Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Electronic Supplementary Information for:

A stretchable and adhesive composite hydrogel containing PEDOT: PSS for wide-range and precise motion sensing, electromagnetic interference shielding and triboelectric nanogenerator

Zixuan Zhou[a], Weizhong Yuan[a*] and Xiaoyun Xie[b*]

[a]*School of Materials Science and Engineering, Key Laboratory of Advanced Civil Materials of Ministry of Education, Tongji University, Shanghai, 201804, People's Republic of China.* E-mail address: yuanwz@tongji.edu.cn (W. Yuan)

[b]*Department of Interventional and Vascular surgery, Shanghai Tenth People's Hospital, School of Medicine, Tongji University, Shanghai 200072, People's Republic of China. E-mail address: xiaoyunxietj@126.com (X. Xie)*

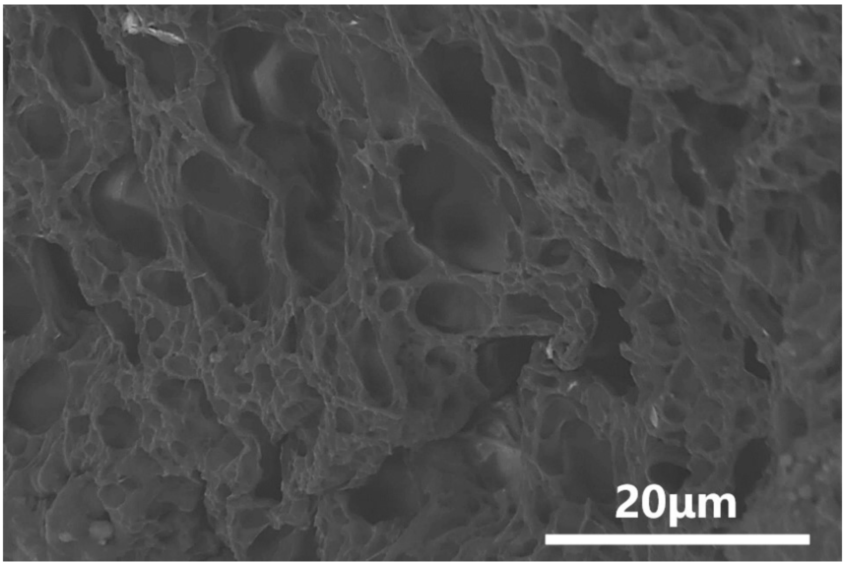

Fig. S1. SEM of the PVA/PAA-PEDOT: PSS-TA hydrogel.

