Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Information

A Carbon Nanotubes-Based Textile Pressure Sensor with High-Temperature Resistance

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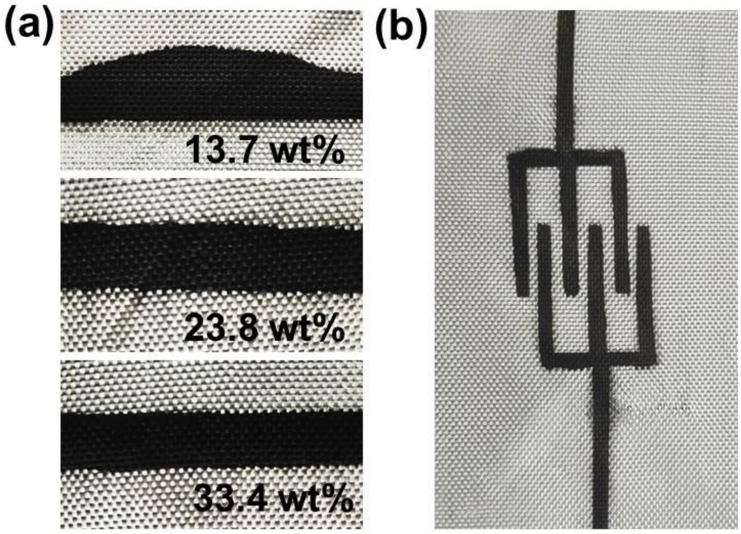

Figure S1. (a) Optical images of blade-coated MWCNT electrodes from different solid contents. (b) Optical image of a prepared interdigitated electrode.

The inks with a solid content of 13.7 wt% diffused obviously on the quartz fabrics. With increasing solid content, the ink diffusion of the MWCNT inks became weaker.

The ink with a high solid content of 33.4 wt% formed straight lines with sharp edges on the surface of the quartz fabric. Interdigitated electrodes with sharp edges were obtained by using ink with a solid content of 23.8 wt%.

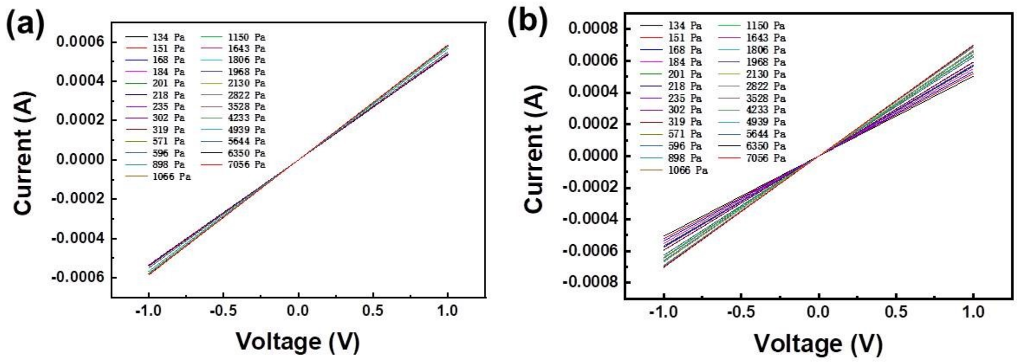

Figure S2. Current versus voltage (I−V) curves of the single MWCNT electrode at different pressures measured at (a) room temperature and (b) 300 °C.

The MWCNT electrode exhibited an excellent linear I-V characteristic for all pressures both at room temperature and 300 °C. With increasing applied pressure, the resistance gradually decreased. The resistance declining with increasing pressure was more obvious at 300 °C, implying a higher sensitivity.

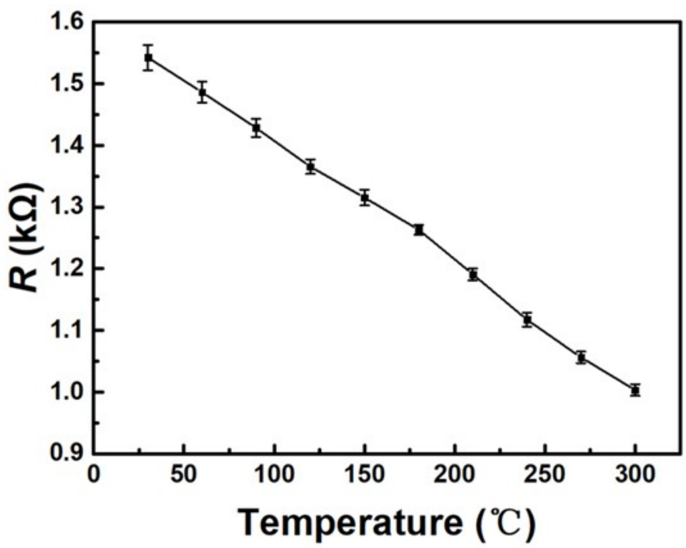

Figure S3. The MWCNT electrode exhibited linear dependence of the resistance on the temperature.

