Supporting Information

One Wearable, Washable, and Highly Sensitive Piezoresistive Pressure Sensor Based on 3D Sponge Network for Real-time Monitoring Human Body Activities

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KEYWORDS: MXene, sponge, piezoresistive pressure sensor, wearable, washable

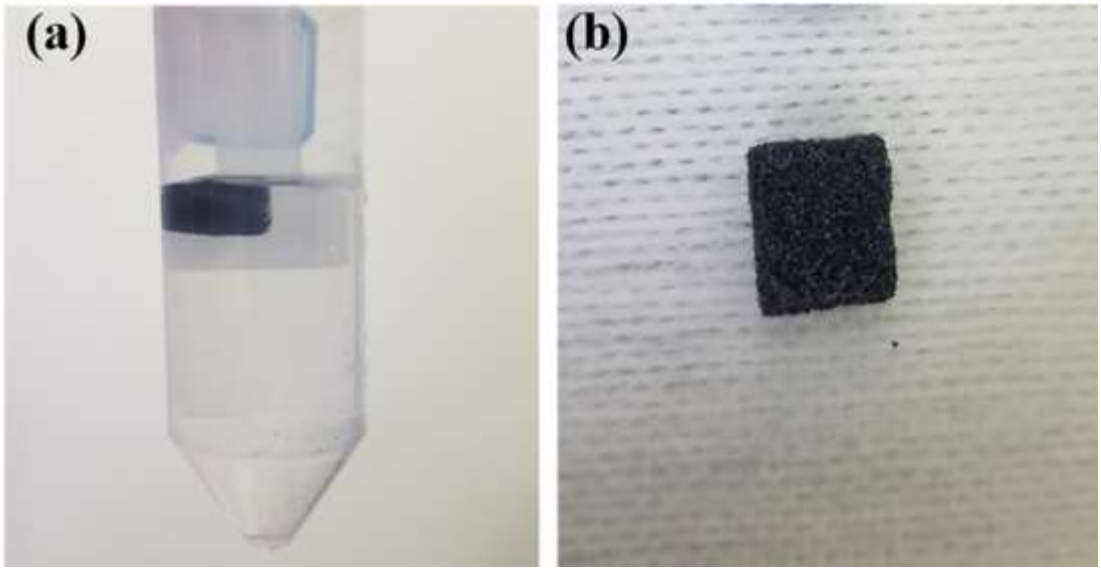

Figure S1. (a) Putting the CMP in DI water for ultrasonic cleaning. (b) Drying the CMP after ultrasonic cleaning.

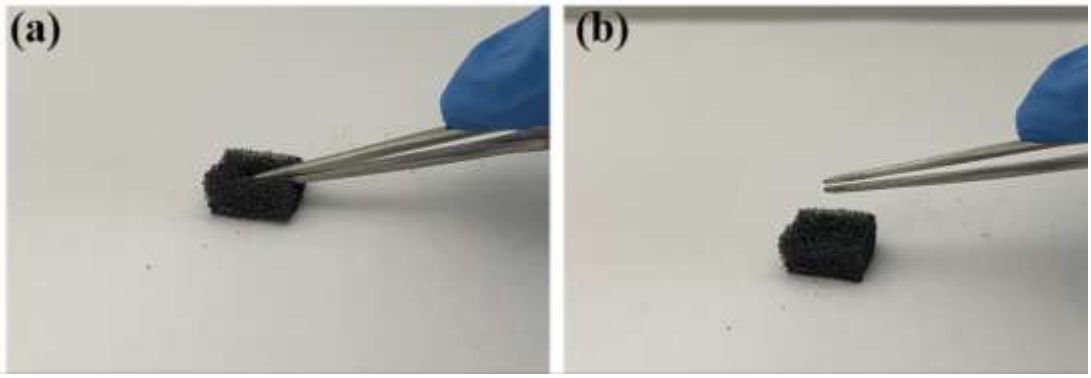

Figure S2. (a) The CMP is pressed by the tweezers. (b) The CMP is released from the compression.

