

Supporting Information

High-precision, stretchable kirigami-capacitive sensors with ultra-low cross-sensitivity for body temperature monitoring

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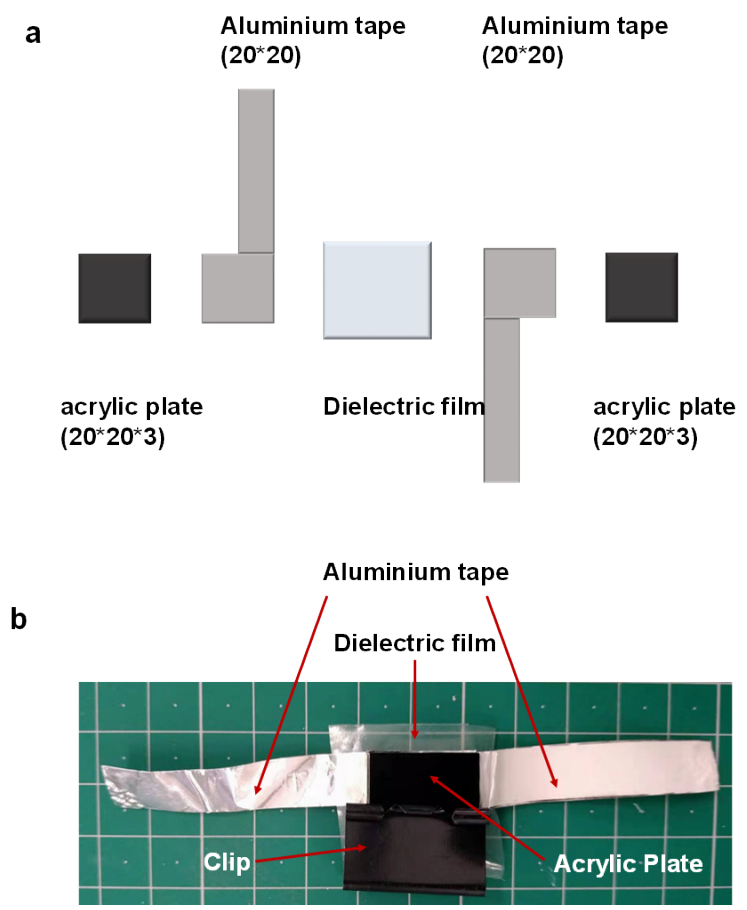


Fig. S1 Diagram (a) and optical image (b) of the testing fixture for dielectric constant.

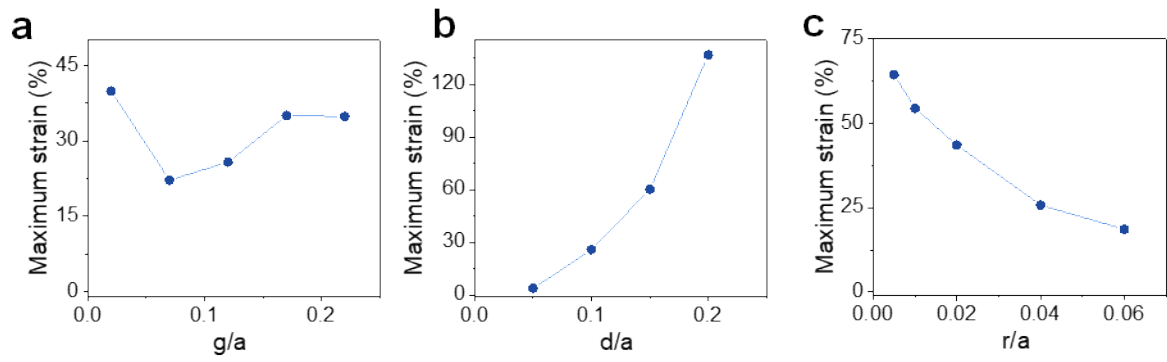


Fig. S2 Maximum strain at 100% external strain versus geometry parameters. For (a), $l = 8\text{mm}$, $d = 1\text{mm}$, $r = 0.4\text{ mm}$; for (b), $l = 8\text{mm}$, $g = 2\text{ mm}$, $r = 0.4\text{ mm}$; for (c), $l = 8\text{mm}$, $d = 1\text{mm}$, $g = 2\text{ mm}$.