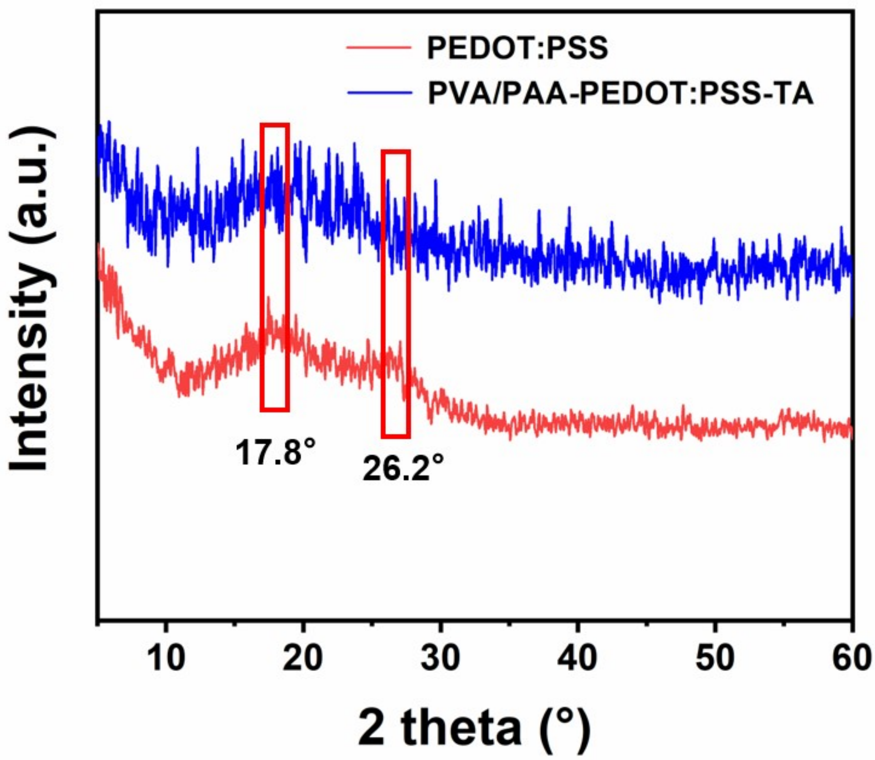

Fig. S2. XRD test of the PEDOT: PSS and PVA/PAA- PEDOT: PSS-TA hydrogel.

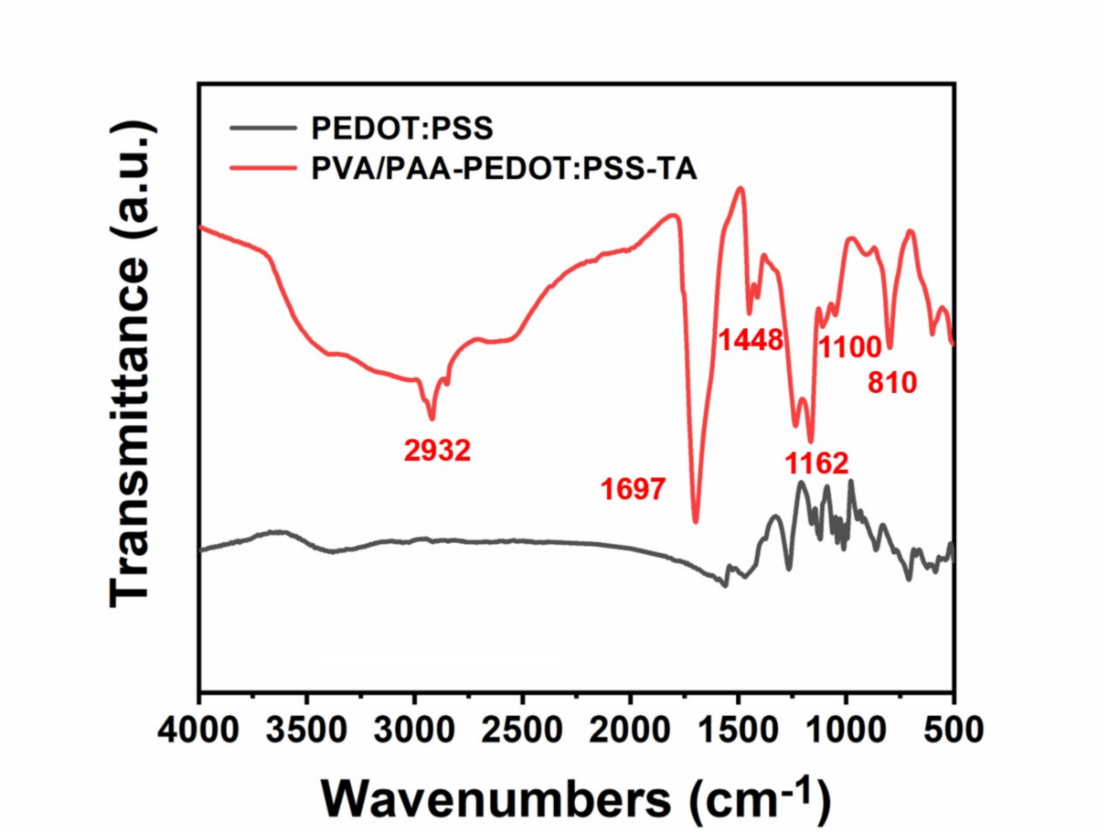

Fig. S3. ATR-FTIR of the PEDOT: PSS and PVA/PAA- PEDOT: PSS-TA hydrogel.

