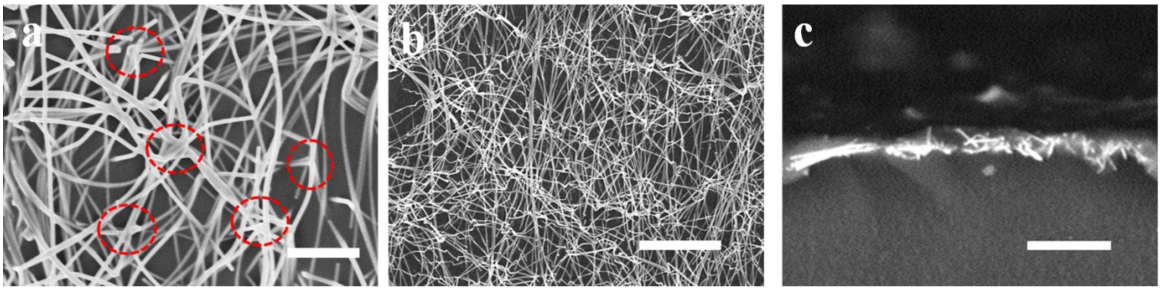

Figure S1. (a) FE-SEM image of the junctions between AgNWs after annealing (Scale bar: 1 μm); (b) FE-SEM image of the AgNW network on released PDMS substrate (Scale bar: 4 μm); (c) Cross-sectional FE-SEM image of the stretchable AgNW/PDMS composite film (Scale bar: 2 μm).

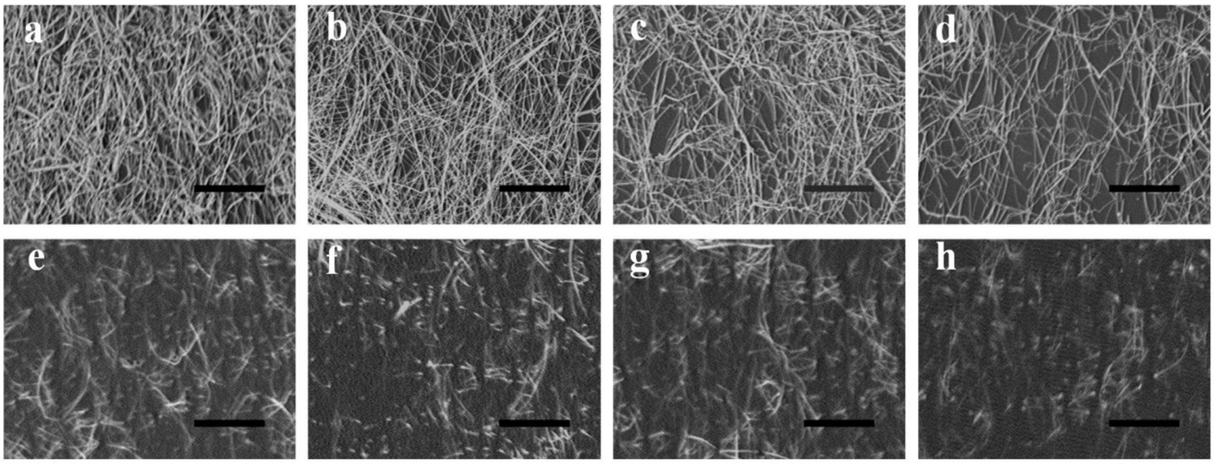

Figure S2. (a-d) SEM images of AgNW networks with different AgNW loadings; (e-h) SEM images of corresponding AgNW networks after coating ultrathin PDMS layer (namely, APF-1 (e), APF-2 (f), APF-3 (g) and APF-4 (h)). Scale bars: 5 μm.

