Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Stretchable and transparent nanofiber-networked electrodes based on nanocomposites of polyurethane/reduced graphene oxide/silver nanoparticles with high dispersion and fused junctions

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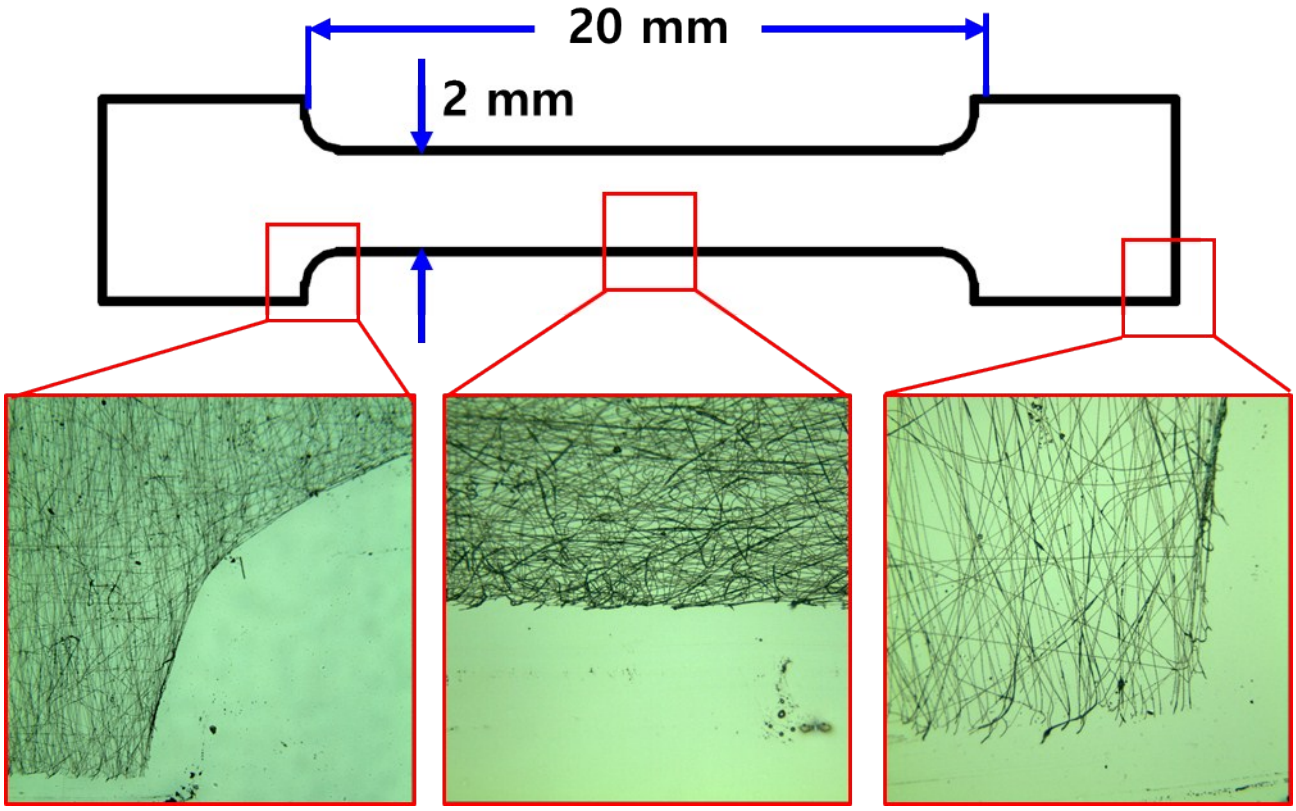

Fig. S1 Stencil pattern of electrode and optical images of the straight and round edges of stencil-patterned electrode.