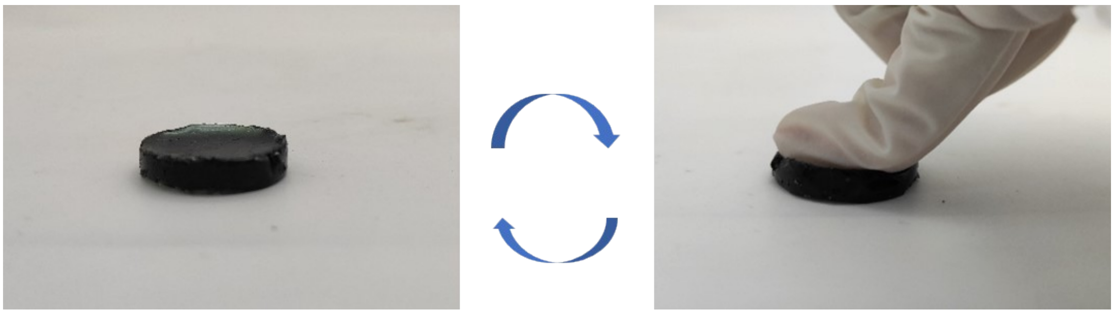

Fig. S4. The initial state of the PVA/PAA-PEDOT: PSS-TA hydrogel and the state after pressing.

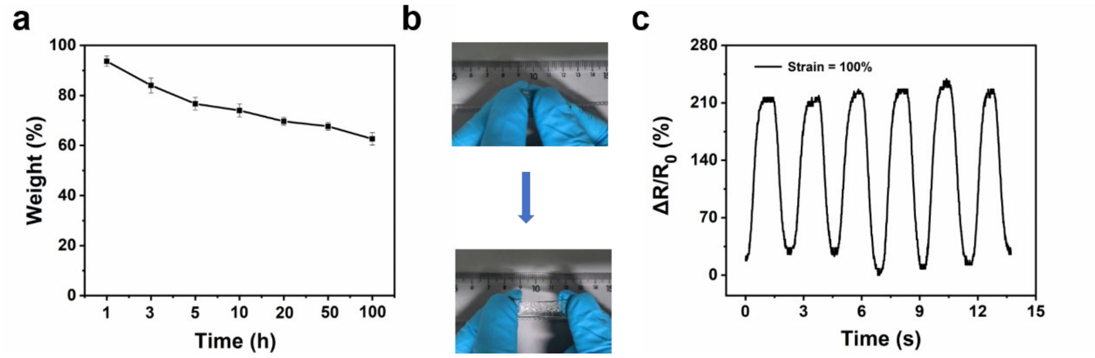

Fig. S5. (a)Weight change of PVA/PAA-PEDOT: PSS-TA hydrogel after being placed at room temperature for 100 h. (b) The stretching ability of the hydrogel after 100 h and (c) the relative resistance change when the strain was 100%.

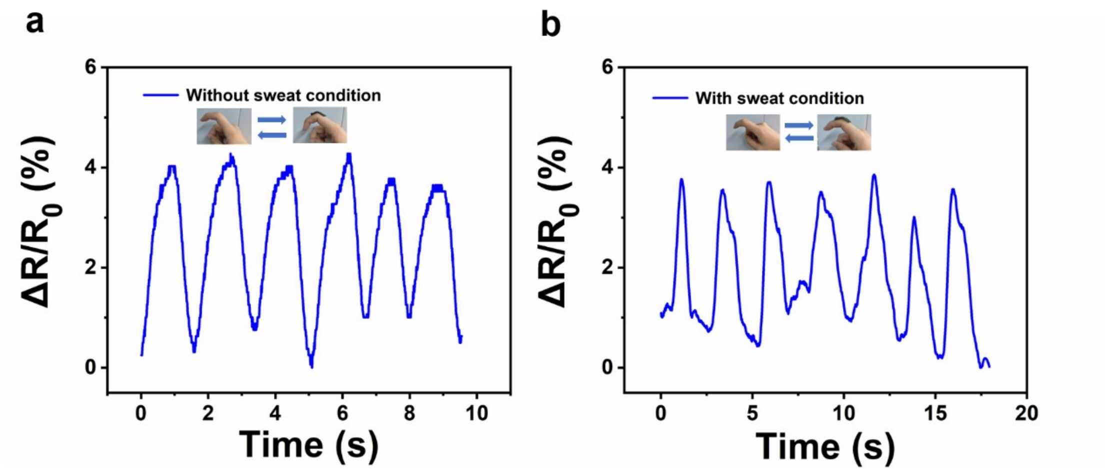

Fig. S6. PVA/PAA-PEDOT: PSS-TA hydrogel was placed on non-sweaty (a) and sweaty (b) fingers for sensing testing.