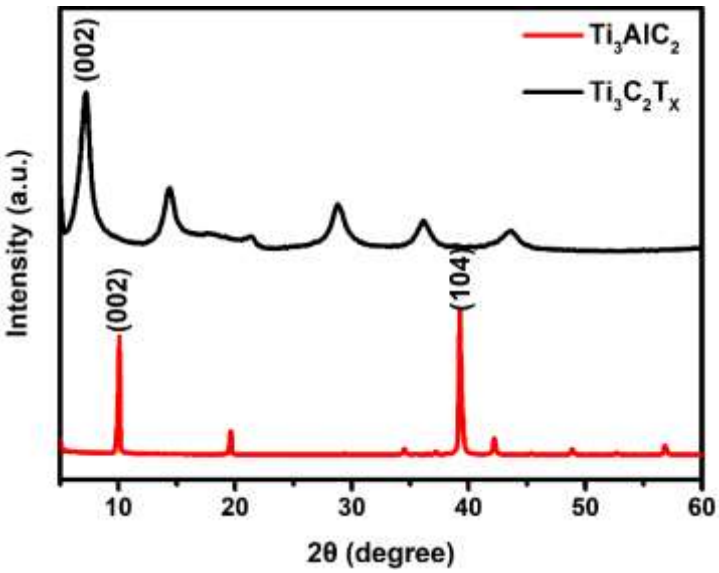

Figure S3. XRD pattern of MXene ($Ti_3C_2T_X$) and MAX (Ti_3AlC_2).

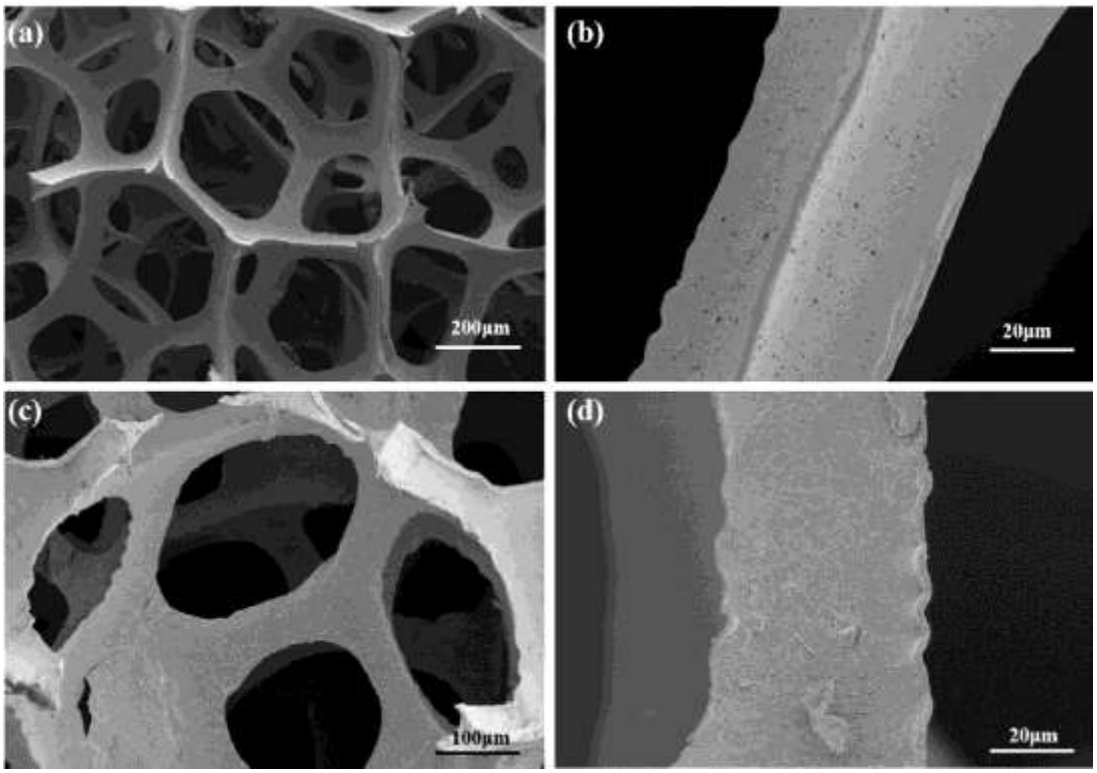

Figure S4. SEM images of (a) the PU sponge and (b) the single PU sponge skeleton. SEM images of (c) the CMP sponge and (d) the single CMP sponge skeleton.

