Wireless Piezoelectric Device Based on Electrospun $PVDF/BaTiO_3$ NW Nanocomposite Fibers for Human Motion Monitoring

Wenzhe Guo [a], Cenxiao Tan [a], Kunming Shi [b], Junwen Li [c], Xiao-Xiong Wang [a], Bin Sun [a,b,*], Xingyi Huang [b,*], Yun-Ze Long [a,*], and Pingkai Jiang [b]

[a] *Collaborative Innovation Center for Nanomaterials & Devices,College of Physics, Qingdao University, Qingdao 266071, China*

[b] *Department of Polymer Science and Engineering, Shanghai Key Laboratory of Electrical Insulation and Thermal Aging, Shanghai Jiao Tong University, Shanghai 200240, China*

[c] *Joint Institute for Computational Sciences, University of Tennessee, Knoxville, TN 37996, United States*

* Email: qdusun@qdu.edu.cn, binsun@sjtu.edu.cn (B. Sun)

xyhuang@sjtu.edu.cn (X. Huang)

yunze.long@163.com (Y.Z. Long)

Keywords: Electrospinning; Nanocomposite fibers; Piezoelectricity; Wireless transmission; Human motion monitoring

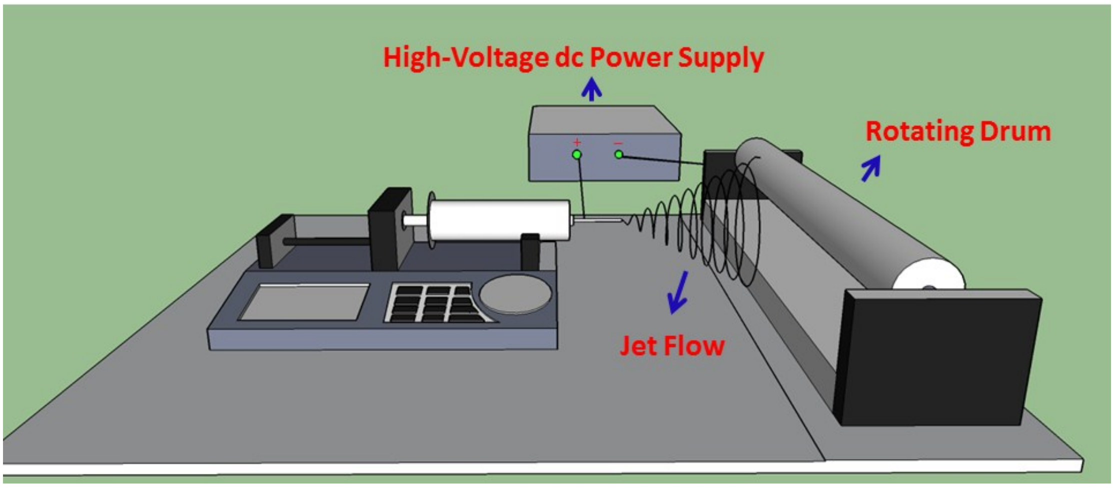

Fig. S1 Schematic of the apparatus for electrospinning

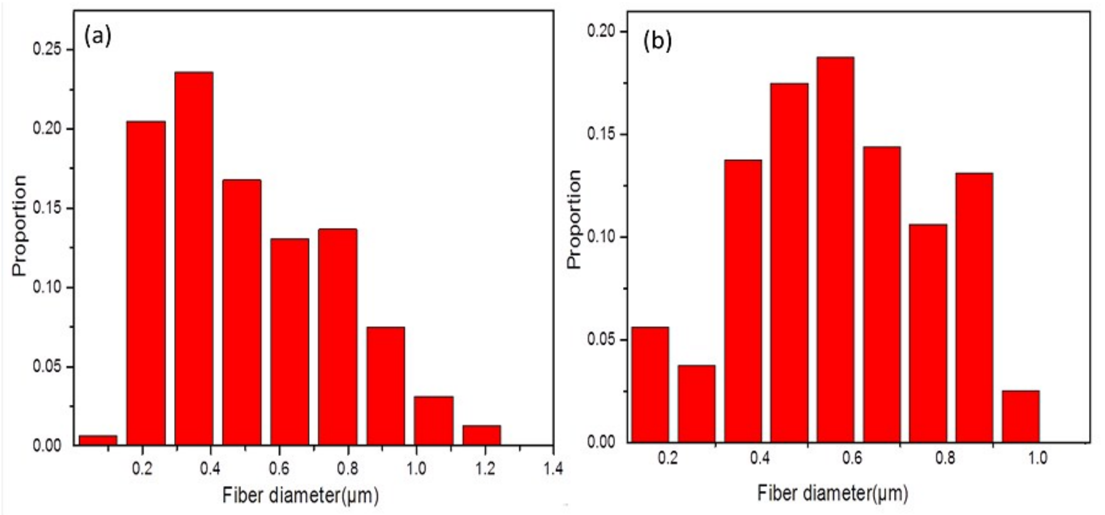

Fig. S2 Bar chart of the fiber size distributions of (a) pure PVDF fibers and (b) PVDF/$BaTiO_3$ NWs nanocomposite fibers.

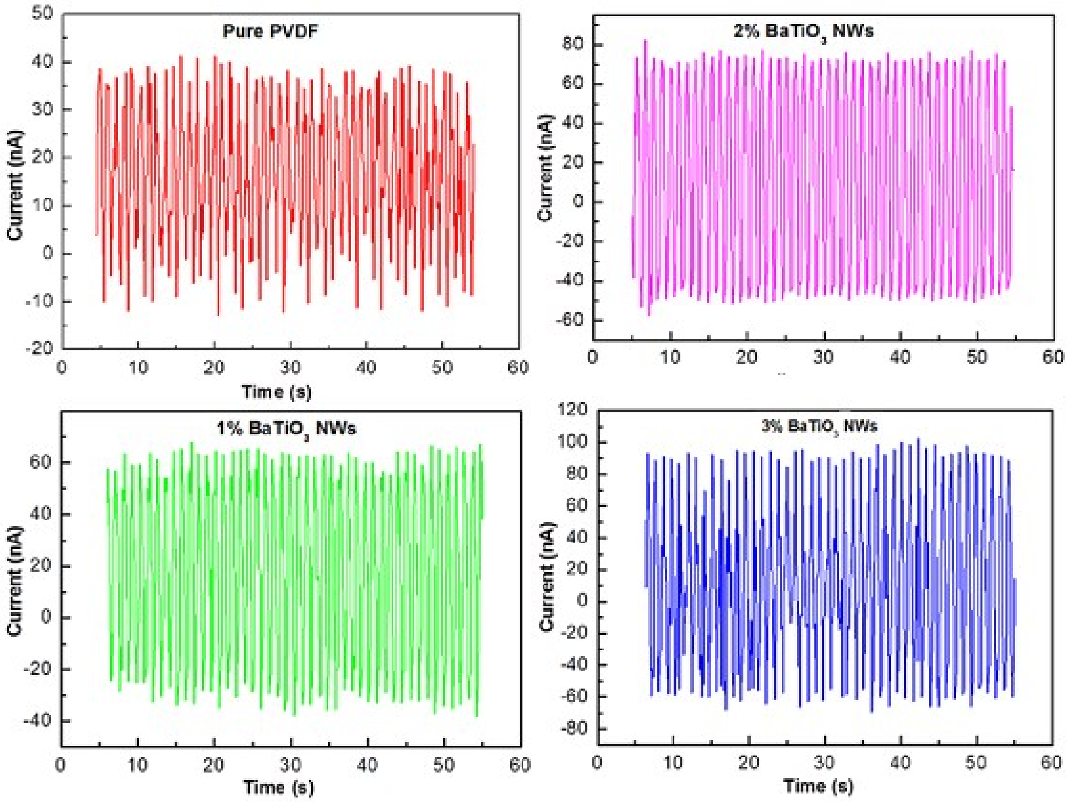

Fig. S3 Relationship between the output current and the content of $BaTiO_3$ NWs in the electrospun fibers. (The impact force is of 9 N and frequency of 3.5 Hz).