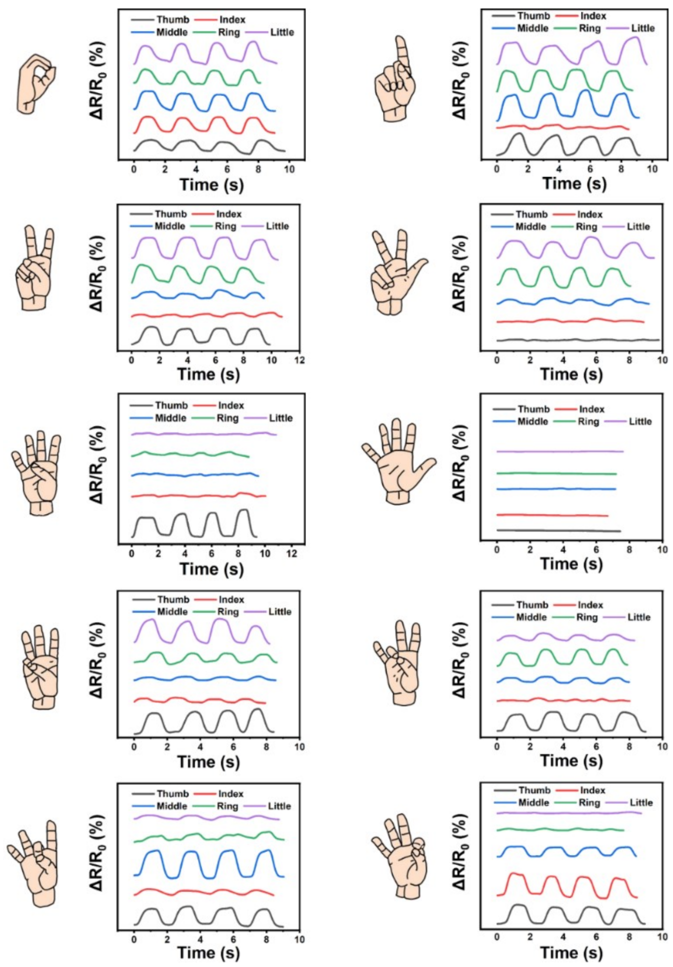

Fig. S7. The signal change of the PVA/PAA-PEDOT: PSS-TA hydrogel sensor attached on the different finger when performing 0-9 hand gestures.

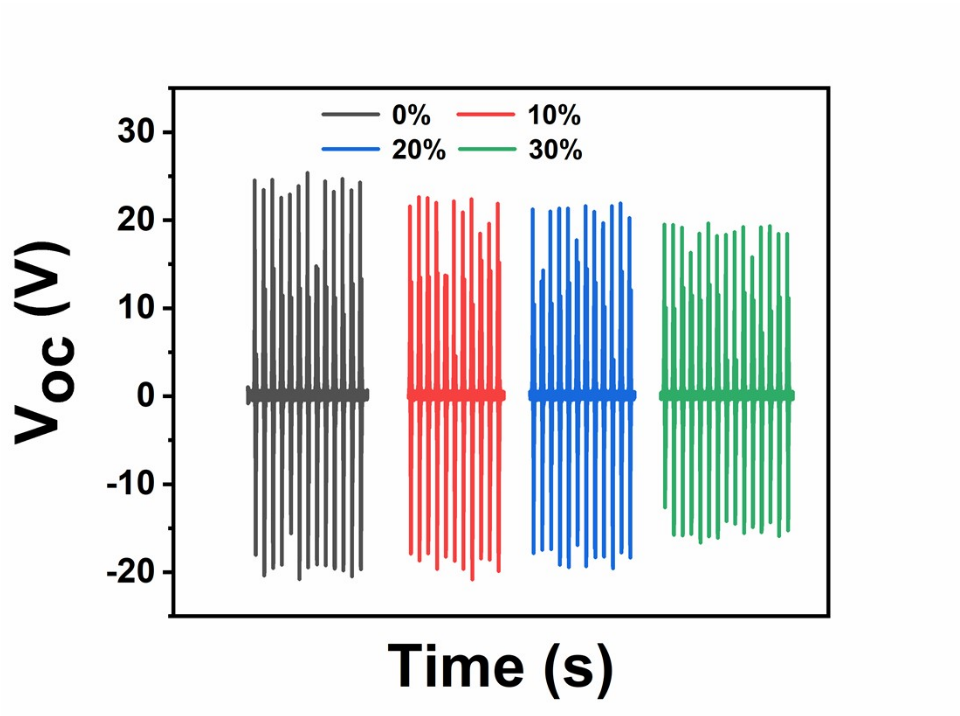

Fig. S8. Voltage signals generated by TENGs with different deformations.

