

Supporting Information

A strong and flexible electronic tube for real-time monitoring temperature, motions and flow

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1. Supporting Images

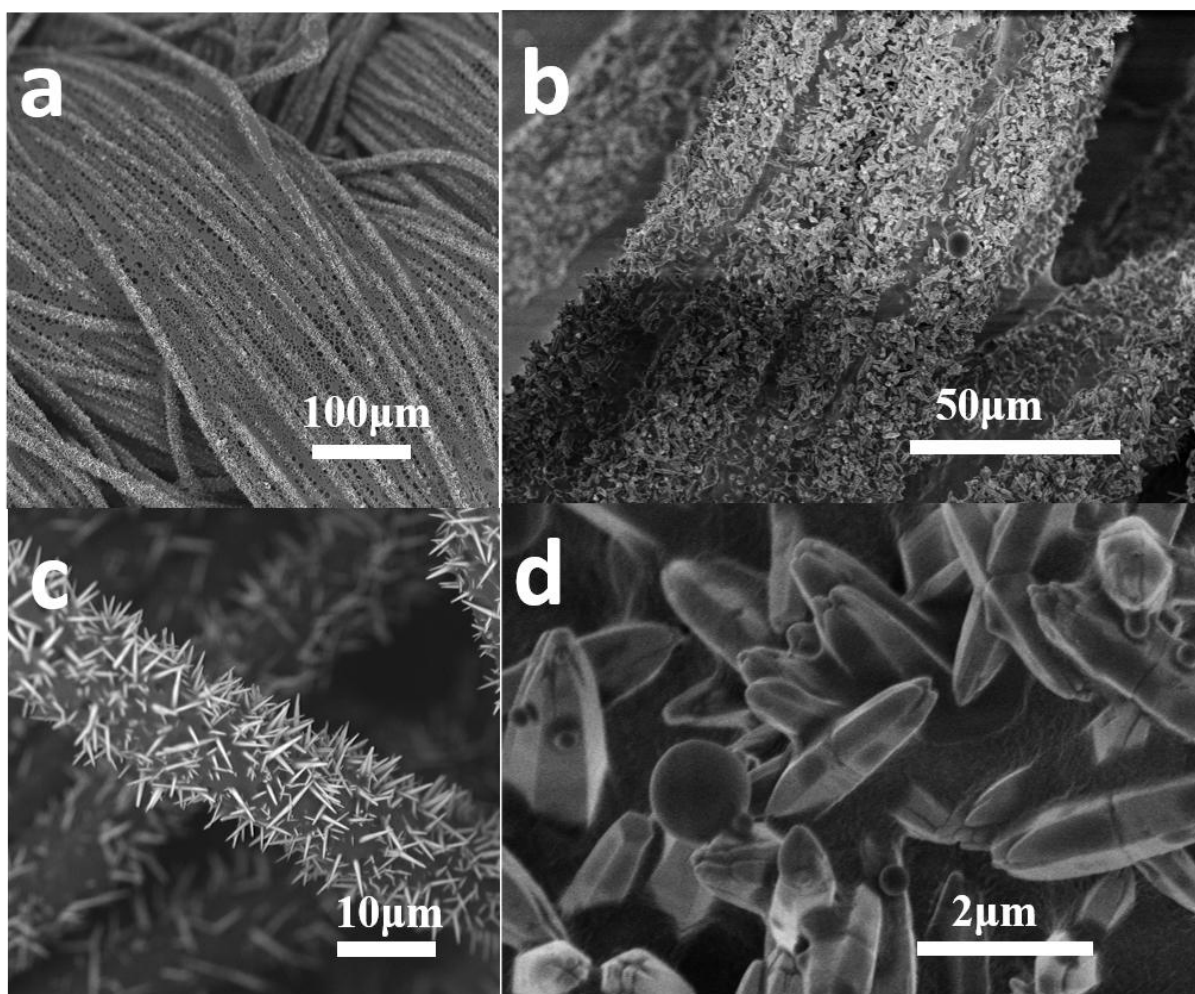


Fig. S1 SEM images of the cotton@SWNTs/ZnO@PVDF.