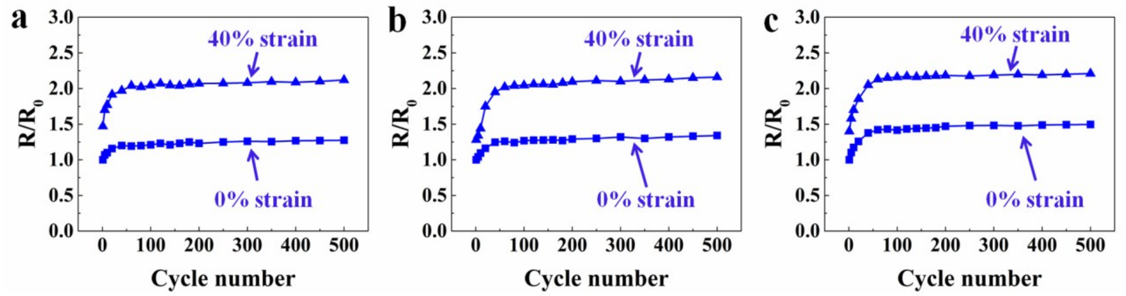

Figure S3. Resistance ratios of APF-2 (a), APF-3 (b) and APF-4 (c) as a function of stretching/releasing cycles at 0 % and 40 % strains.

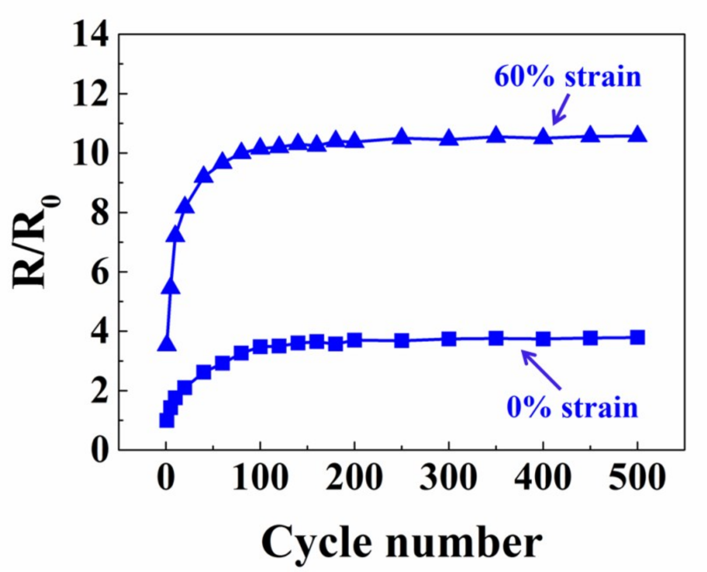

Figure S4. Resistance ratios of APF-2 as a function of stretching/releasing cycles at 0 % and 60 % strains.

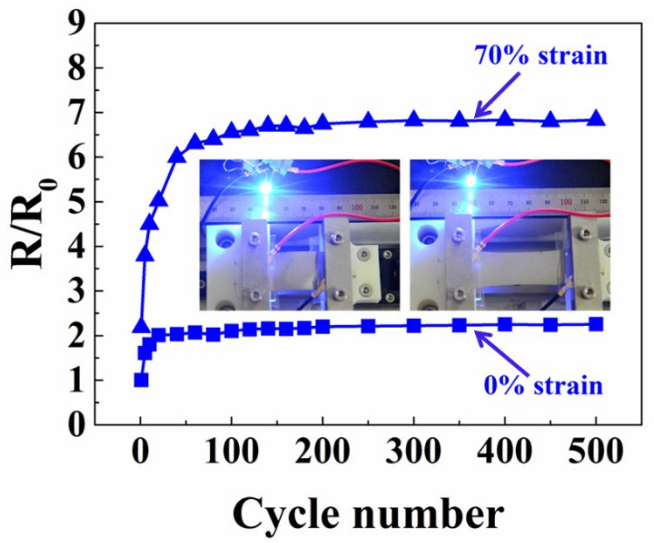

Figure S5. Resistance ratios of APF-5 as a function of stretching/releasing cycles between 0 % and 70 % strains (Original resistance is 0.87 Ω within 1 cm, the insets are photographs of a powered light-emitting diode integrated with APF-5).