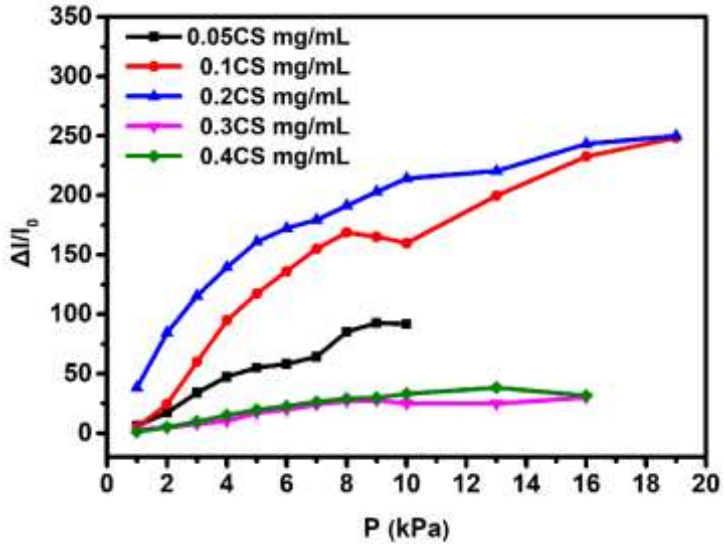

Figure S5. Current response of the CMPP sensor with various concentration of CS (0.05 mg/mL, 0.1 mg/mL, 0.2 mg/mL, 0.3 mg/mL, 0.4 mg/mL) under different pressures. For all the curves, the concentration of MXene is 1 mg/mL.

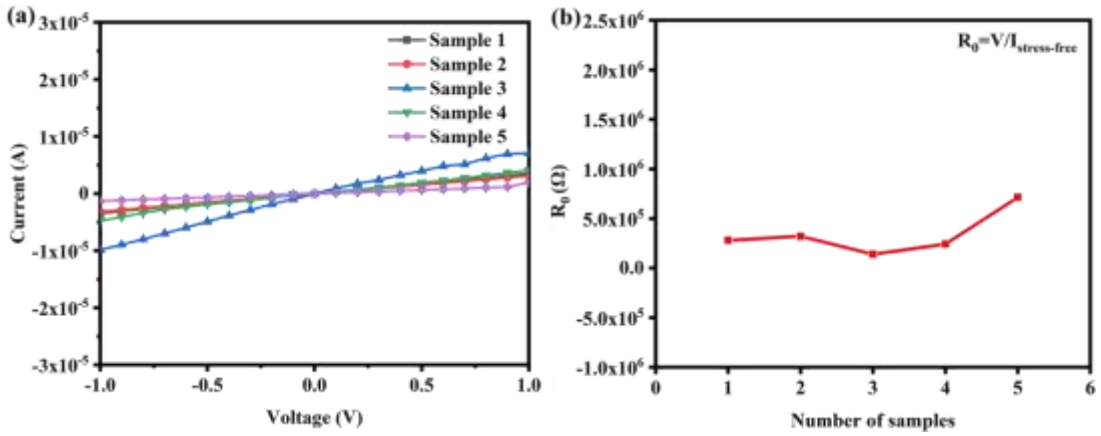

Figure S6. (a) C-V curves of five identical CMPP sensors under stress-free state. (b) R_0 of these five sensors.

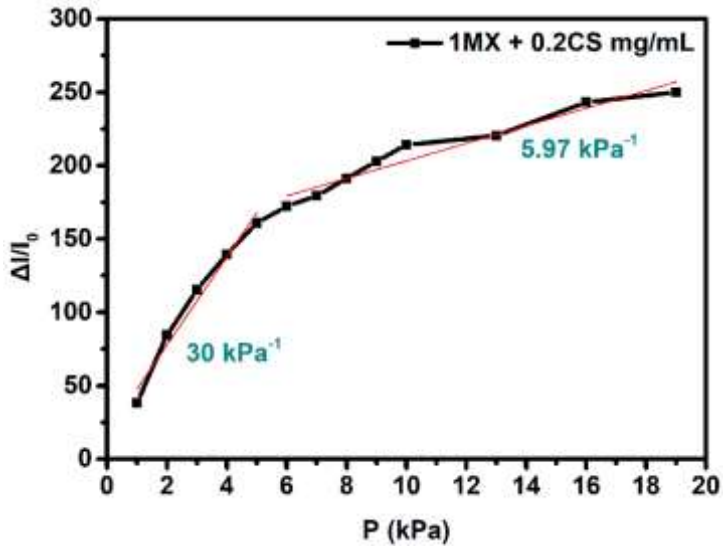

Figure S7. The sensitivity of the CMP pressure sensor under different pressure. The concentration of MXene and CS for the sensor are 1 mg/mL and 0.2 mg/mL, respectively.