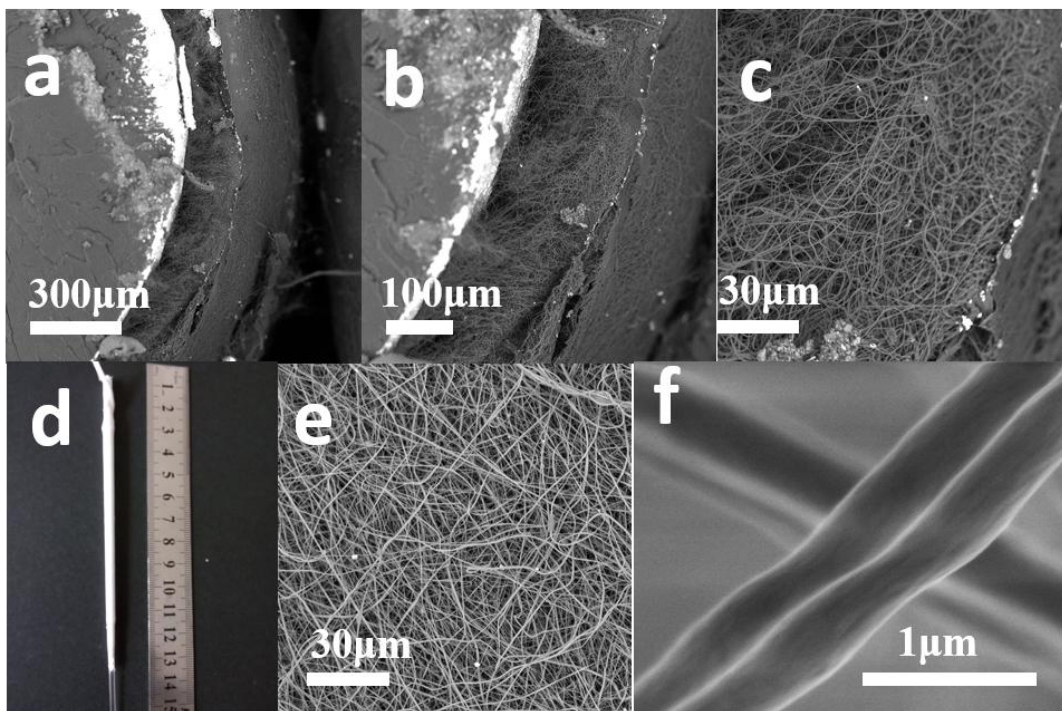


Fig. S2 (a) SEM image of cross-section view of tubular PVDF fibrous membrane. (b) and (c) are corresponding magnified picture. (d) photograph of tubular PVDF fibrous membrane. (e) SEM image of top view of PVDF fibrous membrane. (f) is corresponding magnified picture.



Fig. S3 A photograph of silicone rubber microreactor.

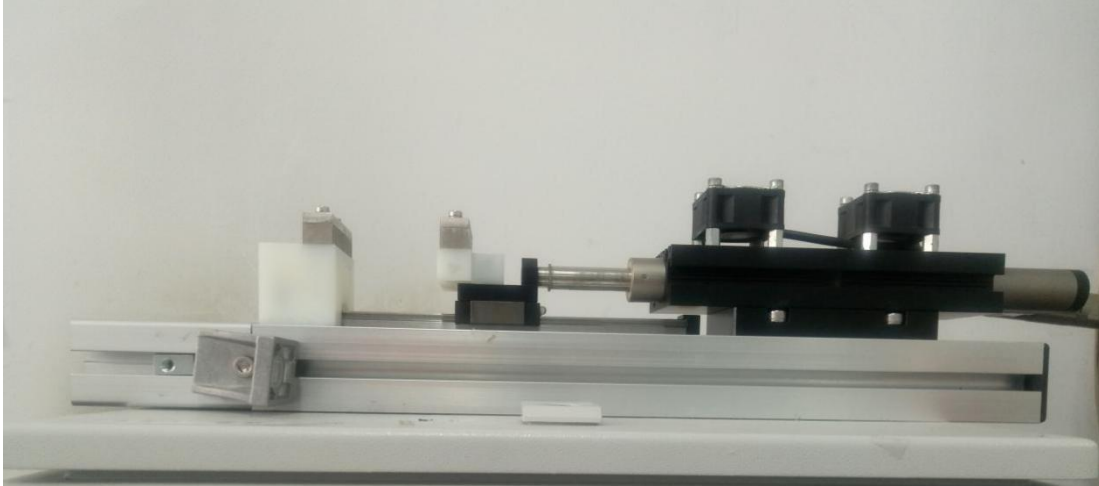


Fig. S4 A photograph of mechanical motor-driven machine.