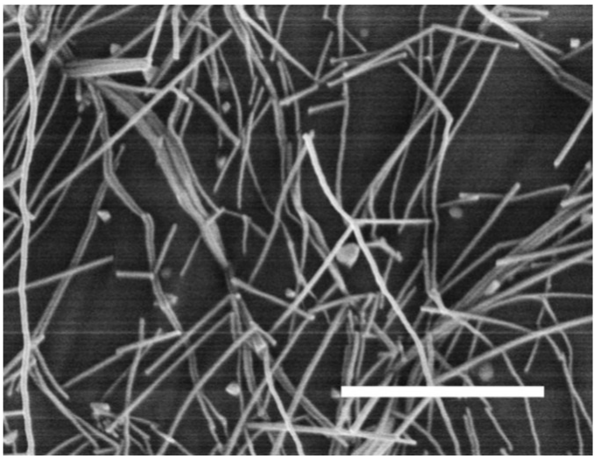

Figure S6. FE-SEM image of APF-6 after 100 stretching/releasing cycles (Scale bar: 3 μm).

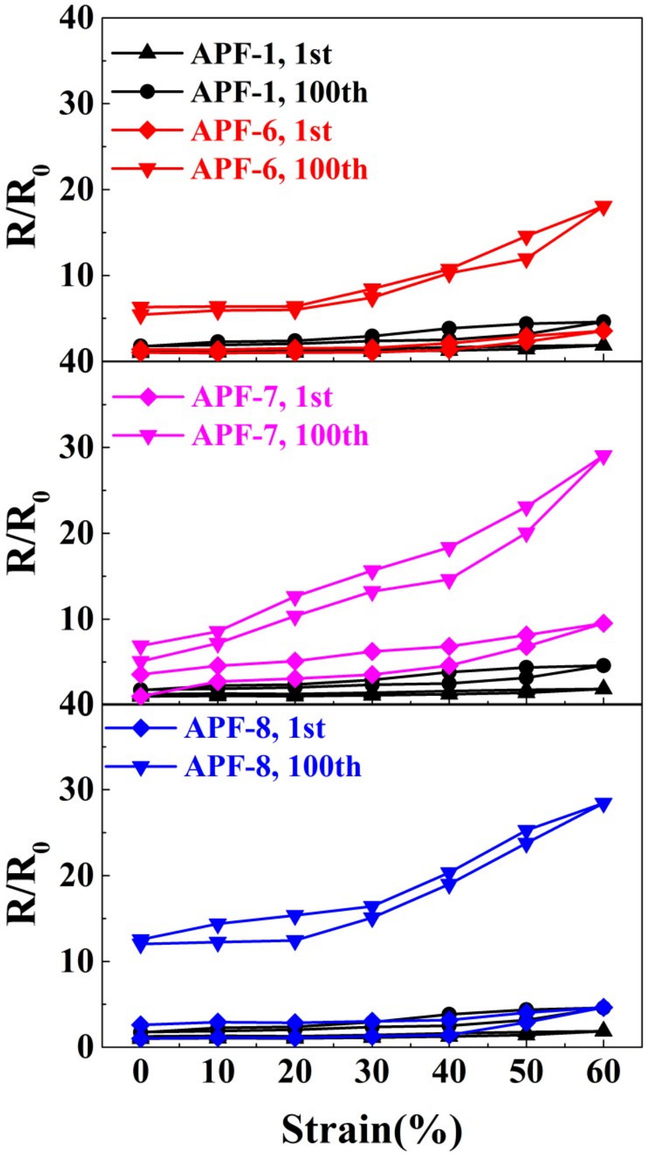

Figure S7. Resistance ratio changes of APF-1, APF-6, APF-7 and APF-8 during the stretching/releasing process, respectively.

