Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Printing Conformal and Flexible Copper Networks for Multimodal Pressure and Flow Sensing

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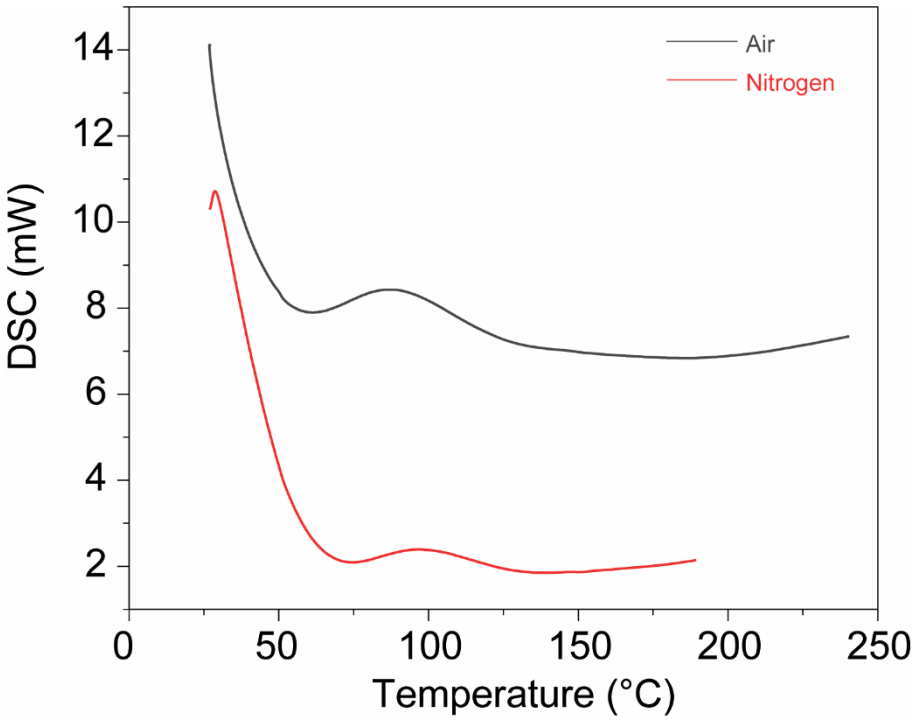

Figure S1. DSC curves for polycarbonate evaluated in air and in nitrogen environments.