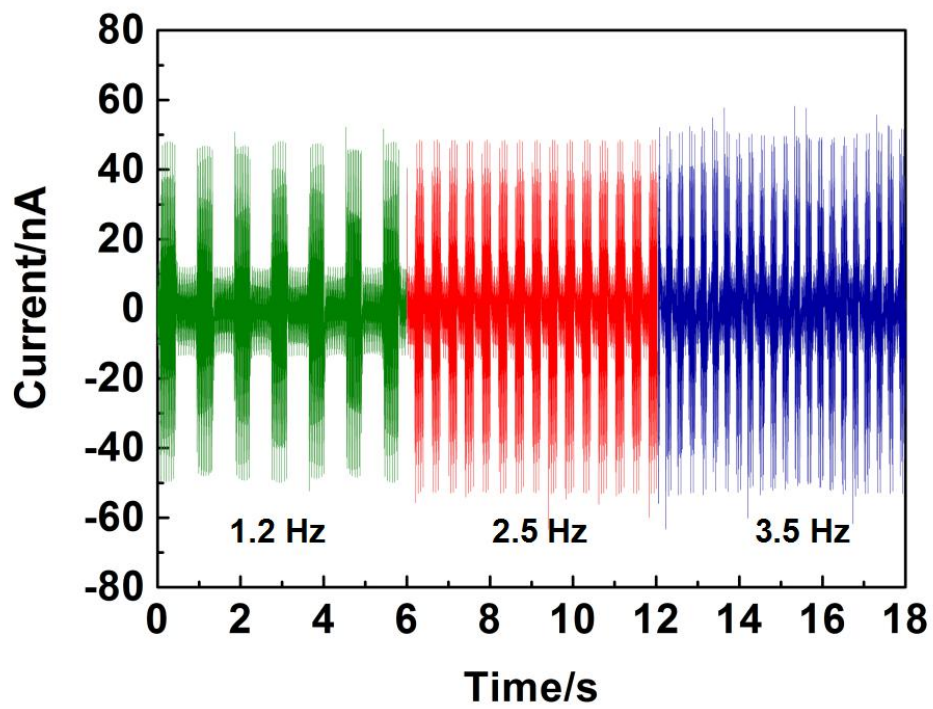


Fig. S5 The output current of flexible sensor under bending condition with different frequencies.

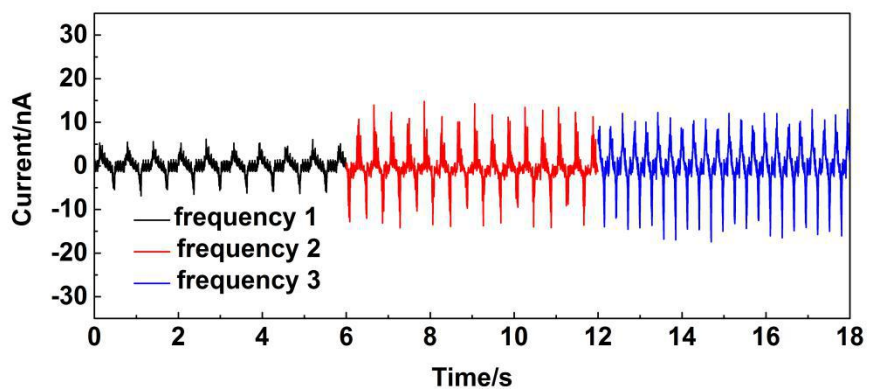


Fig. S6 The output current generated by the sensor under compressing with different frequencies.