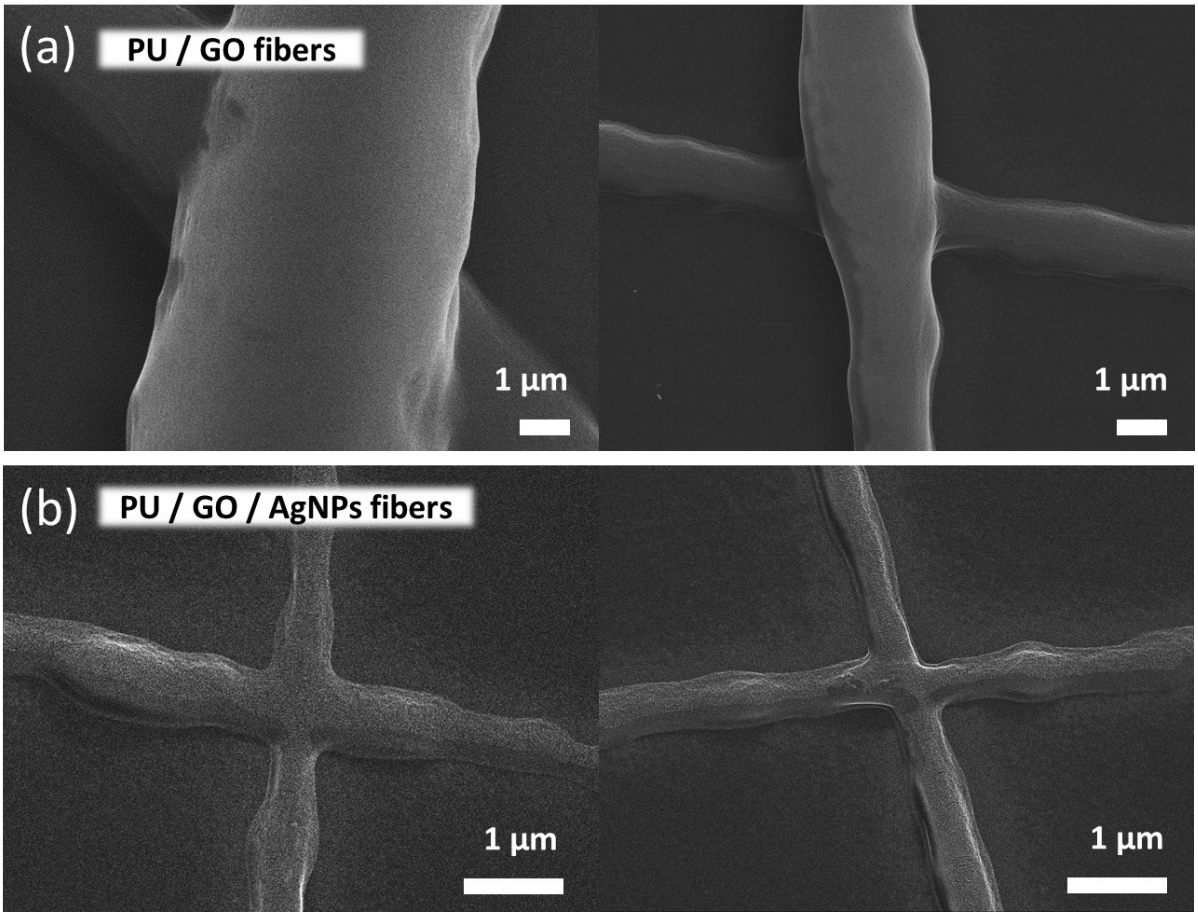

Fig. S2 FE-SEM images of nanofibers. (a) Intersection of PU/GO nanofibers. (b) Intersection of PU/GO/AgNPs nanofibers. The PU/GO/AgNPs nanofibers are fused together at junctions between nanofibers to form a single layer, while the PU/GO nanofibers are physically laminated without forming fused junctions.