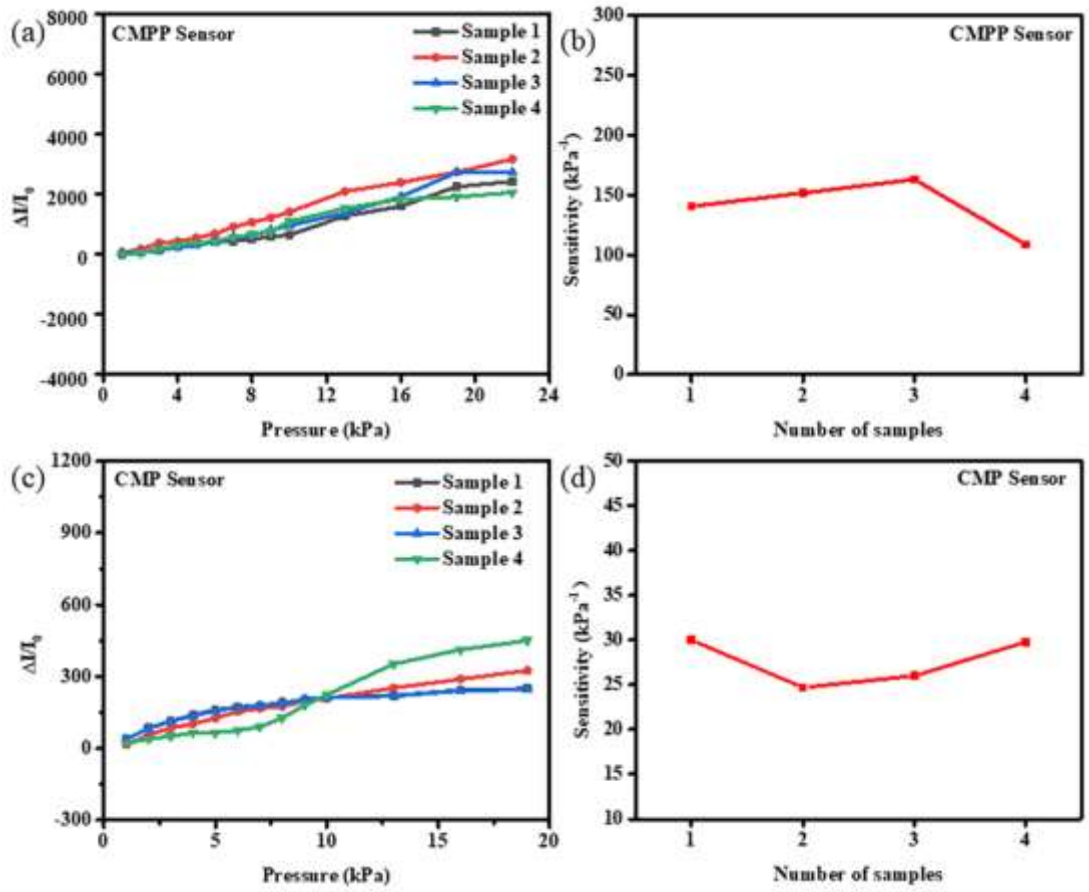

Figure S8. (a) The current response of four identical CMPP sensors under different pressures. (b) The sensitivity of four identical CMPP sensors calculated from (a). (c) The current response of four identical CMP sensors under different pressures. (d) The sensitivity of four identical CMP sensors calculated from (d).