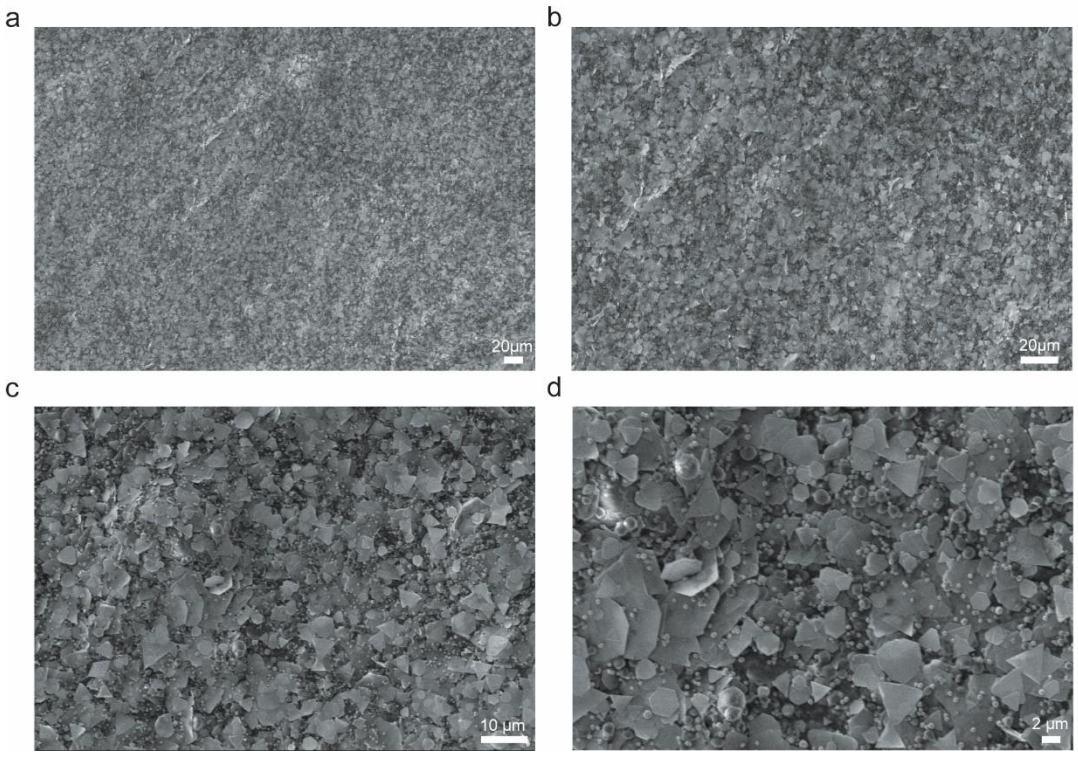

Figure S2. SEM images of unsintered copper nanoplates. (a) 500× magnification. (b) 1000× magnification. (c) 2500× magnification. (d) 5000× magnification.

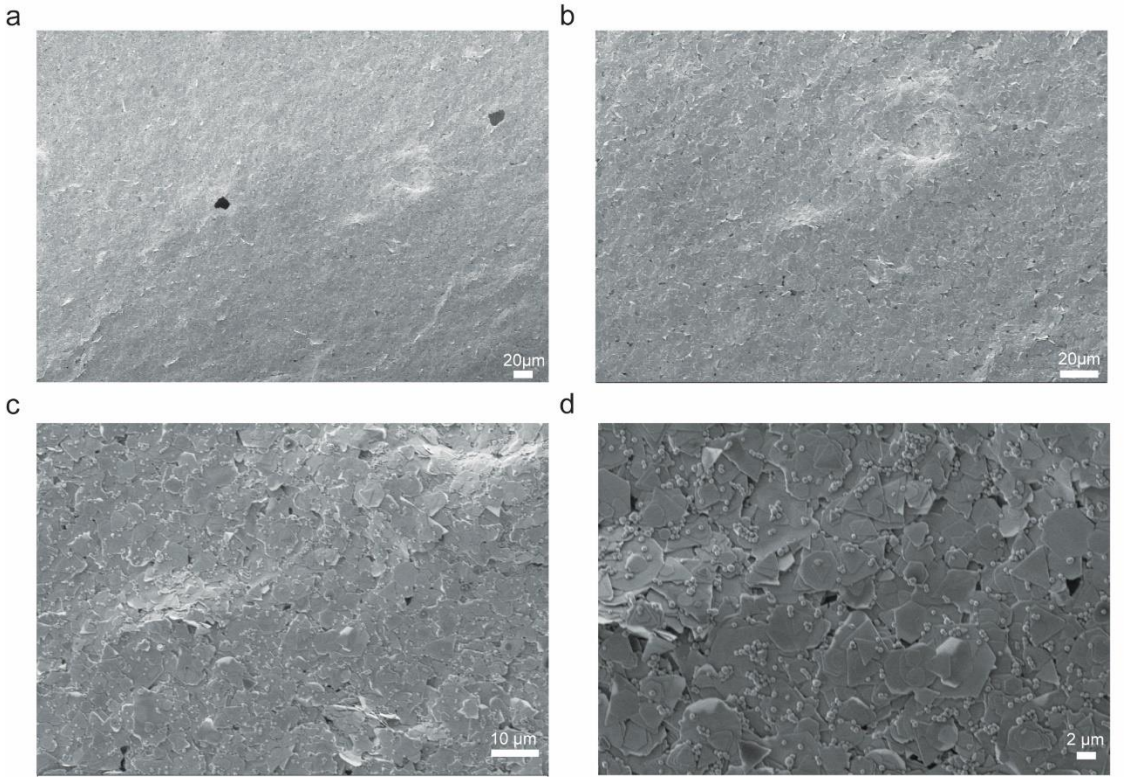

Figure S3. SEM images of unsintered copper nanoplates hot-pressed at 150ºC. (a) 500× magnification. (b) 1000× magnification. (c) 2500× magnification. (d) 5000× magnification.