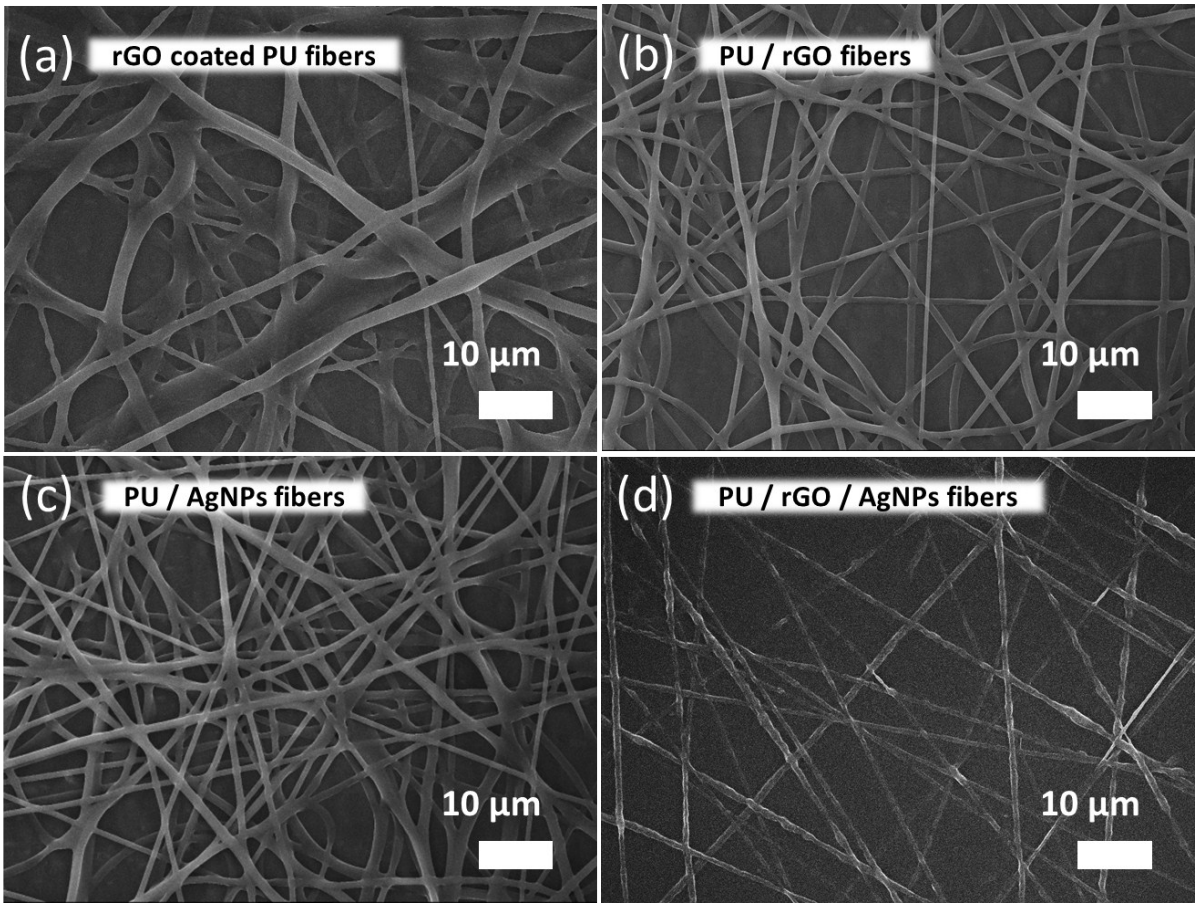

Fig. S3 FE-SEM images of different nanofibers (a) rGO-coated PU fibers. (b) PU/rGO fibers. (c) PU/AgNPs fibers. (d) PU/rGO/AgNPs fibers.