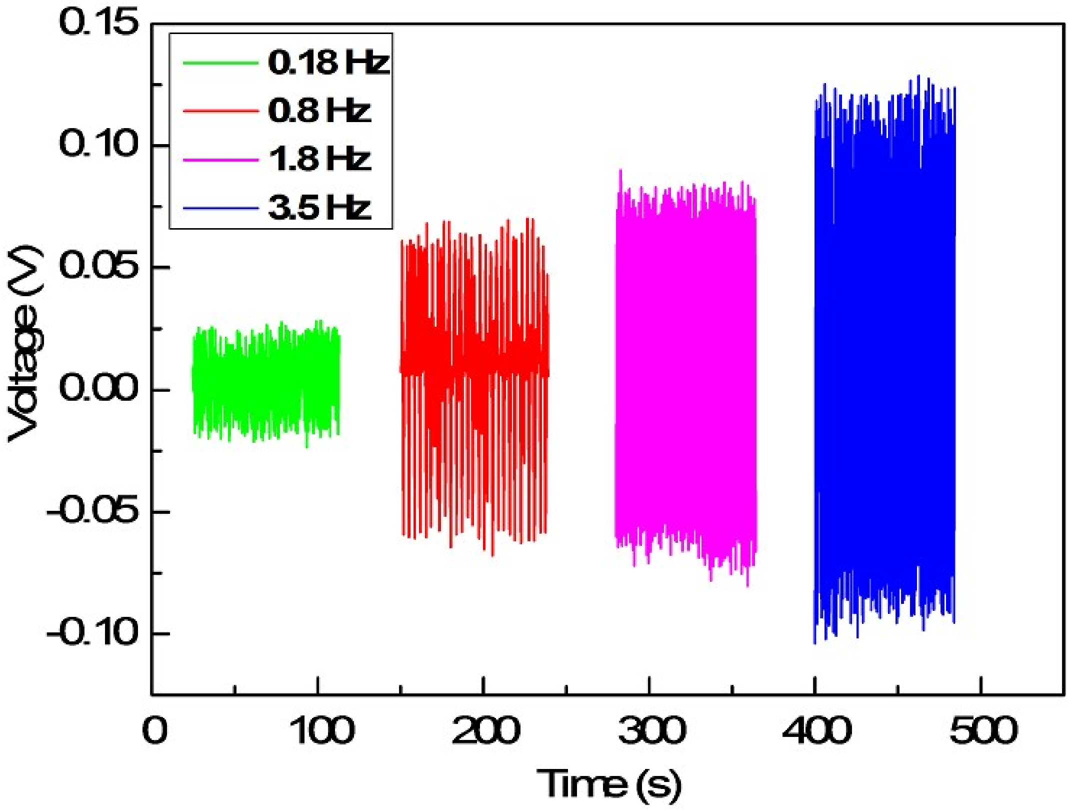

Fig. S4 Influence of impact frequency on the voltage of the as-spun fibers containing $BaTiO_3$ NWs of 3 wt.%. (The impact force is of 9 N)

