# Self-powered pulse sensor for antidiastole of cardiovascular disease

With the support by the National Natural Science Foundation of China, a collaborative study by the research groups led by Prof. Li Zhou (**李舟**) and Prof. Wang Zhonglin (**王中林**) from Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, in cooperation with cardiologists, Prof. Fan Yifan (**范一帆**) and Prof. Sun Guanglong (**孙广龙**) from Chaoyang and Anzhen Hospitals have presented a self-powered ultrasensitive pulse sensor (SUPS) for antidiastole of cardiovascular disease, which was published in *Advanced Materials* (2017, 29: 1703456).

Despite being the leading cause of death worldwide, most cardiovascular diseases could be prevented by physiological monitoring over time by wearable devices. The optimum operational requirements for such devices are stability, ultralow power consumption, and high-sensitivity. In addition, they should be suitable for a long-term use and be patient friendly, such as low weight and miniature design. The currently used cardiac cycle and heart rate monitoring technologies include photoplethysmography (PPG) and Piezoelectric Pulse Transducer (PPT). However, PPG measures the cardiac pressure pulses by detecting changes in light absorption of the dermis and subcutaneous tissue, and this system has high energy consumption and is highly sensitive to body movement and ambient light, making a diagnosis based solely on it very difficult.

Li & Wang's group presented a self-powered ultrasensitive pulse sensor (SUPS) based on triboelectric nanogenerator (TENG). Structured to a specific design and made by selected polymer material and metal material with nano-interface, the SUPS can produce impressive electrical outputs and exhibit high peak signal-noise ratios. By integrating with a bluetooth chip, the SUPS provides accurate, wireless and real-time monitoring of pulse signals of the cardiovascular system on a smart phone/PC. In addition, when applying the SUPS to diagnosis of cardiovascular disease, antidiastole of coronary heart disease, atrial septal defect and atrial fibrillation was made, and the arrhythmia (atrial fibrillation) was indicatively diagnosed from health by characteristic exponent analysis, showing its feasibility as a mobile diagnosis system for cardiovascular diseases.

This groundbreaking device is expected to be applied in on-line monitoring, intelligent mobile diagnosis and prevention of various cardiovascular diseases.

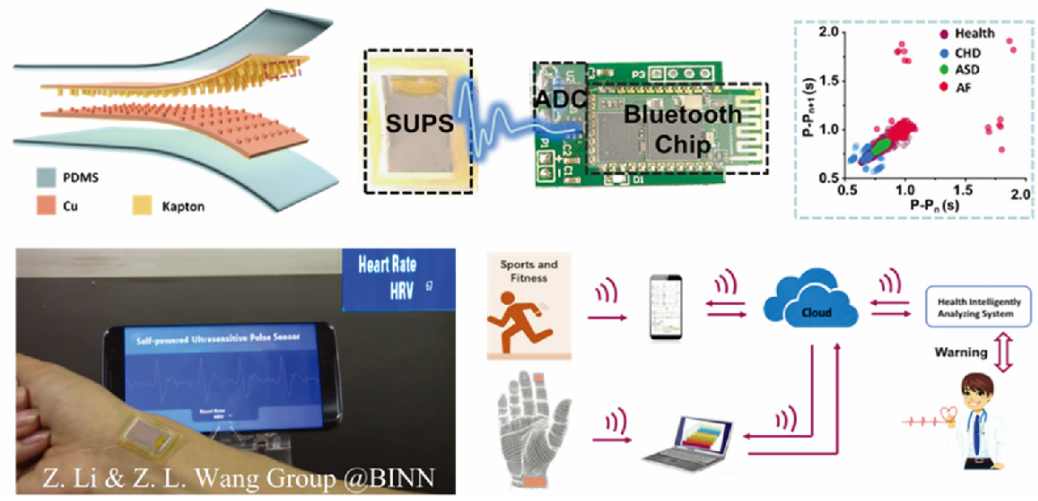


**Figure** Schematic diagram of SUPS and intelligent mobile monitoring system based on the SUPS. The comparison of Poincare plot for antidiastole between healthy and cardiovascular diseases.