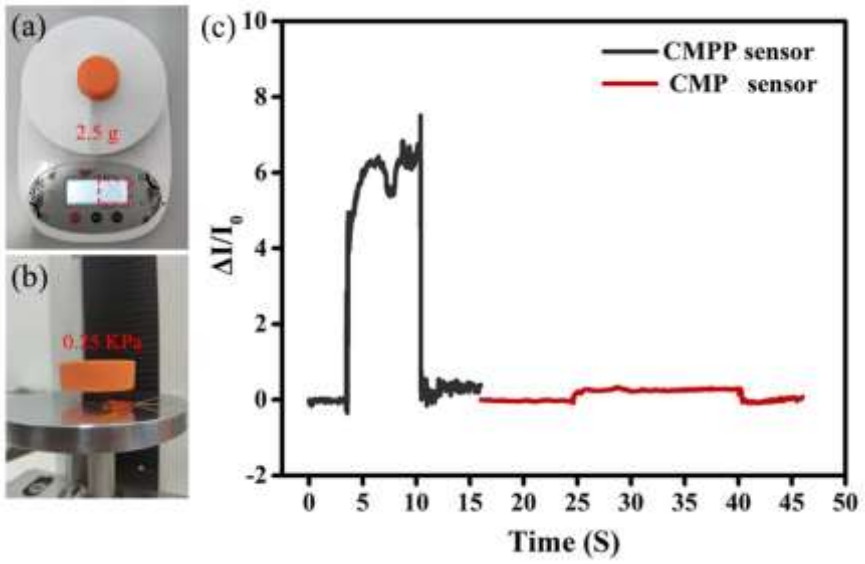

Figure S9. (a) Photograph of the light object which weighs 2.5g, corresponding to a pressure of 0.25 kPa. (b) Photograph of sensors testing the light-weight object. (c) The current change of sensors under 0.25 kPa. The black and red line corresponding to the CMPP and CMP sensor, respectively.

Table S1. Performance summary of piezoresistive sensors.

Materials	Sensitivity (kPa^{-1})	Pressure range (kPa)	Response/ Recovery time (ms)	Stability (cycle times)	Ref.
MXene/CS/PU/PVA	140.6	0-22	200/30	5000	This work
CNTs/AgNPs sponge	9.08	2.24-61.81	/	2000	41
CNT/PDMS sponge	0.01-0.02	0.01-1200	8.5/10	8000	42
C-MOF/PANIF/PU	158.26	<60	22/20	15000	43
CNF/CB/PU	0.35	>7.9	/	1000	44
RGO/PU	0.67	0-30	10/16	10000	45
Graphene-sponge	0.046	0.3-40	180	200	46
MXene-sponge/PVA	442	0.009-18.56	138/127	10000	18
GO/PPy/PU	0.79	0.075–15	<70 ms	10000	47
MXene/rGO aerogel	22.56	>1	245/212	10000	20
ANFs/MXene aerogel	128	0-5	320/98	1000	48
MXene/CNC aerogel	114.6	0.01-10	167/121	100000	49