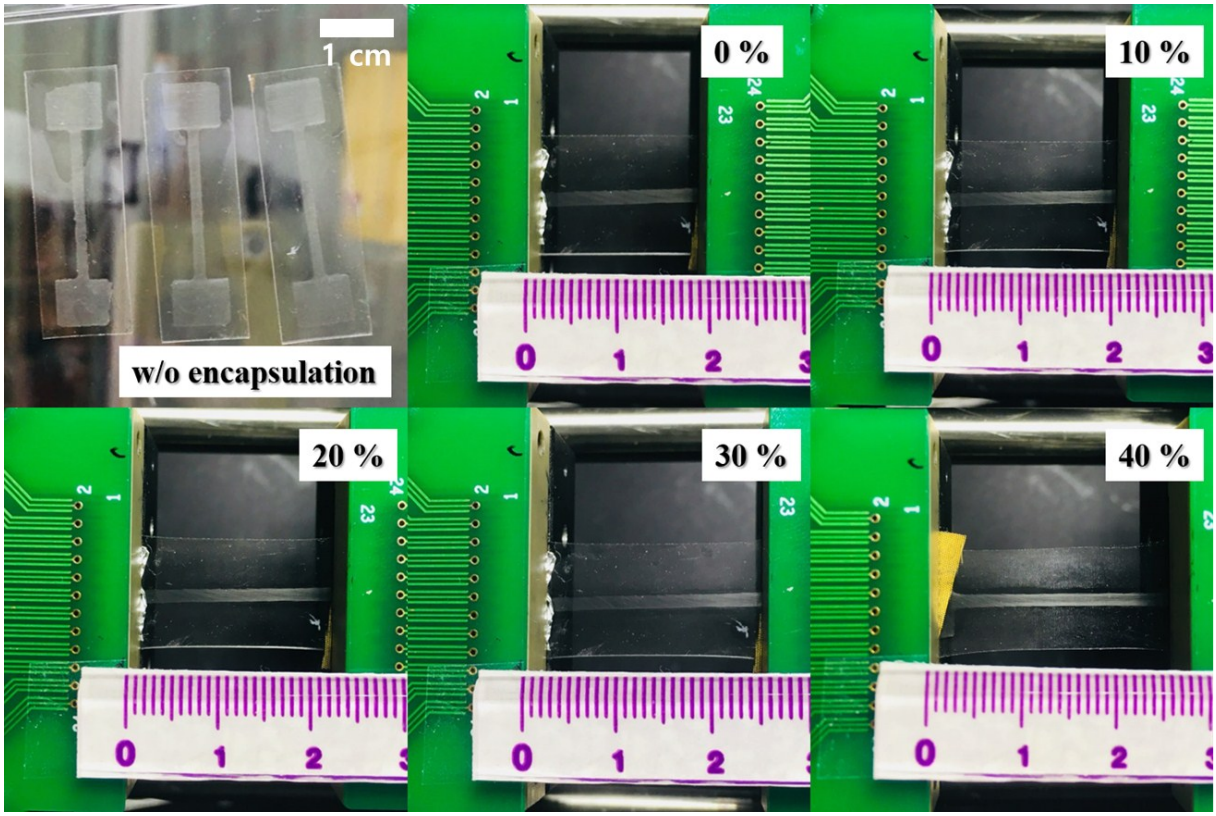

Fig. S4 Photographs of STNNEs under uniaxial stretching from 0% to 40% during the stretching test in a custom-built stretching tool.