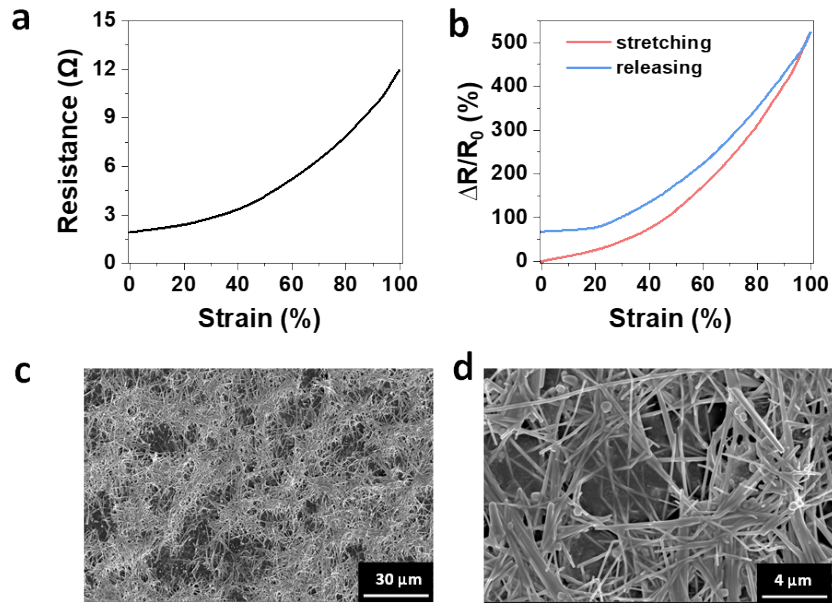


Fig. S3 (a) Resistance of the AgNWs electrode (L: 20 mm, W: 10 mm) under strain up to 100% strain; (b) Relative resistance changes of the AgNWs electrode (L: 20 mm, W: 10 mm) in a 100% strain cycle; (c) and (d) top view SEM images of the AgNWs electrode layer.

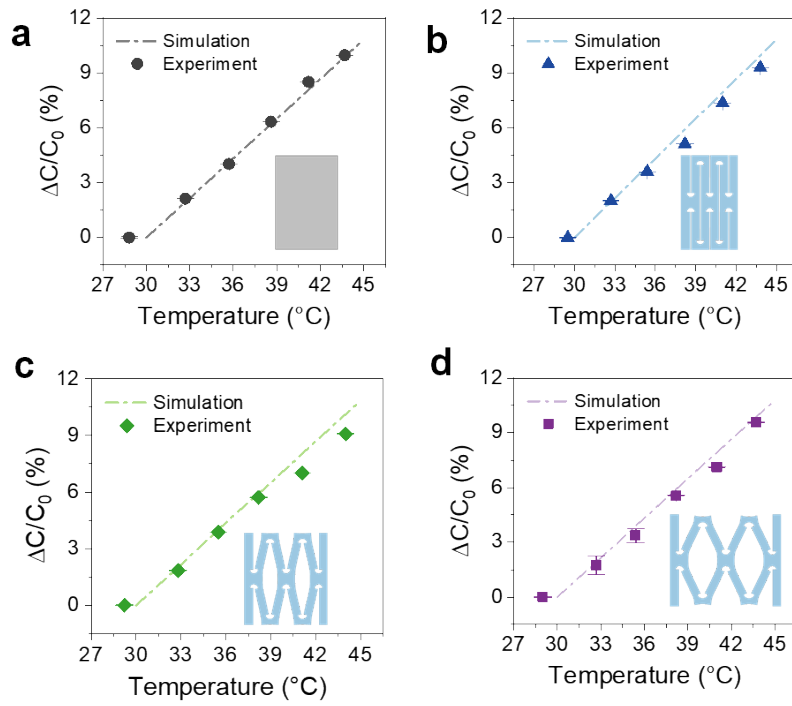


Fig. S4 Simulated and experimental relative capacitance change of sensors over temperature. (a) Uncut sensor, Kirigami sensor at 0% (b), 50% (c), and 100% (d) strains.