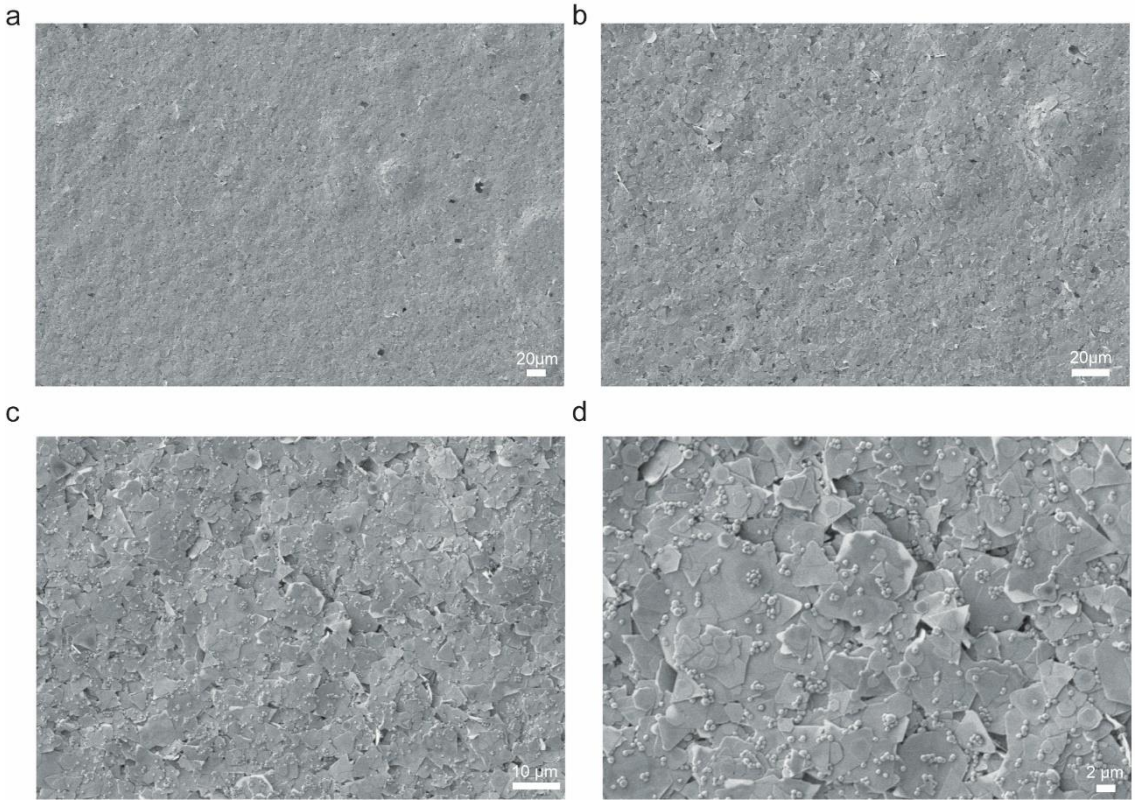

Figure S4. SEM images of unsintered copper nanoplates hot-pressed at 180ºC. (a) 500× magnification. (b) 1000× magnification. (c) 2500× magnification. (d) 5000× magnification.

