Supporting Information

Design of a self-powered and superhydrophobic- pressure sensor with stable human motion monitoring

Xujie Cheng,[a,b] Zhengrui Li,[a,b] Haoyang Song,[a,b] Junchi Ma,[a,b] Siyu Gao[a,b] and Yongquan Qing*[a,b]

[a]School of Materials Science and Engineering, Northeastern University, Shenyang 110819, China

[b]Key Laboratory for Anisotropy and Texture of Materials, Ministry of Education, Northeastern University, Shenyang 110819, China

***Corresponding author**

E-mail address: qingyq@mail.neu.edu.cn

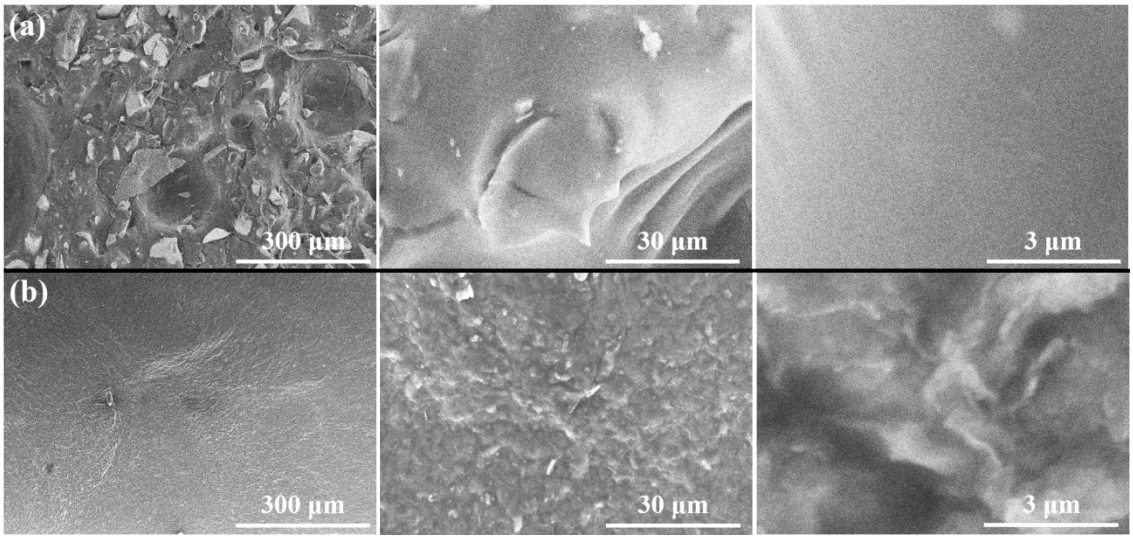

Fig. S1 SEM images of **(a)** merkel disc magnetic elastomer base surface and **(b)** MXene-coated merkel disc magnetic elastomer base surface at different magnification.