The resistance of a single MWCNT electrode decreased from 1.562 kΩ to 1.016 kΩ as the temperature increased from 30 °C to 300 °C, exhibiting a semiconductor character.

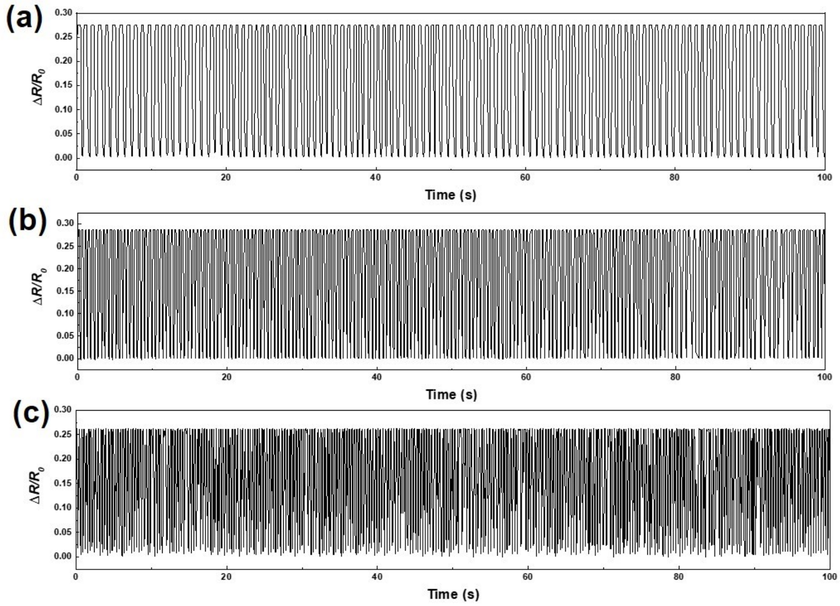

Figure S4. Cycling pressure response curves at various loading frequencies for the uncalcinated sensor.

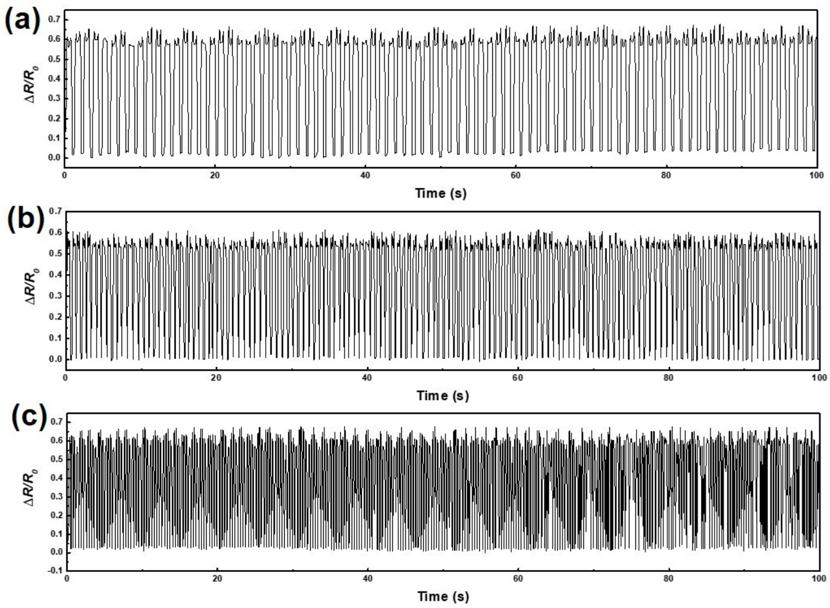

Figure S5 Cycling pressure response curves at various loading frequencies for the sensor after being calcinated at 900 °C for 30 min.

The resistance changed synchronously with the dynamic loadings at different loading frequencies. The resistance of the textile sensors, including the uncalcinated and the calcinated samples, recovered to their initial values when they were released from different loading frequencies, exhibiting stable pressure responses and insensitive to loading frequency.

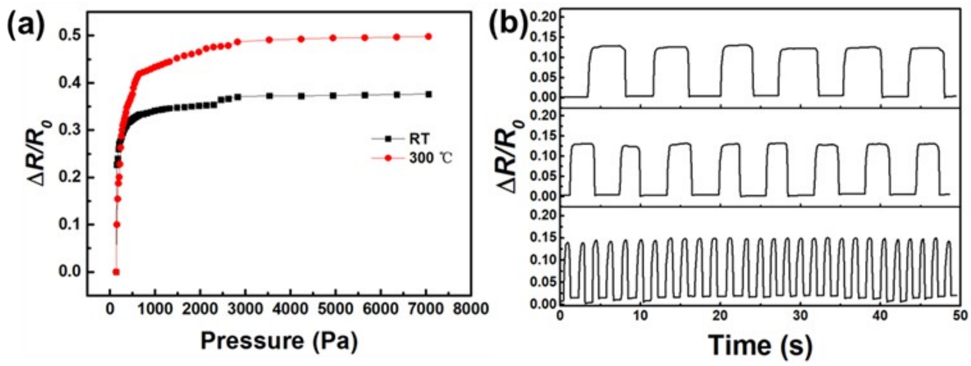

Figure S6 Sensing performance of the pressure sensor after being soaked in water for 40 h. (a) The relative resistance change of the pressure sensor at room temperature (RT) and 300 °C. (b) Cycling pressure response curves at various loading frequencies at 300 °C

The soaked pressure sensor maintained good sensing performance both at room temperature and 300 °C. The $\Delta R/R_0$ value increased with the increasing pressures and changed synchronously with the dynamic loadings. When pressure load was released, the resistance of the sensor recovered to its initial value. The improvement in the sensing performance could be attributed to the increased conductivity of MWCNTs at a high temperature.