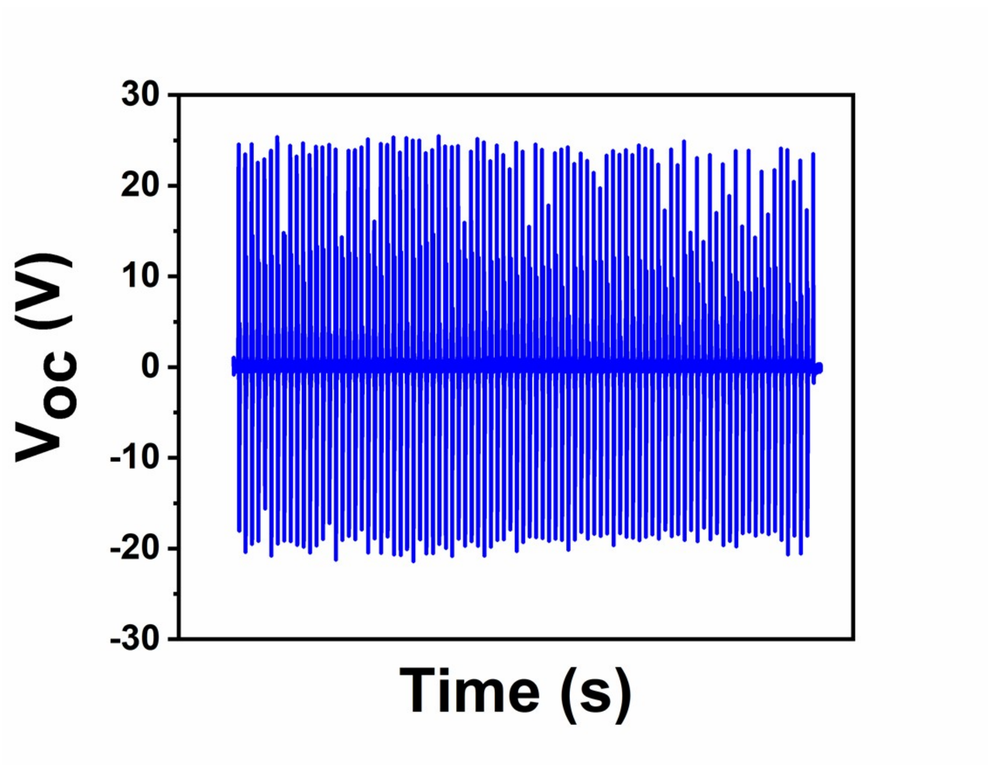

Fig. S9. Durability test of TENG under a repeated force of 30 N.

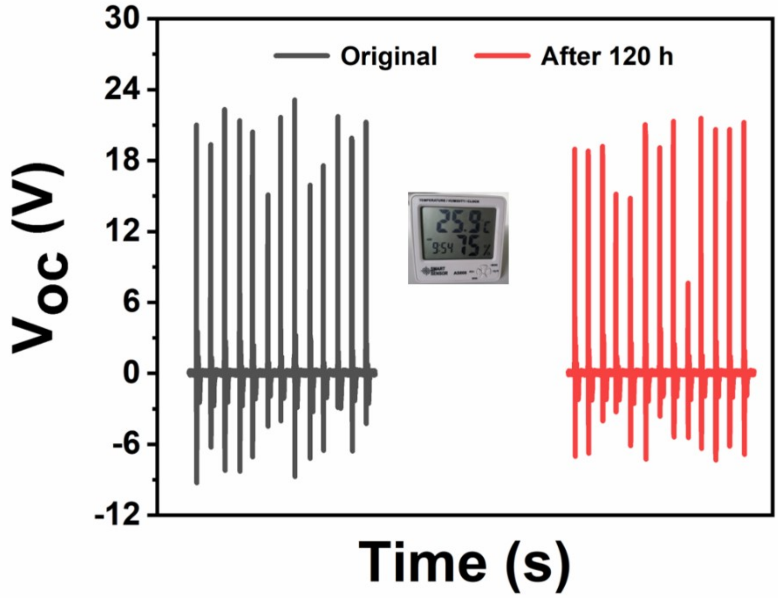

Fig. S10. The open circuit voltage (V_{oc}) generated by TENG against the skin before and after being placed in the environment of ~26℃ and 75% humidity for 120h.

