Low-cost High Sensitive Resistive Strain Sensors for Wearable Electronics

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A geometry model used to calculate strain in a bending sensor is shown in Figure S1a. The calculation method is deliberated in Ref. 39. The strain $\varepsilon = \pm h/2r$, where r is the curvature radius and h is the thickness of the PET substrate. Since the thickness of the PET substrate is much thicker than that of graphite granular thin film, the film thickness can be ignored. The chord length c=2r sin Θ , where $\Theta = l/2r$ and l is the length of the film. Therefore, the cord length is related to the strain by the following equation:

$$c = \frac{h}{\varepsilon} \sin\left(\frac{l}{h}\varepsilon\right)$$

The strain is can be calculated for different cord lengths as the sensor bends. Figure S1b shows the chord length as a function of radius at fixed arc length l = 20mm and h = 0.1 mm.



Figure S1. a) Geometry model used to calculate strain in a bending sensor. b) The chord length as a function of radius at fixed arc length l = 20mm.

A simple setup is made by glass slide and 3M adhesive paste as shown in Figure S2. The chord length of the sensor can be measured in experiment.



Figure S2. A hand-made setup used to bend the sensor.

Hysteresis loops during bending of the sensor were measured at different frequencies as shown in Figure S3. Due to the simple setup used for measurements, the loops looked not very smooth. However, the hysteresis effect of resistance during both the bending and releasing process was not very large.



Figure S3 Hysteresis loop during bending of the sensor at frequencies of (a) 0.5Hz (b) 1.0Hz (c) 1.5Hz and (d) 2.0Hz.