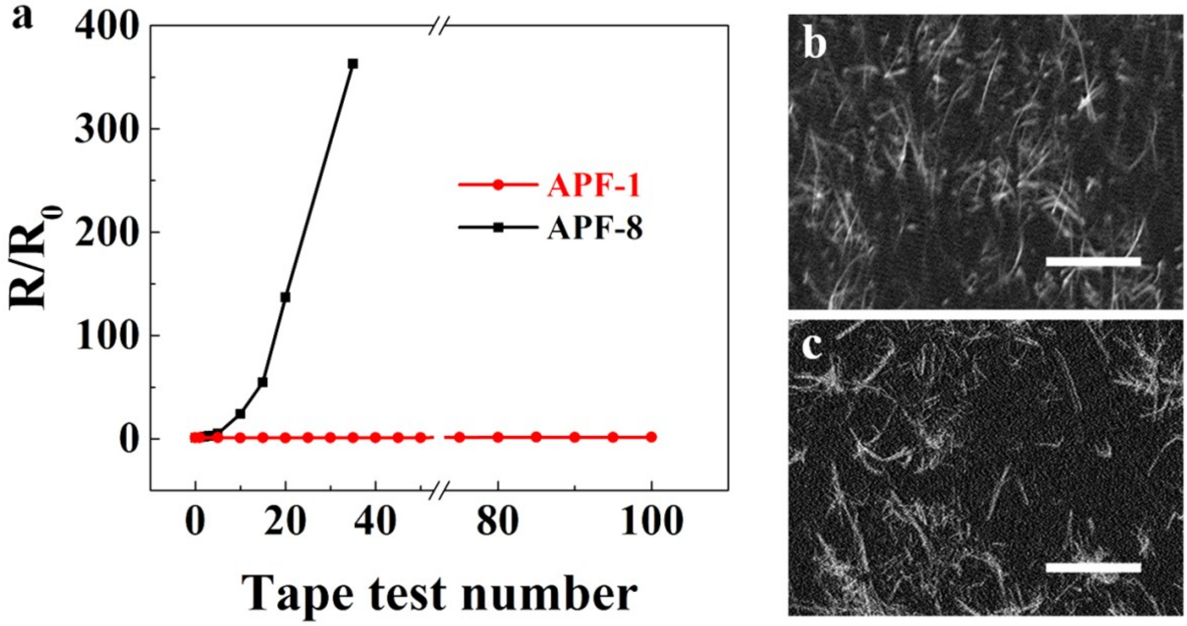

Figure S8. (a) Tape test of APF-1 and APF-8; SEM images of APF-1 (b) and APF-8 (c) after scraping using a coin (Scale bars: 5 µm).

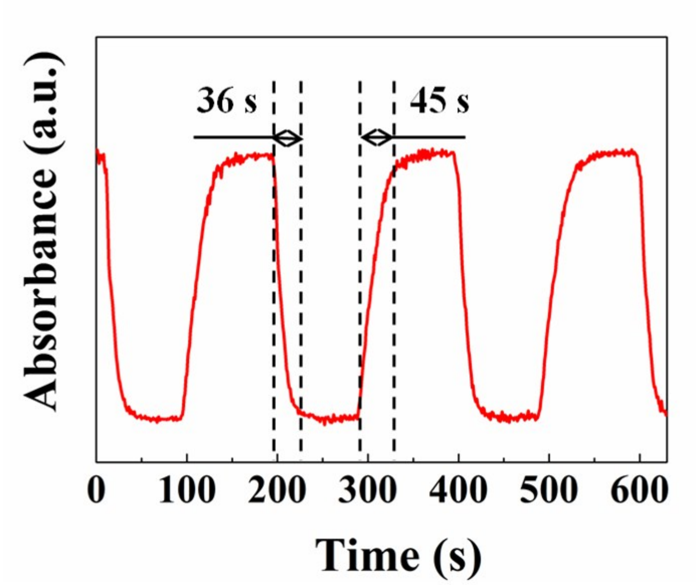

Figure S9. *In situ* absorption response (at 550 nm) between the colored and bleached states for the stretchable electrothermal chromatic film.