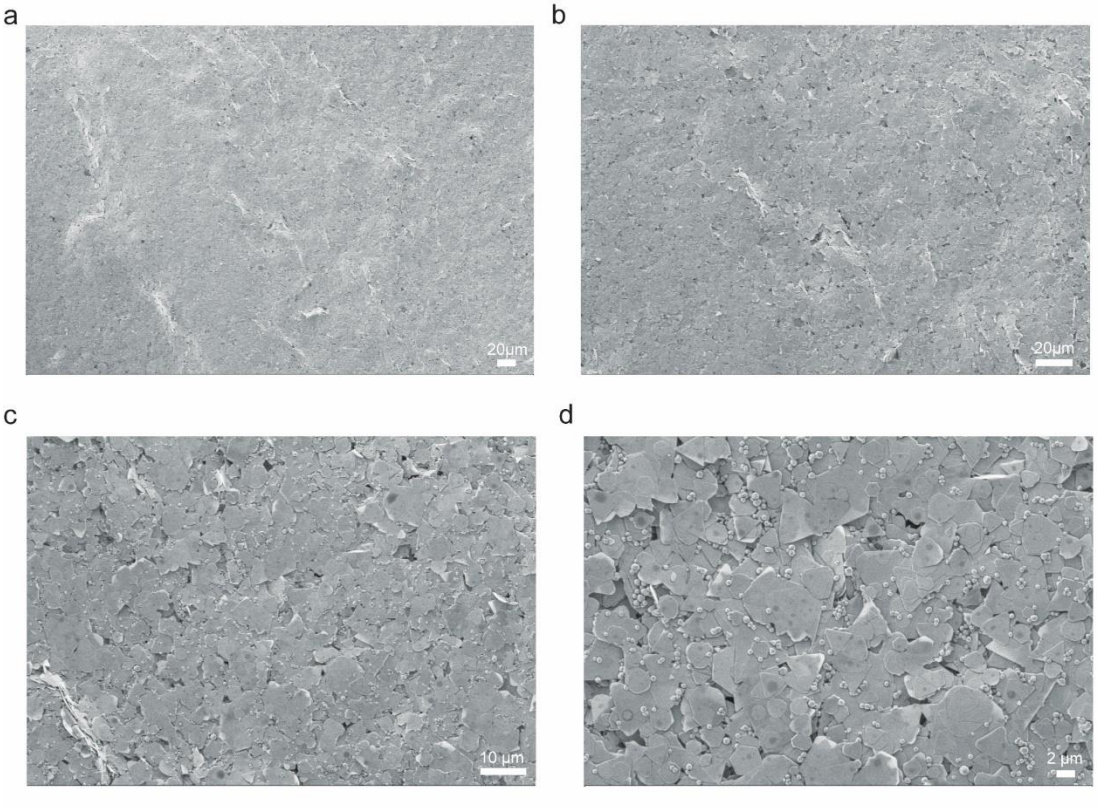

Figure S5. SEM images of unsintered copper nanoplates hot-pressed at 200ºC. (a) 500× magnification. (b) 1000× magnification. (c) 2500× magnification. (d) 5000× magnification.