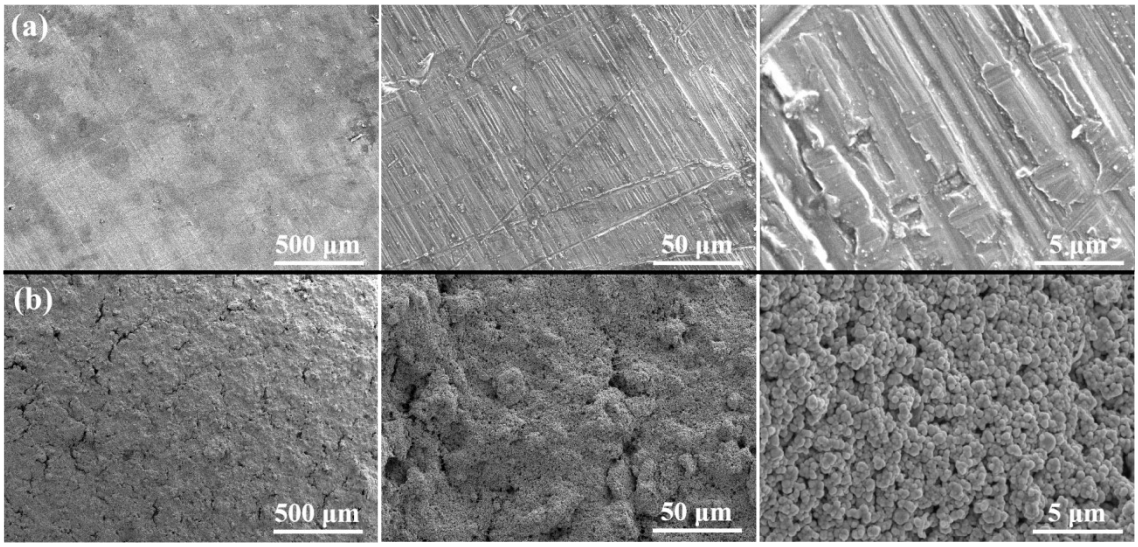

Fig. S2 SEM images of **(a)** ferromagnetic TENG surface and **(b)** superhydrophobic-coated ferromagnetic TENG surface at different magnification.

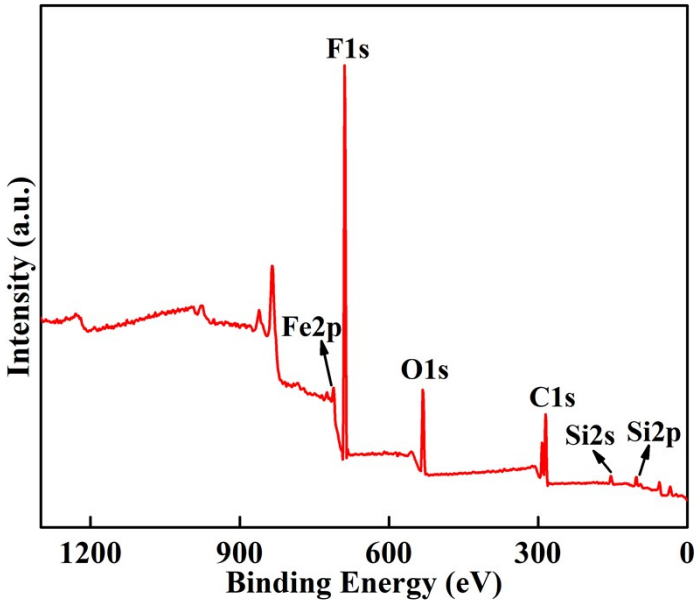

Fig. S3 XPS survey spectra of superhydrophobic layer surface.

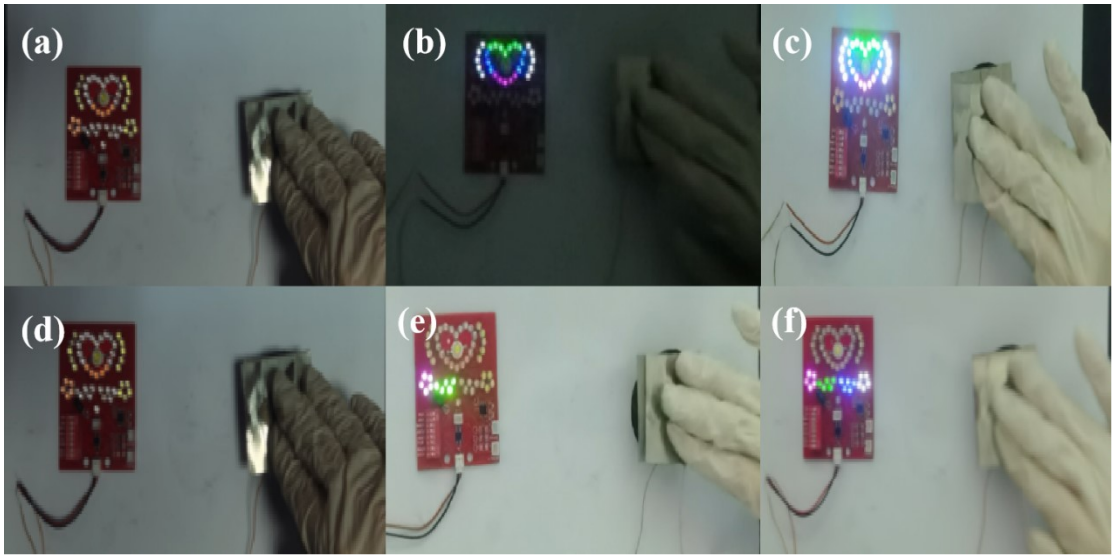

Fig. S4 LED bulbs lit with TENG in the background of **(a-c)** direct current mode and **(d-f)** alternating current mode.