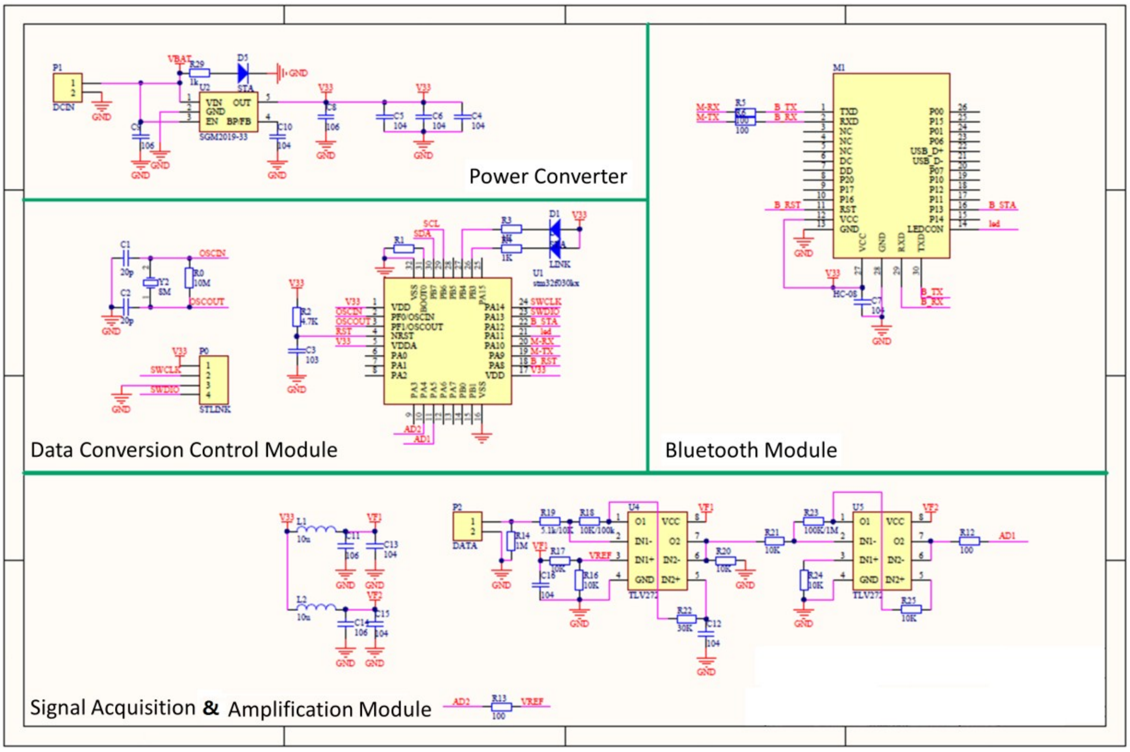

Fig. S5 Circuit diagram of the wireless integrated circuit system

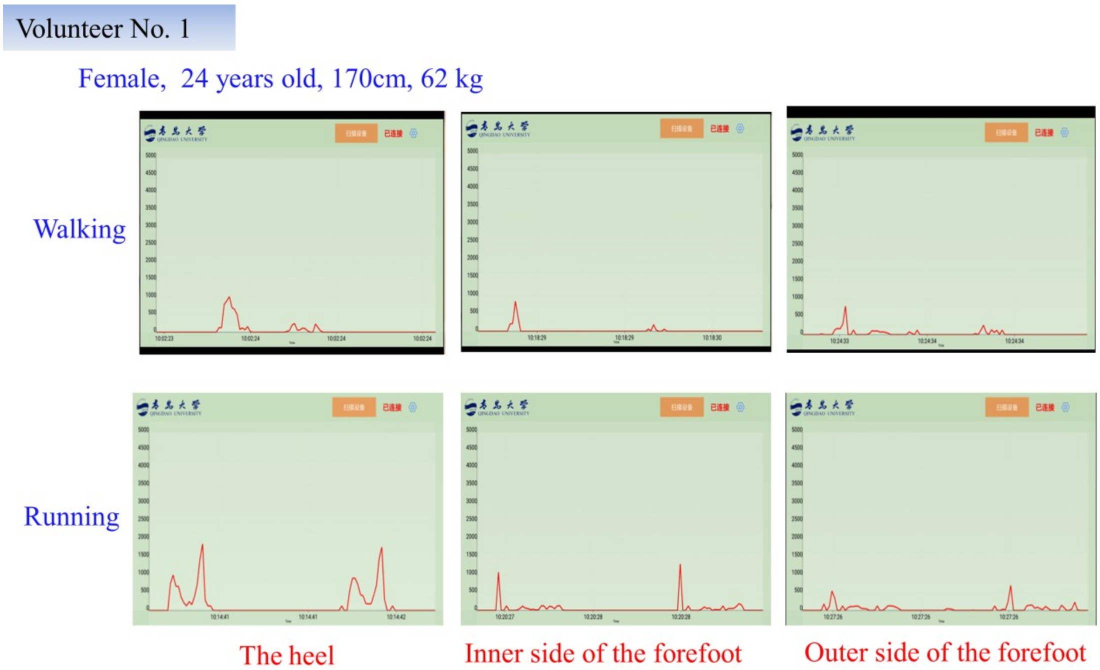

Fig. S6 Piezoelectric signals of volunteer No. 1. The part where the habitual abrasion occurs of their shoes is under the heel.

Fig. S7 Piezoelectric signals of volunteer No. 2. The part where the habitual abrasion occurs of their shoes is under inner side of the forefoot.

Fig. S8 Piezoelectric signals of volunteer No. 3. The part where the habitual abrasion occurs of their shoes is under the heel and outer side of the forefoot.