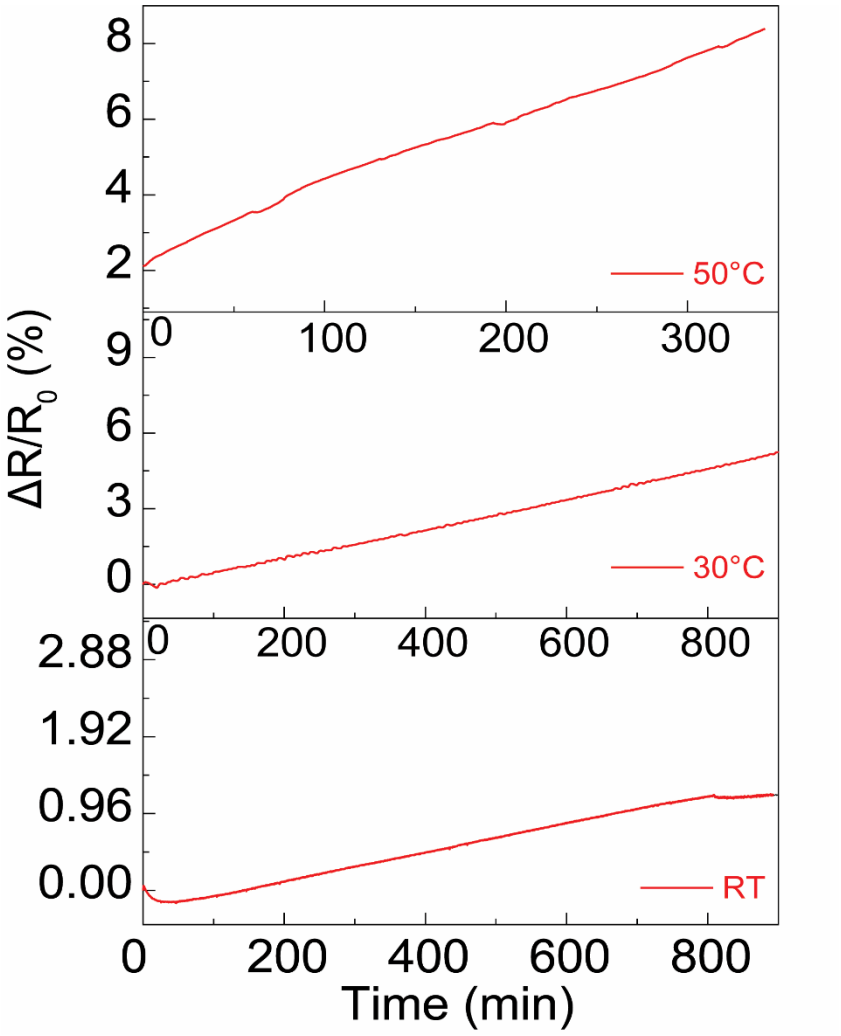

Figure S6. Reliability curves for the temperature sensor at room temperature, 30ºC and 50ºC.