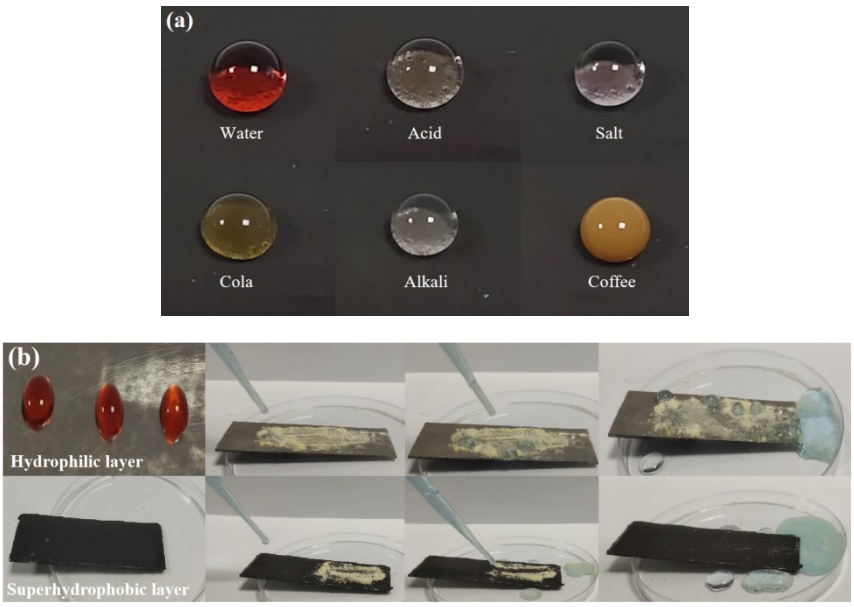

Fig. S5 (a) Different types of liquid droplets with a spherical shape on a superhydrophobic layer: deionized water, Cola, Coffee, acid (0.1 M HCl), base (0.1 M NaOH), and salt (3.5 wt.% NaCl). **(b)** Photographs showing the self-cleaning process of the hydrophilic layer of bare steel and superhydrophobic layer of ferromagnetic TENG (with a small inclination angle (<5°)) after chalk ash deposition.