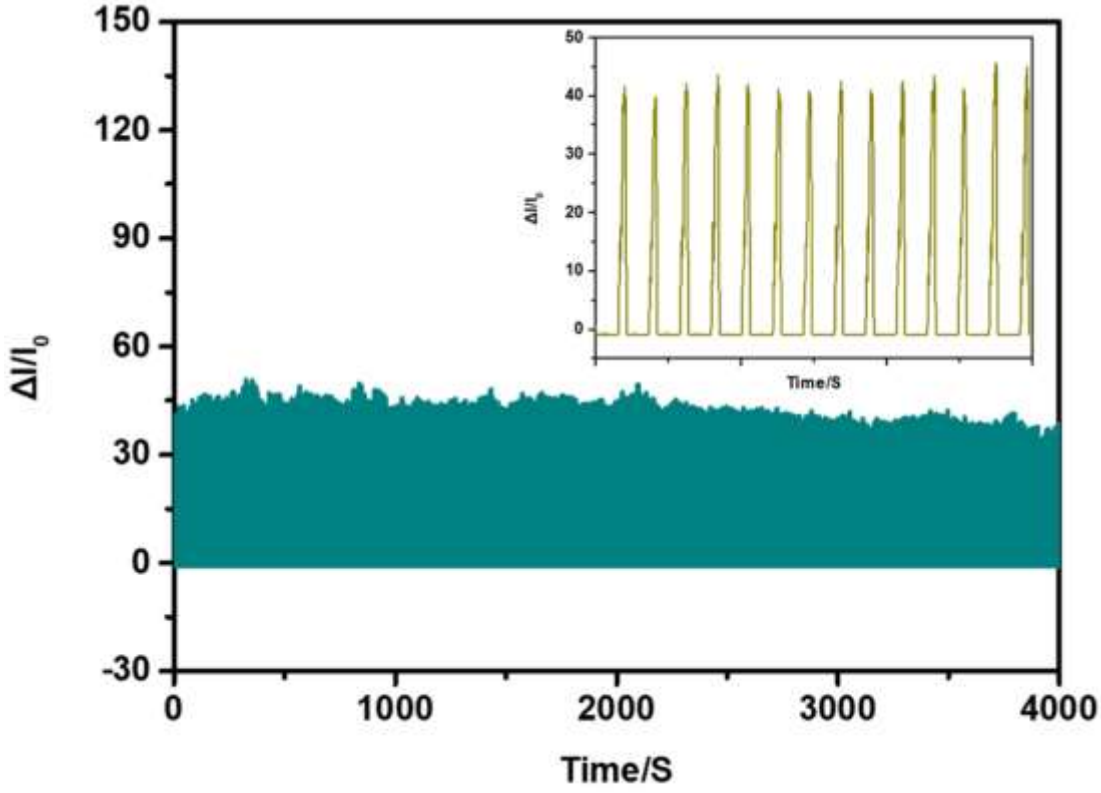

Figure S10. After stirring and cleaning, the stability test of the sensor for 2000 cycles.

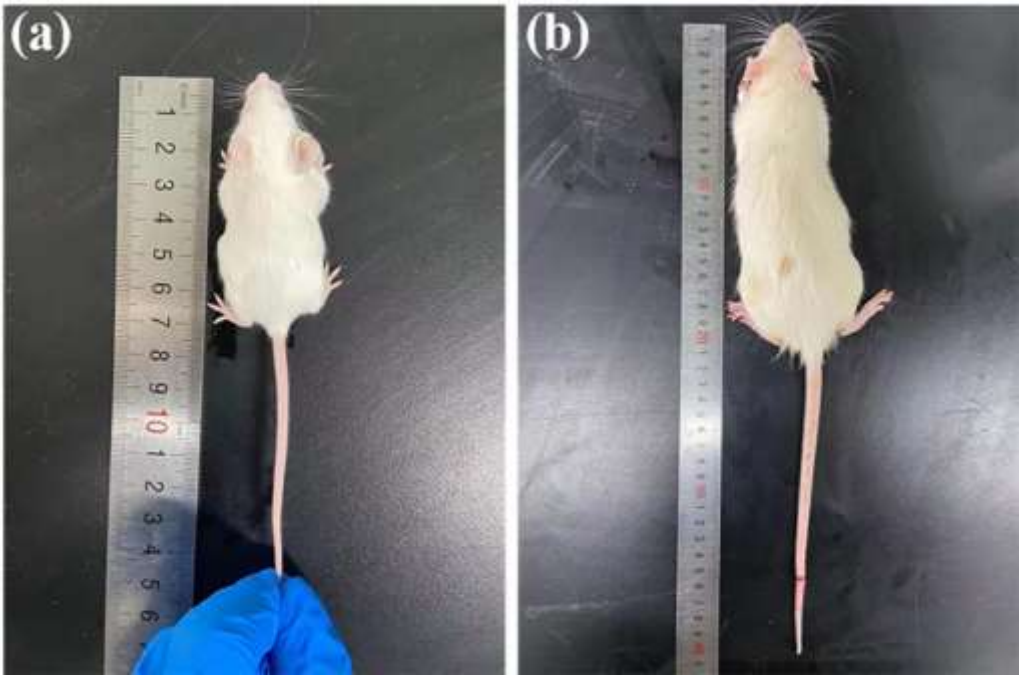

Figure S11. The actual size of (a) the mouse and (b) the rat.