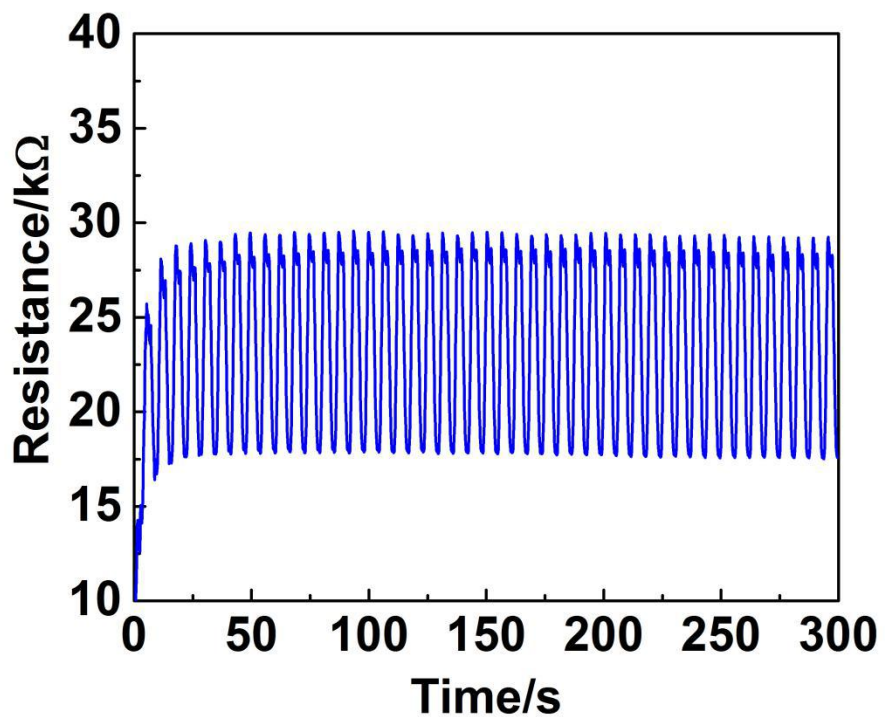


Fig. S7 The stability test of the cotton@SWNTs/ZnO@PVDF.

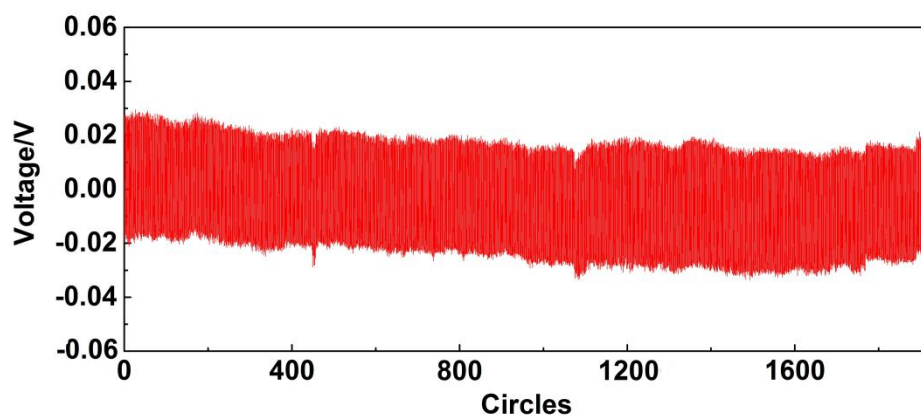


Fig. S8 The output signal of the sensor during 1920 circles' compressing circle test.