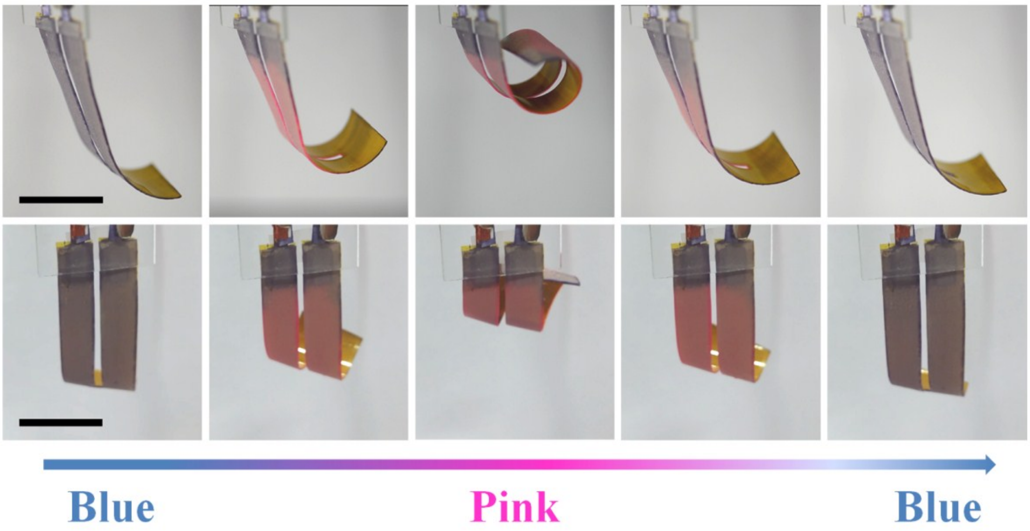

Figure S10. Photographs of synchronous actuation and color-changing processes for the electrothermal chromatic actuator (Side view (up) and back view (down), scale bars: 20 mm).

Table S1. Sheet resistance of four types of AgNW/PDMS composite films

Samples	APF-1	APF-2	APF-3	APF-4
Original sheet resistances (Ω sq^{-1})	6.34	9.88	14.1	18.4
Sheet resistances after annealing (Ω sq^{-1})	4.67	5.48	7.90	8.97
Sheet resistances after coating of ultrathin PDMS layer (Ω sq^{-1})	5.32	6.87	9.87	12.2

Table S2. Comparison of AgNW/PDMS-based transparent stretchable films

Materials	Sheet resistance (Ω sq^{-1})	Transmittance (%)	Strain (%)	R/R_0			Ref.
				1st cycle	nth cycle	100th cycle	
AgNW/PDMS	5	70	40	1.41	-	1.68	Present work
			60	1.8	-	4.6	
	17	82	40	1.26	-	2.03	
AgNW/PDMS	4.5	80	50	~1.7	~6 (50th)	-	20
AgNW/PDMS	2.64	~60	35	5.39	-	-	21
AgNW/PDMS	30	~85	20	-	~3(5th)	-	23
	~7.5	~65	50	-	~8(5th)	-	
AgNW/Dopamine /PDMS	~35	80	20	1.5	-	-	24
AgNW/AA/PD	10	45	70	-	5(10th)	-	32
AgNW/PDMS	26.1	85.8	30	2.3	-	-	34
AgNW/PDMS	~22	85.7	30	4.75	-	-	35
			10	~1	1.51 (50th)	~1.55	
AgNW/PDMS	~50	~70	20	5.7	-	-	36

Notes: AA is acrylic acid.

Movie S1. Color changes of the stretchable electrothermal chromatic film during stretching process.

Movie S2. Actuation process of electrothermal actuator.

Movie S3. Thermal imaging process of electrothermal actuator.