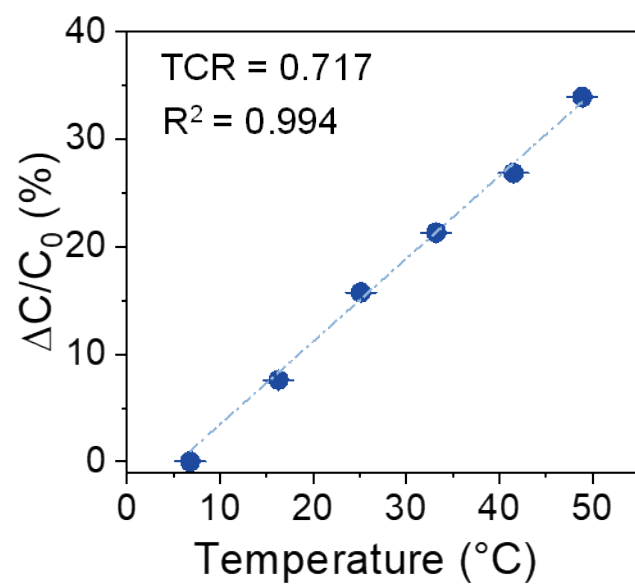


Fig. S5 Relative capacitance change of the kirigami AgNWS-TPU sensor in the temperature range from 5 to 50 °C.

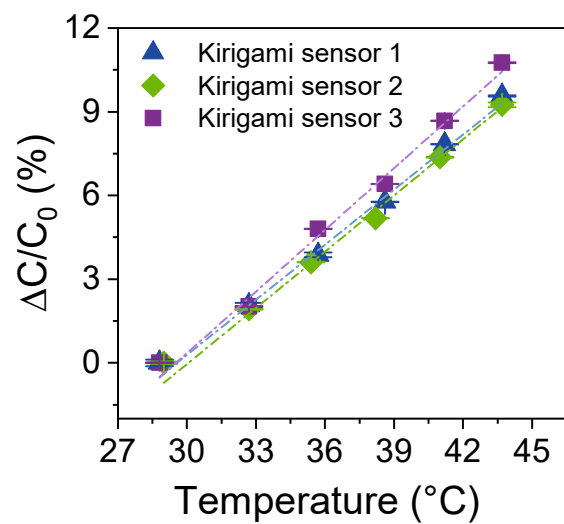


Fig. S6 Relative capacitance change of three individually-made TPU-AgNWs sensors upon heating.

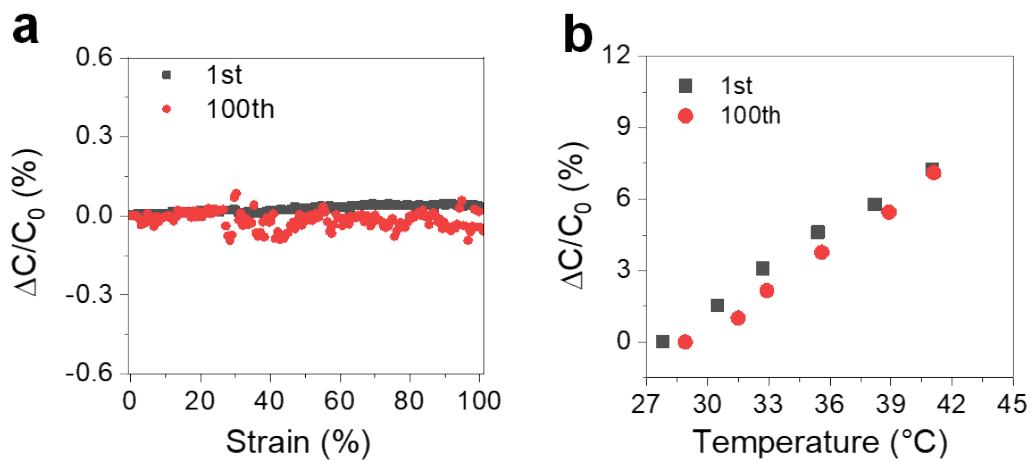


Fig. S7 (a) The relative capacitance changes of the AgNWs-TPU sensor at the 1st and 100th stretching cycles; (b) The relative capacitance changes of the AgNWs-TPU sensor upon heating after the 1st and 100th stretching cycles.