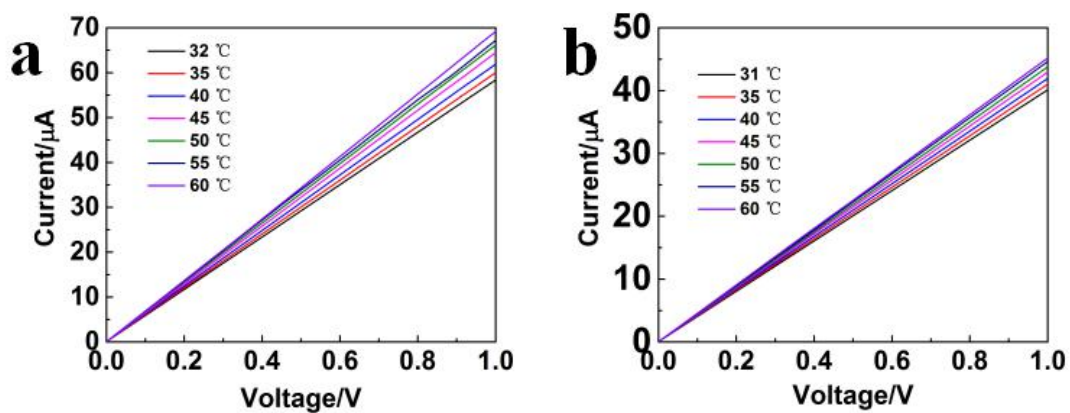


Fig. S9 (a) The I-V curves of the sensor measured under different temperature before 1920 circles' bending. (b) The I-V curves of the sensor measured under different temperature after 1920 circles' bending.

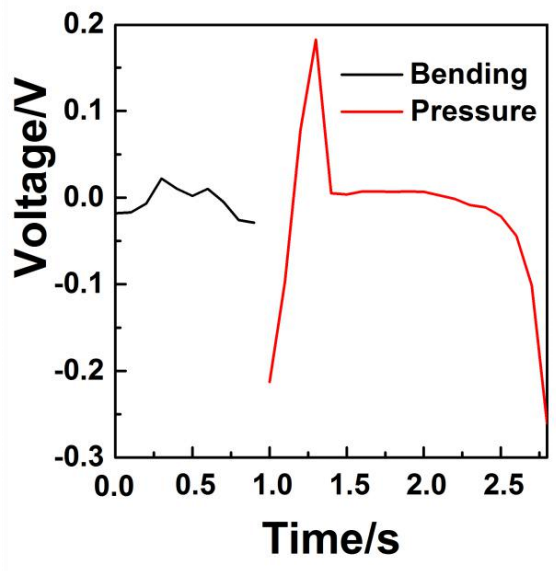


Fig. S10 The output voltage of the sensor under bending and pressure.

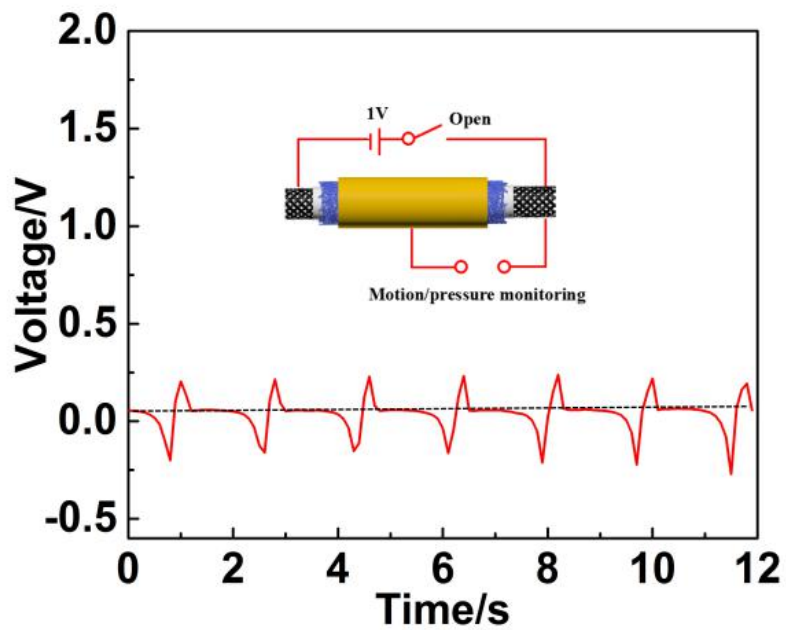


Fig. S11 The output voltage under pressure without voltage applied on the shared electrode.