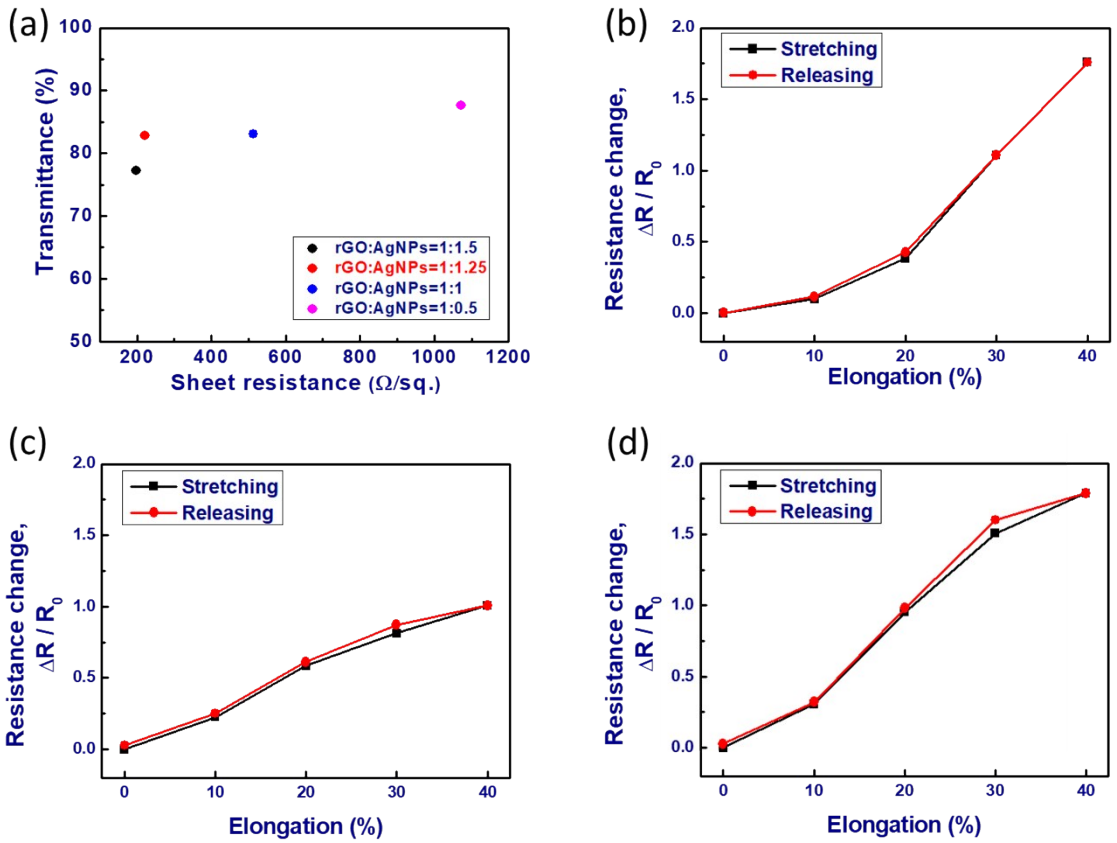

Fig. S5 Evaluation of the optical and electrical properties of nanofibers with different loading ratios of rGO and AgNPs on PDMS substrates. (a) Transmittance-sheet resistance of the nanofibers for different loading ratios of rGO and AgNPs. Resistance change (ΔR/R0) versus elongation of nanofibers with loading ratios of (b) 1:0.5, (b) 1:1, (c) 1:1.25, and (d) 1:5.

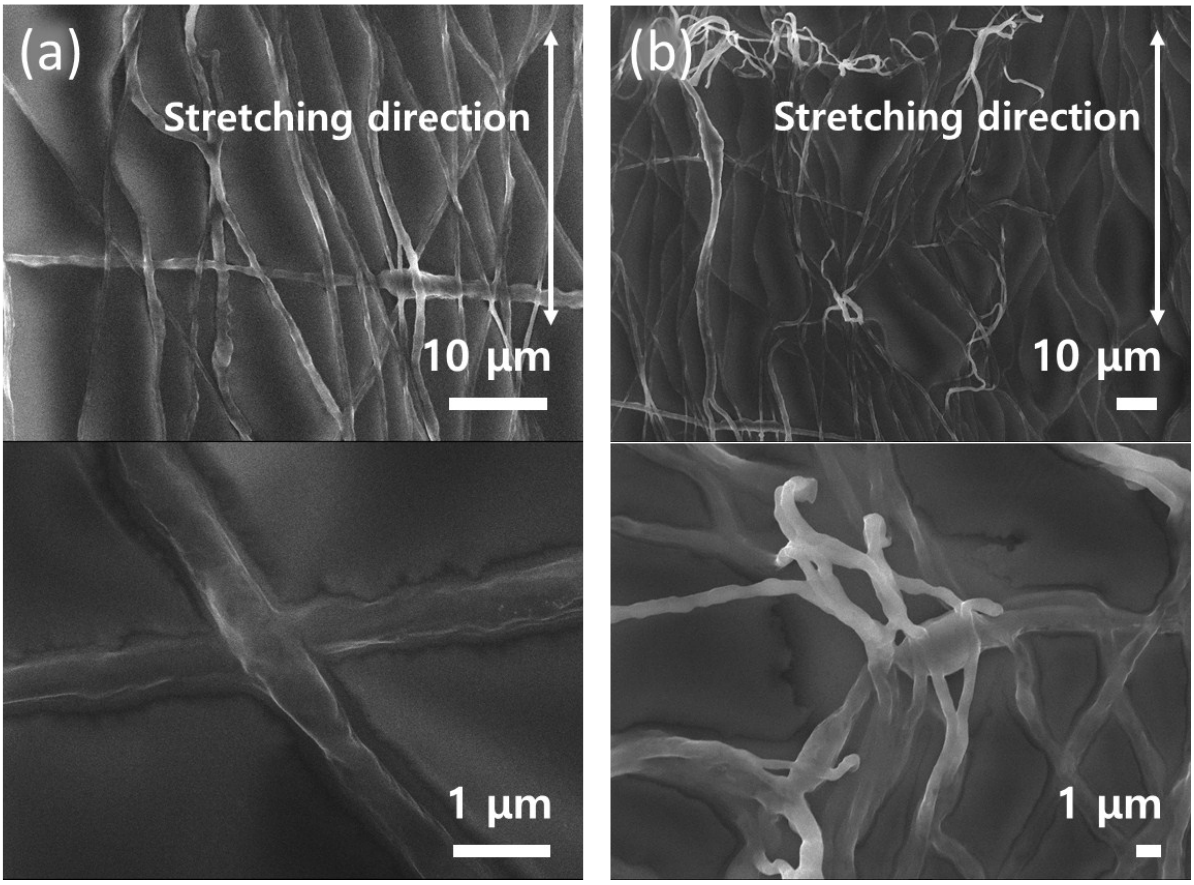

Fig. S6 FE-SEM images of STNNEs after mechanical deformation. (a) Images of the STNNE after 10,000 stretching cycles at 40% strain. The bottom image shows that the fiber intersection is stable, even after cyclic stretching. (b) Images of the STNNE under stretching at more than 300% strain. The bottom image is a magnified view of the region where the fibers are cut and curled.