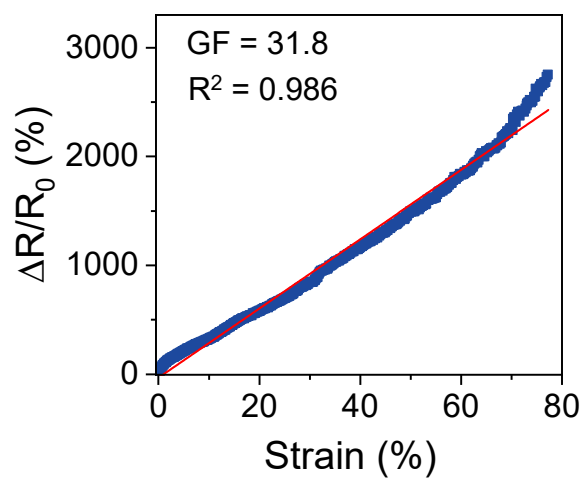


Fig. S8 The relative resistance changes of the CNF-reinforced strain sensor when being stretched.

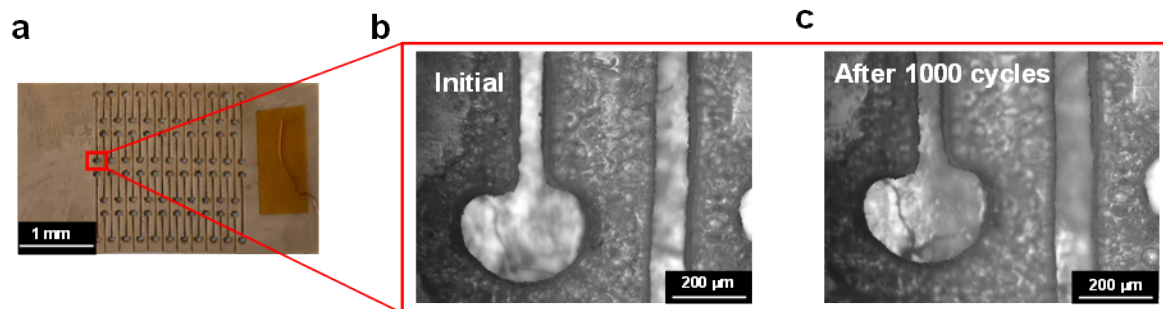


Fig. S9 Optical images of kirigami sensor (a) and the conjunction area of this sensor before (a) and after (b) 1000 80% strain cycles.

Table S1. Temperature sensitivity of three random sensors made under the same conditions

| Sensors | Temperature sensitivity ($^{\circ}\text{C}^{-1}$) |
|--------------------------|--|
| Sensor 1 | 0.0070 |
| Sensor 2 | 0.0063 |
| Sensor 3 | 0.0073 |
| Standard variation | 0.0005 |
| Coefficient of variation | 7.5% |

Table S2. Summary of recently reported strain-insensitive temperature sensors.

| Sensors | Sensor type | Range (°C) | Sensitivity (°C ⁻¹) | Linearity | Resolution (°C) | Strain range | Reference |
|-----------------------------|-------------|------------|---------------------------------|-----------|-----------------|--------------|-----------|
| FSSF | Resistive | 30 - 80 | 0.008 | linear | 0.37 | 50% | 1 |
| AgNWs- PI | Resistive | 25-60 | 0.0038 | Linear | 0.16 | 100% | 2 |
| Graphene PDMS | Resistive | 25 -75 | 0.0076 | Linear | N/A | 20% | 3 |
| PEDOT:PSS /SWCNTs Fibre | Resistive | 20 - 50 | 0.0093 | Nonlinear | N/A | 220% | 4 |
| carbon nanotube transistors | Circuit | 15-55 | -25 mV | 0.99 | 2 | 60% | 5 |
| SWCNTs/AgNW sensor | Circuit | 0-100 | 37 mV | Linear | N/A | 40% | 6 |
| AgNWs-TPU sensor | Capacitive | 30 - 45 | 0.007 | 0.997 | 0.14 | 100% | This work |

Reference:

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