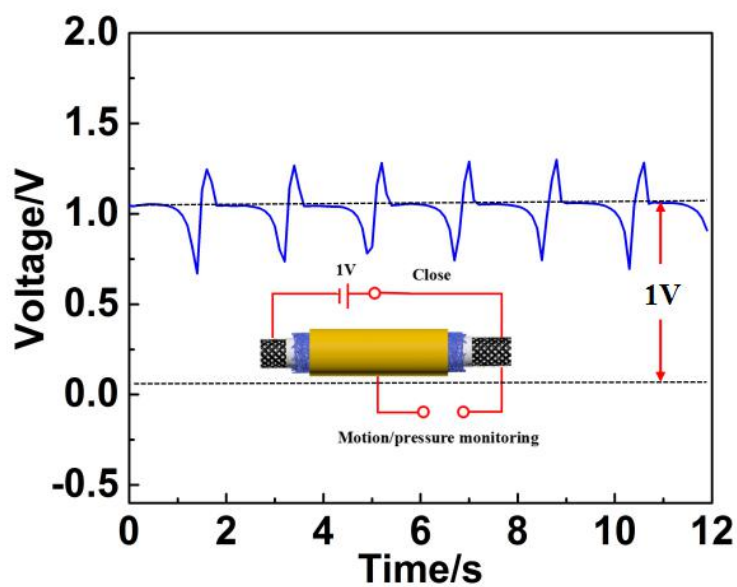


Fig. S12 The output voltage under pressure with 1V applied on the shared electrode.

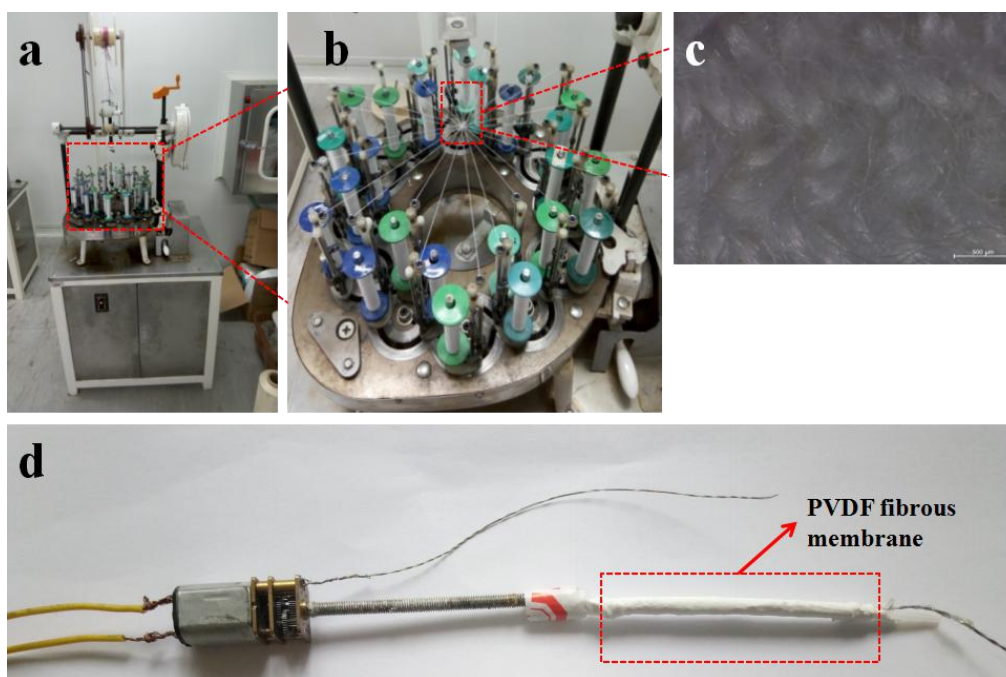


Fig. S13 (a) A photograph of high-speed braiding machine. (b) Partial enlarged detail of (a). (c) A photograph of the braided cotton hose. (d) A photograph of motor used for electrospinning.



Fig. S14 (a) A photograph of PVDF fibrous membrane. (b) Contact angle of water against of PVDF fibrous membrane after treated with ethyl acetate.