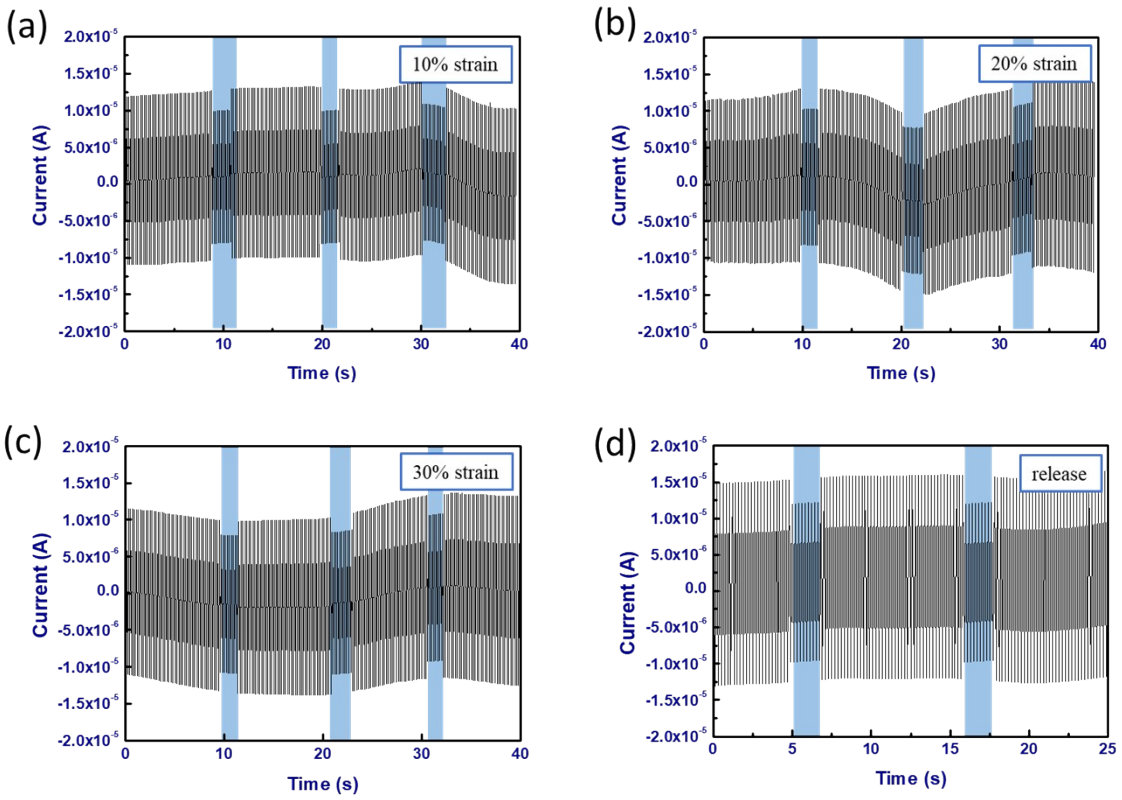

Fig S7 Systematic response tests of the touch sensors under stretching. Current of the touch sensor versus time under touch stimuli under stretched conditions at (a) 10% strain, (b) 20% strain, and (c) 30% strain. (d) Current of the released touch sensor versus time under touch stimuli.