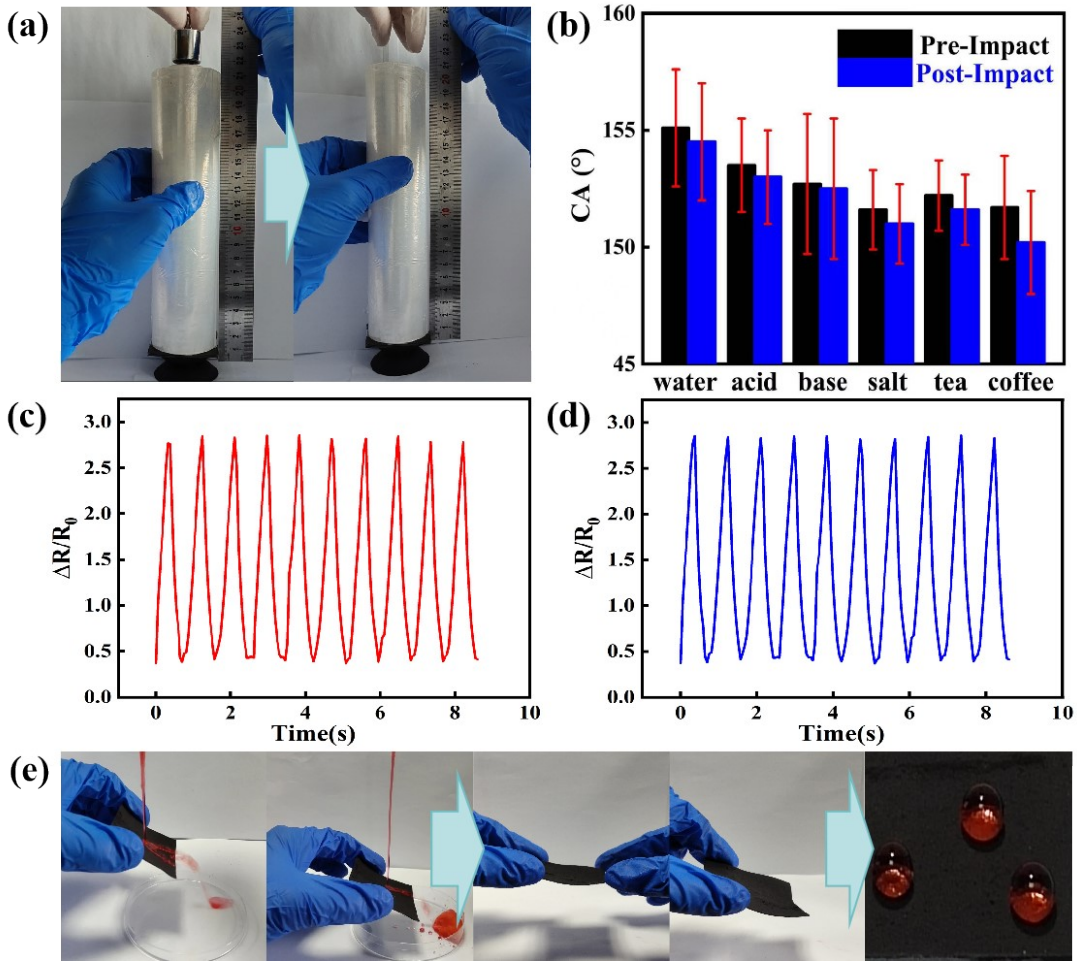

Fig. S6 (a) Mechanical robustness of superhydrophobic outer and inner self-powered sensor: schematic illustration of a 50 g weight impact experiment from a height of 0.2 m onto the outer layer surface. **(b)** Comparison of CAs before and after impact of deionised water, acid (0.1 M HCl), alkali (0.1 M NaOH), salt (3.5 wt.% NaCl), tea and coffee on the superhydrophobic layer surface. **(c,d)** Resistance change of the inner self-powered sensor before (red) and after (blue) impact in the same 3 N compressive stress environment. **(e)** Schematic representation of the surface hydrophobicity of the outer layer after 2 h of continuous water impingement on the surface, 20 times manual twisting and bending.