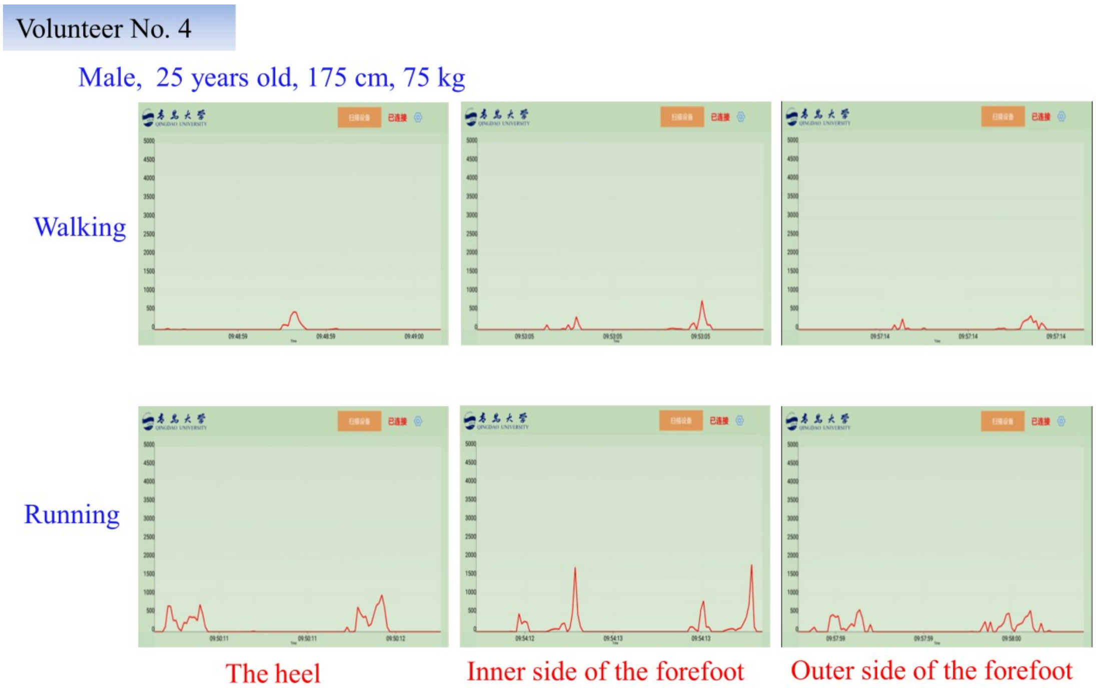

Fig. S9 Piezoelectric signals of volunteer No. 4. The part where the habitual abrasion occurs of their shoes is under inner side of the forefoot.

Table S1 Comparison between the wireless piezoelectric device with some other wireless sensors using mobile phone as receiver

Principle	**Active material**	**Active area**	**Output Current**	**Output Voltage**	**Additional polarization proces**	**Sensitivity**	**Response time**	**Transmitting distance**	**Ref.**
Piezoelectricity	Cotton threads/ CNTs/ PTFE	-	11.22 nA	-	Y	-	-	-	1
Piezoelectricity	PZT	3×4 cm^2	35 μA	200 V	Y	-	-	-	2
Piezoelectricity	PMN-PZT	1×1 cm^2	1.74 μA	17.8 V	Y	-	34 ms	5 m	3
Piezoelectricity	PPy@PVA-co-PE	0.75×25 cm^2	-	-	-	1.24 kPa^{-1}	-	-	4
Piezoelectricity	PZT	-	-	1.85 V	Y	0.018 kPa^{-1}	60 ms	-	5
Piezoelectricity + triboelectricity	Silk fibroin/PVDF	2×4 cm^2	12 μA	500 V	N	-	-	-	6
Piezoelectricity	$BaTiO_3$ NWs/PVDF	3.5 × 3.5 cm^2	105.69 nA	0.128 V	N	0.017 kPa^{-1}	290 ms	8 m	This work

[- present not given].

Abbreviations: CNT, Carbon nanotube; PTFE, Polytetrafluoroethylene; Y, Yes; N, No; PZT, $Pb(Zr_x,Ti_{1-x})O_3$; PMN-PZT, $(1-x)Pb(Mg_{1/3}Nb_{2/3})O_3$-$(x)Pb(Zr,Ti)O_3$; PPy, Polypyrrole; PVA-co-PE, Poly(vinyl alcohol-co-ethylene); PVDF, Poly(vinylidene fluoride); MWCNTs, Multiwalled carbon nanotubes; PANI, polyaniline.

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