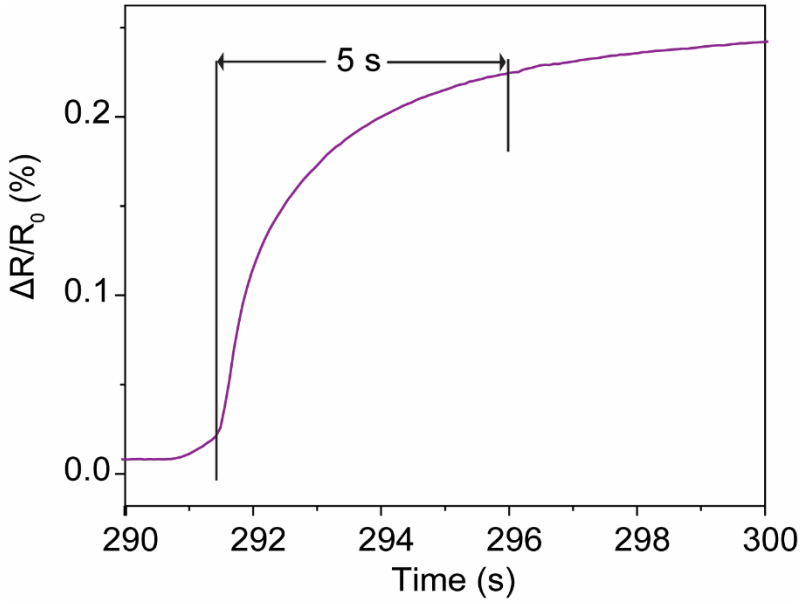

Figure S7. Response time for sensor under a pressure of 557.2 Pa

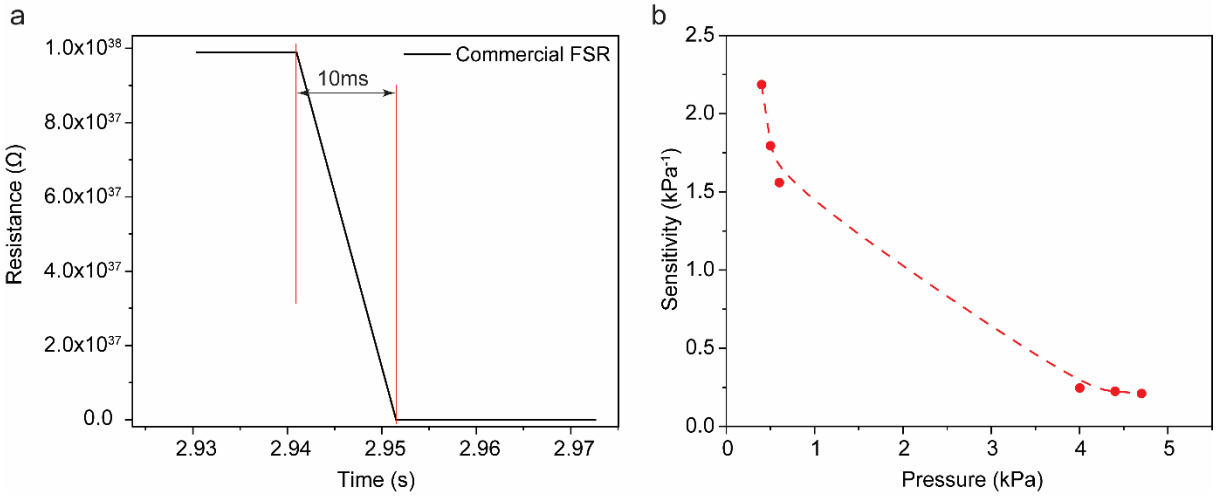

Figure S8. (a) Plot depicting the response time of a commercial Force Sensitive Resistor (FSR). (b) Sensitivity vs Pressure plot for the commericial FSR sensor.

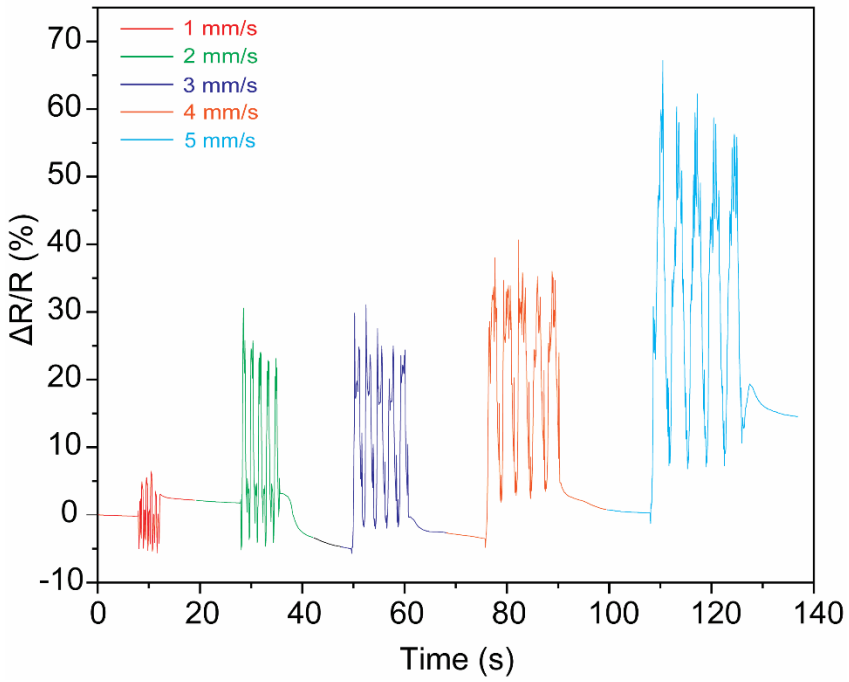

Figure S9. Sensor utilized for strain sensing at different strain rates applied via a mechanial test setup.

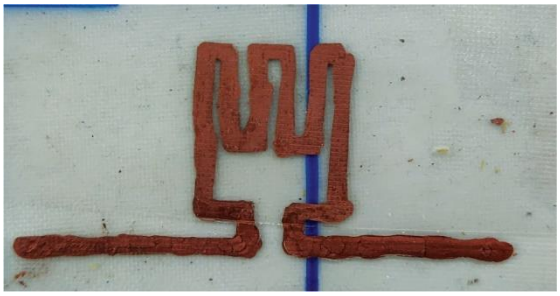

Figure S10. Optical image of the modified sensor with the dipole antenna.

