Flexible pressure sensor for continuous measurement of human arterial pulse wave

Keyu Meng*, Jin Yang*

*Department of Optoelectronic Engineering, Chongqing University, Chongqing 400044, P. R. China.
*Email: yangjin@cqu.edu.cn
*Email: 20150802002t@cqu.edu.cn

Real-time heath monitoring and assessment is becoming more and more critical and indispensable, which largely contributes to the advancement of the field of wearable electronics for biomedical applications[1,2]. Pulse wave carries comprehensive information regarding human cardiovascular system, which is highly correlated to various physiological diseases related to heart. To measure the subtle changes in the pulse wave, various novel materials and nanotechnologies are applied to develop wearable sensors over the past decades, including piezoelectric materials, metal nanowires, and conductive fibers. However, the above mentioned wearable sensors are incapable of measuring the distinguishable arterial pulse wave owing to the insufficient sensitivity. Here, we reported a self-powered TENG based pressure sensor (as shown in Figure 1) for continuous measurement of human arterial pulse wave in a noninvasive real-time manner, as shown in Figure 2. Additionally, a further step was taken to develop a cost-effective, wearable, user-friendly sensor system. Via a system-level optimization, all the system components can collaboratively work together for continuous and noninvasive human health assessment and monitoring.

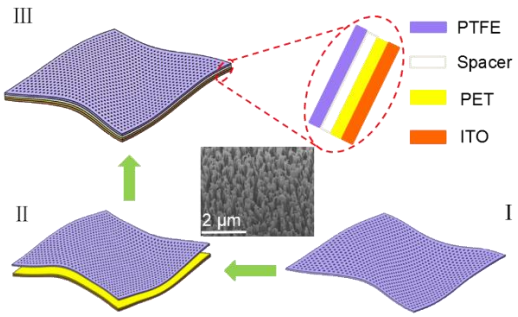

Figure 1. The fabrication of TENG based pressure sensor for human health monitoring. Schematic diagram illustrating the pressure sensor. Inset view is a SEM image of surface-etched PTFE nanowires. The scale bar is 5μm.

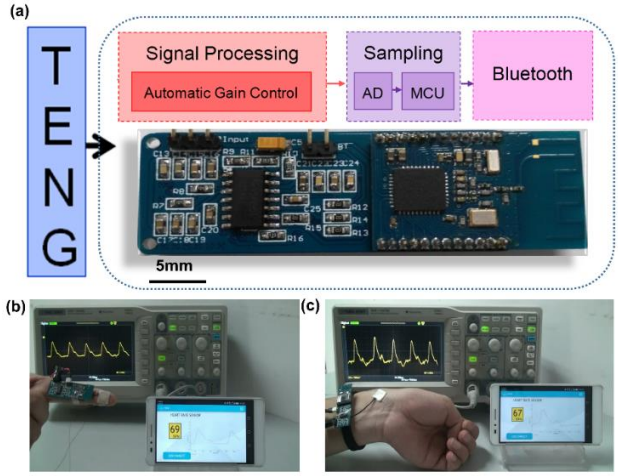

Figure 2. (a) A schematic diagram of the signal management circuit. Photographs showing the low power consumption sensor system is worn against (b), human finger (c), wrist for real-time pulse wave measurement. And the real-time data can be received and display on mobile phone APP and oscilloscope simultaneously.

References

[1] Fang, Y. et al. A highly shape-adaptive, stretchable design based on conductive liquid for energy harvesting and self-powered biomechanical monitoring. Science Advances. Vol. 2, No. 6, pp. e1501624, 2016.

[2] Lai, Y.; Deng, J.; Zhang, S.; Niu, S.; Guo, H. & Wang, Z. Single-Thread-Based Wearable and Highly Stretchable Triboelectric Nanogenerators and Their Applications in Cloth-Based Self-Powered Human-Interactive and Biomedical Sensing. Advanced Function Material. Vol. 27, pp. 1604462, 2017.