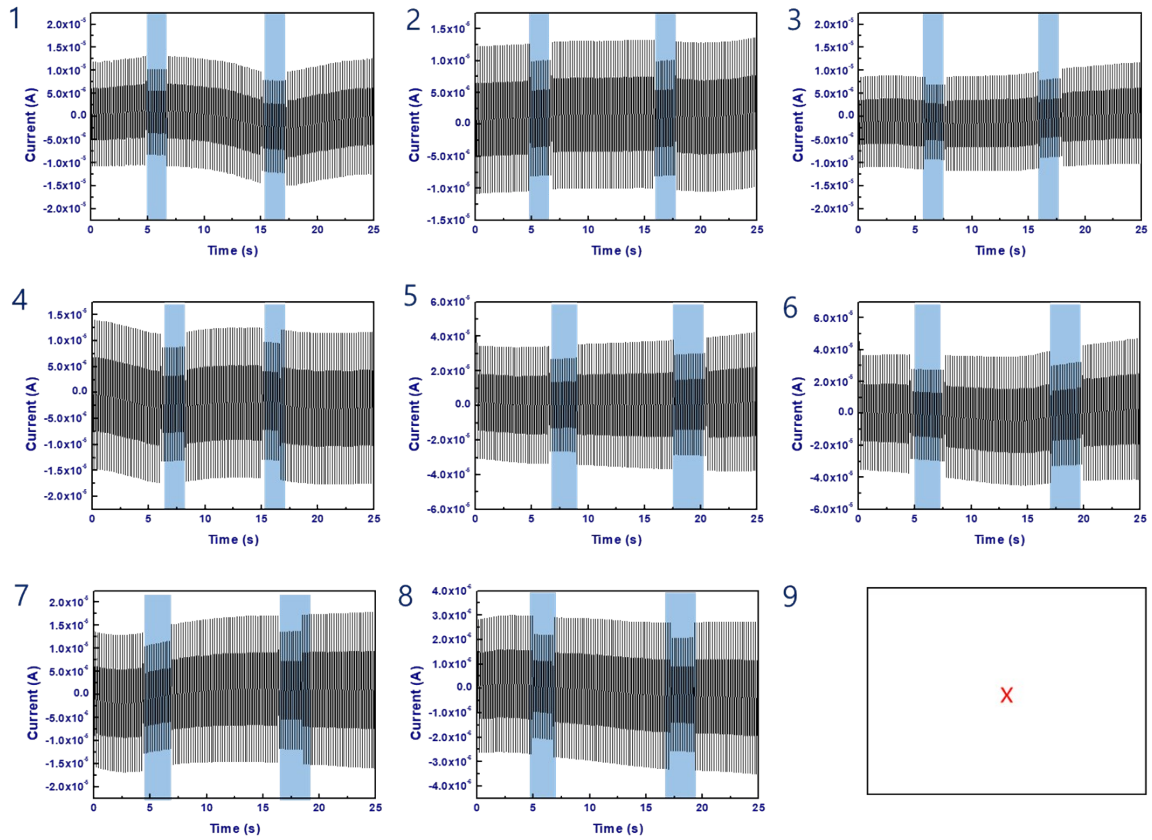

Fig S8 Current responses of the 3x3 array of touch sensors. The current of the devices in the touch sensor array versus time under touch stimuli at the initial state. One device (located at 3,3) was not functioning in the array.

Table S1. Weight ratio percentages of PU, rGO, and AgNPs in each fibers.

Weight ratio (%) / Fibers	PU	GO	AgNPs
PU fibers	100	0	0
PU / rGO fibers	96.78	3.22	0
PU / AgNPs fibers	96.00	0	4.00
PU / rGO / AgNPs fibers	96.38	1.61	2.01

Table S2. Comparison of compliant electrode properties.

	Mechanical properties			Electrical properties			Optical properties
	Max. tensile strain (%)	Cyclic stretching tests		At the max, tensile strain	Released after 1 cycle	After cyclic stretching	Optical transmittance at wavelength of 550 nm (%)
		# of cycles	elongation strain (%)	Relative resistance change (R/R_0)	Relative resistance change (R/R_0)	Relative resistance change (R/R_0)	
PU/rGO/AgNPs fibers	40	10,000	40	0.83	0.02	0.12	83
PU/rGO fibers	40	-	-	2.15	0.04	-	87
Copper nanowires[23]	25	2,000	25	-	-	-	82
PEDOT:PSS/Zonyl/DMSO[24]	10	5,000	1-	-	0	0	80
Graphene[25]	15	-	-	9	-	-	90

Table S3. Weight ratio percentages of PU, rGO, and AgNPs in PU/rGO/AgNPs nanofibers.

Weight ratio (%) / GO : AgNPs	PU	GO	AgNPs
1 : 0.5	97.56	1.63	0.81
1 : 1	96.78	1.61	1.61
1 : 1.25	96.38	1.61	2.01
1 : 1.5	96.00	1.60	2.40