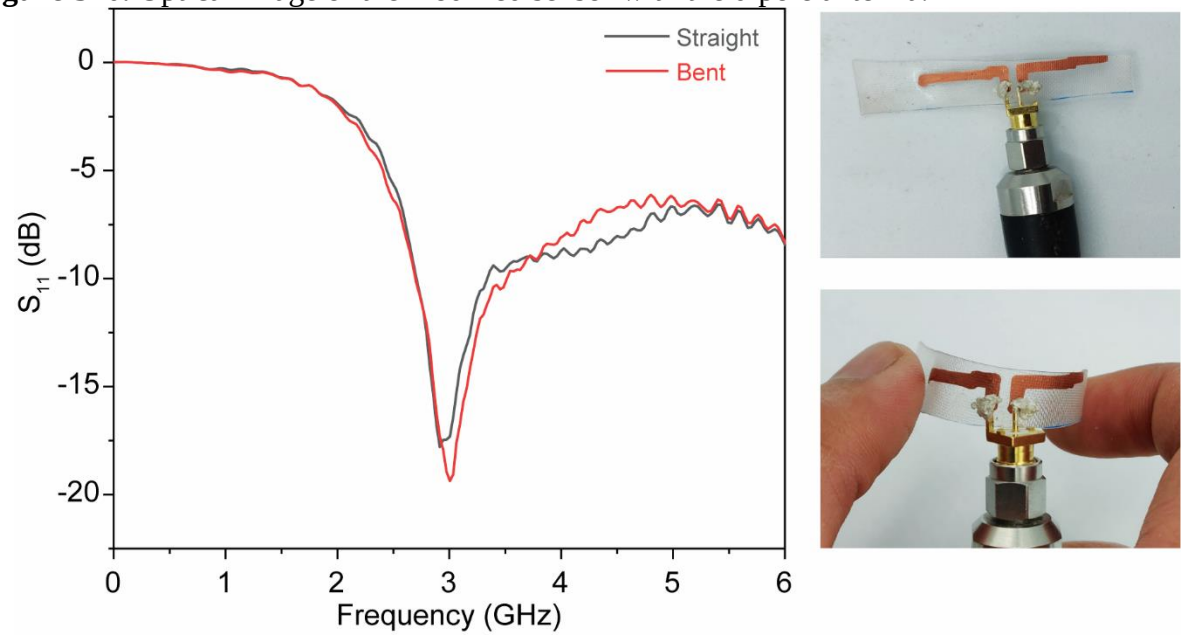

Figure S11. Plot depicting negligible change in the reflection coefficient (S_{11}) when the antenna is in a bent state from its intial straigth position.

Table S1. Comparison table for radar chart in Figure 1.

Material	**Cost**	**Conductivity**	**Response time**	**Sensitivity**	**Scalability**
Copper NPL (This work)	*Low*	*2.3 MS/m*	*130ms*	*0.42 kPa^{-1}*	*High*
Graphene/C foam hybrid[1]	High (freeze drying + thermal annealing)	0.2 S/cm	<10s	0.19 kPa^{-1}	Low
Graphene Porous network[2]	High	2.0 × 10^2 S/m	100ms	0.09 kPa^{-1}	Low
Carbon cotton[3]	Medium (pyrolyzed at 900^{o}C for 1 h in N_2 atmosphere)	11 S/m	100ms	0.33 kPa^{-1}	Medium

Au/PET electrode[4]	High (Precious Metal)	1.7 MS/m	20ms	0.42 kPa^{-1}	Medium
Copper Nanowire-Based Aerogel[5]	Moderately High (freeze drying involved)	1.6 – 12.8 S/cm	9ms	0.7 kPa^{-1}	Medium
Silver Nanowire/Ethylene-co-vinyl Acetate Composite Films[6]	Medium	25000 S/m	16ms	67.3 kPa^{-1}	High

References

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