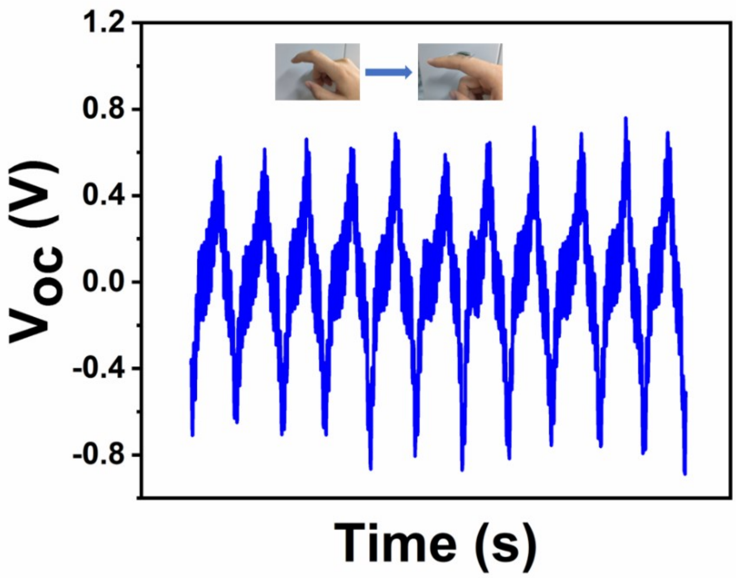

Fig. S11. The voltage output signal of the TENG placed on the flexed finger containing sweat.

Table S1 Comparison between this work and previously-reported gels-based sensors.

Materials	Maximal tensile strain (%)	Adhesion strength (kPa)	Ref.
PVA-FSWCNT-PDA	/	9.2	1
PAM/Fe^{3+}-TA@CNFs	~136	9.3	2
PVA/PSBMA	400	7.66	3
CNC@P(SBMA-*co*-AM)	1127	10.5	4
PVA-TA-EGaIn	233	2.2	5
This work	640	14.97	

References

[S1] M. H. Liao, P. B. Wan, J. R. Wen, M. Gong, X. X. Wu, Y. G. Wang, R. Shi and L. Q. Zhang, Wearable, Healable, and Adhesive Epidermal Sensors Assembled from Mussel-Inspired Conductive Hybrid Hydrogel Framework, *Adv. Funct. Mater.*, 2017, **27**, 1703852.

[S2] J. S. Lu, X. Han, L. Dai, C. Y. Li, J. F. Wang, Y. D. Zhong, F. X. Yu and C. L. Si, Conductive cellulose nanofibrils-reinforced hydrogels with synergetic strength, toughness, self-adhesion, flexibility and adjustable strain responsiveness, *Carbohydr. Polym.*, 2020, **250**, 117010.

[S3] Z. W. Wang, J. Chen, L. F. Wang, G. R. Gao, Y. Zhou, R. Wang, T. Xu, J. B. Yin and J. Fu, Flexible and wearable strain sensors based on tough and self-adhesive ion conducting hydrogels, *J. Mater. Chem. A*, 2019, **7**, 24-29.

[S4] B. W. Yang and W. Z. Yuan, Highly Stretchable, Adhesive, and Mechanical Zwitterionic Nanocomposite Hydrogel Biomimetic Skin, *ACS Appl. Mater. Interfaces*, 2019, **11**, 40620-40628.

[S5] Z. X. Zhou, C. H. Qian and W. Z. Yuan, Self-healing, anti-freezing, adhesive and remoldable hydrogel sensor with ion-liquid metal dual conductivity for biomimetic skin, *Compos. Sci. Technol.*, 2021, **203**, 108608.