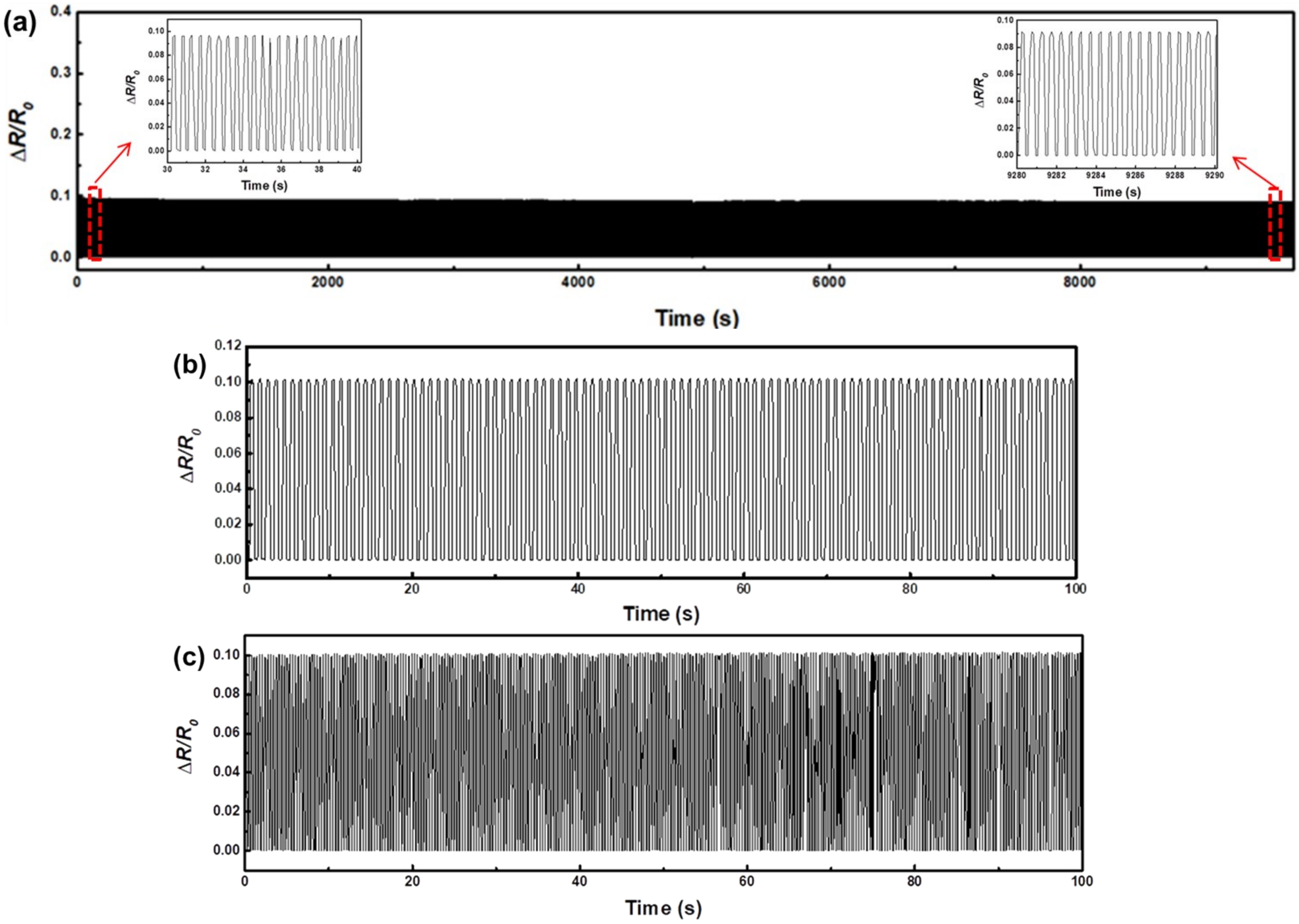

Figure S7 Fatigue performance of the textile pressure sensor after being soaked in water for 40 h. (a) Cyclic pressure test over 20000 compressive cycles. Cycling pressure response curves at various loading frequencies (b and c).

Figure S7 shows that the soaked textile pressure sensor maintained a consistent response over 20000 compressive cycles and exhibited a stable dynamic response performance at various frequencies.