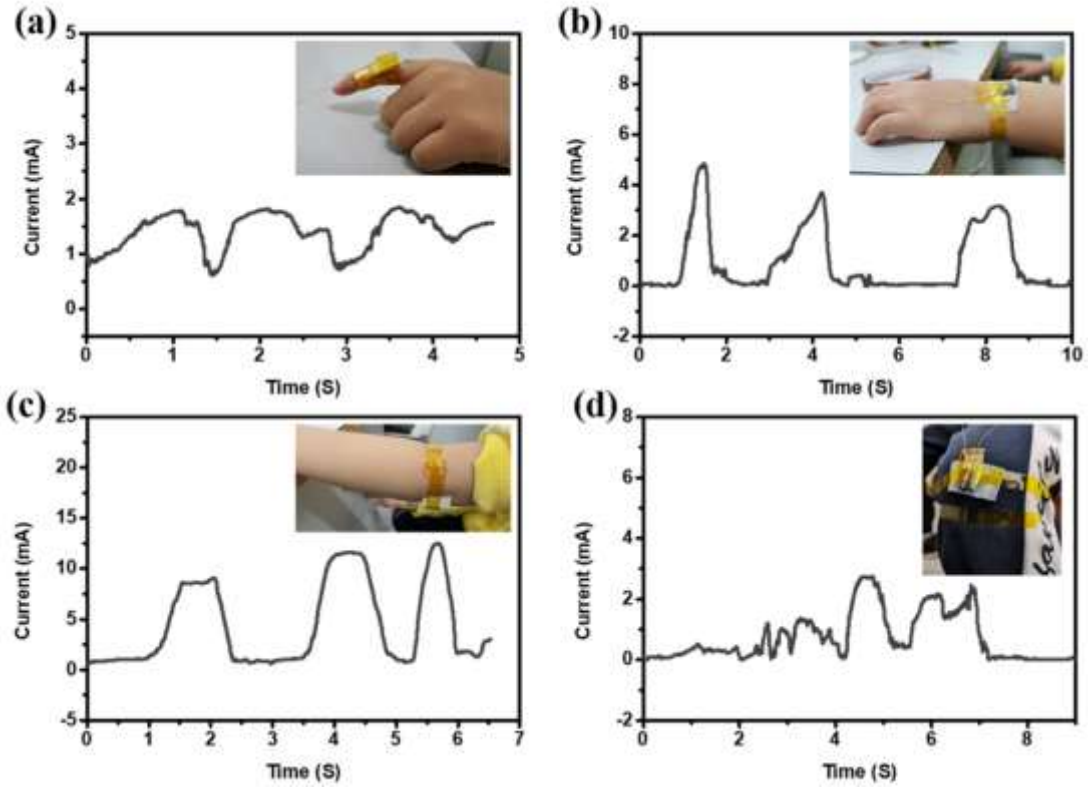

Figure S12. Real-time monitoring of child body activities by the CMPP sensor. Based on the CMPP sensor, I-T curves of the sensor caused by (a) finger bending; (b) wrist bending; (c) elbow bending; (d) leg bending, respectively.

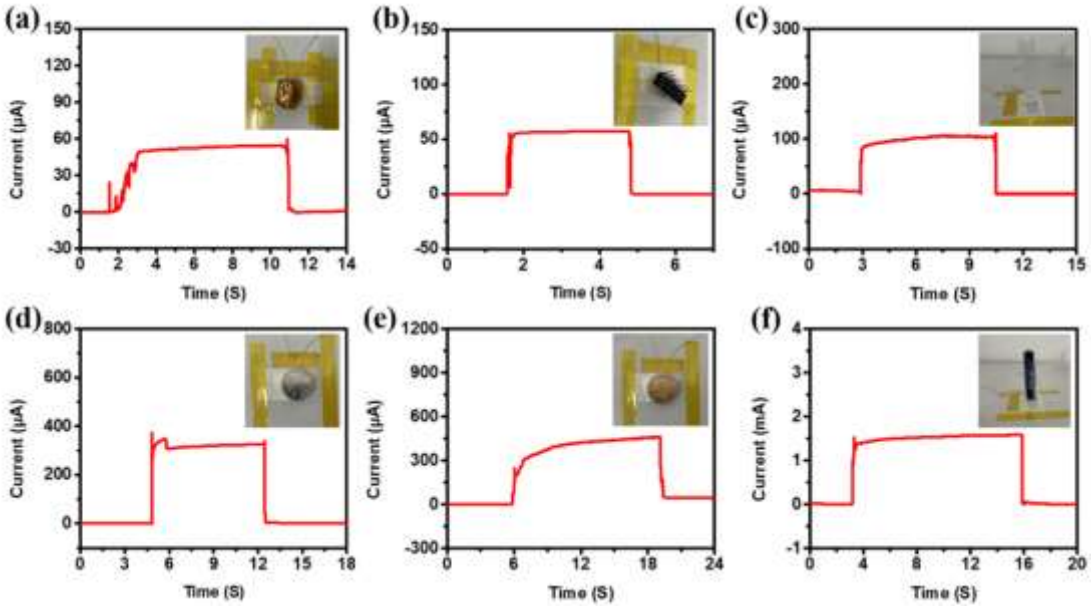

Figure S13. Real-time monitoring of tiny strain. Current response of the pressure sensor operating with (a) an object of 0.5 g; (b) an object of 0.9 g; (c) 1.5 mL of the sample tube; (d-e) RMB coins; (f) a No.7 battery.