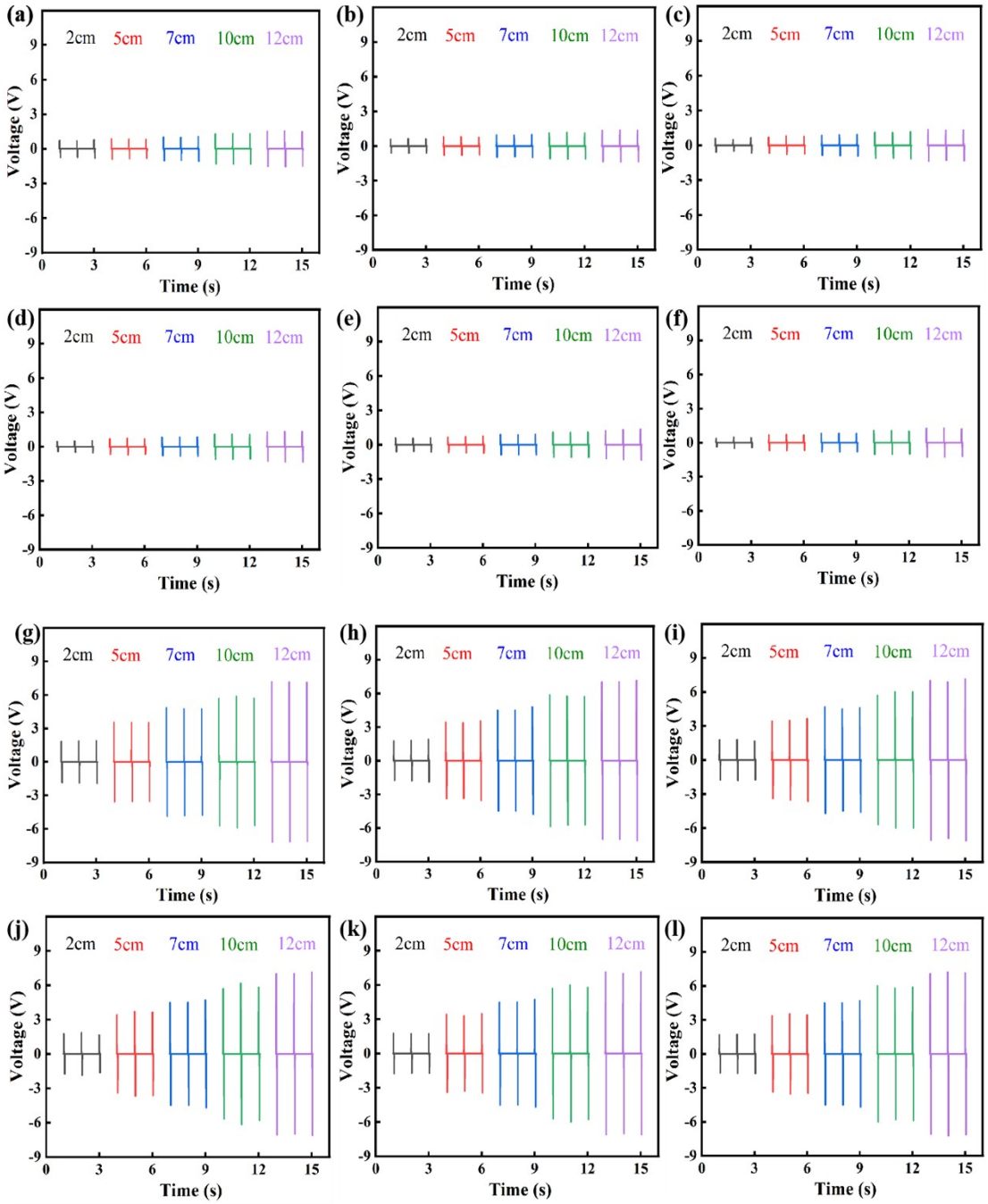

Fig. S7 Power generation stability of the superhydrophobic-coated ferromagnetic TENG in extreme environments. The electrical signals of (a-f) ferromagnetic TENG and (g-l) superhydrophobic-coated ferromagnetic TENG in deionised water, acid (0.1 M HCl), alkali (0.1 M NaOH), salt (3.5 wt.% NaCl), tea and coffee environments, respectively.

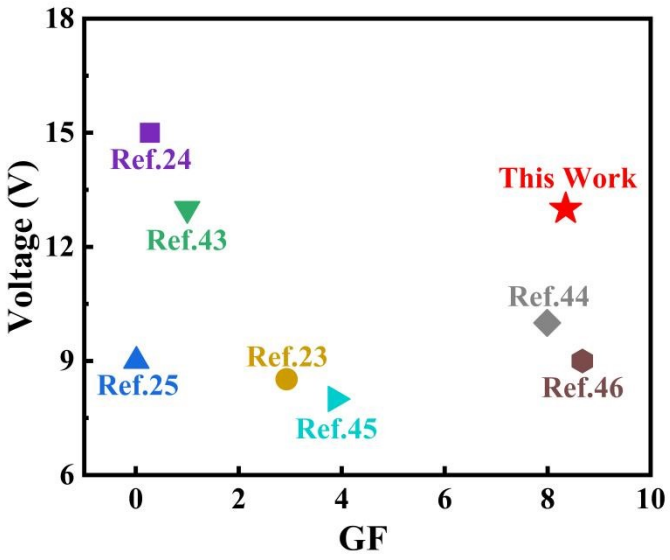

Fig. S8 Comprehensive performance comparison of self-powered wearable strain sensors in the same stress environment.

Supplementary Videos

Video S1: Rolling droplets on the superhydrophobic layer of ferromagnetic TENG surface.

Video S2: Self-cleaning process of superhydrophobic layer of ferromagnetic TENG surface and hydrophilic layer of bare steel surface.

Video S3: Contact and separation of electrodes of TENG lights up a set of LED bulbs.