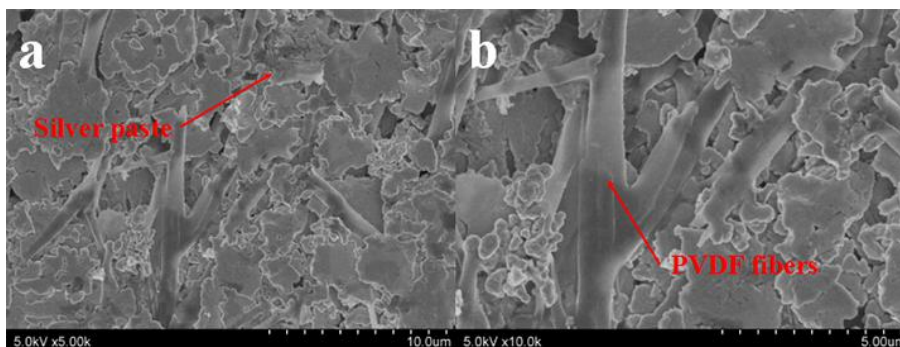


Fig. S15 (a) FE-SEM images of PVDF fibers coated by silver paste. (b) corresponding high magnification images.

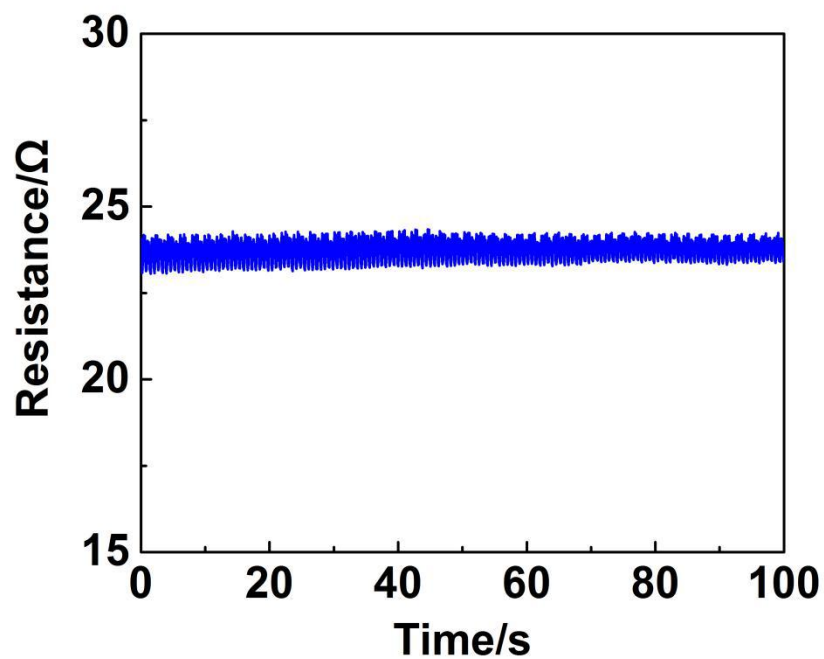


Fig. S16 The stability test of outer electrode.

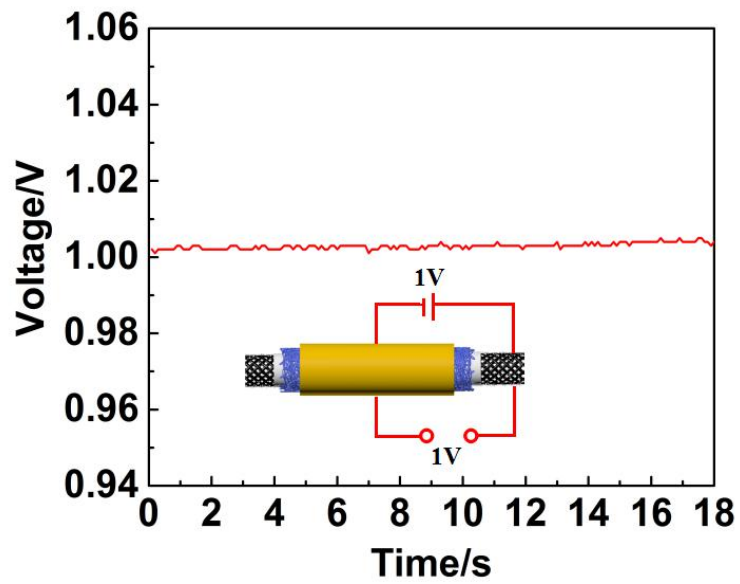


Fig. S17 the open circuit voltage variation during continuous bending process.

2. Supporting Video

Video S1 The temperature sensing of the sensor under bending state during heating process.

Video S2 The temperature sensing of the sensor under bending state during cooling process.