Supplementary Materials for

A Nanogenerator-Type Tactile Sensor towards Texture and Sliding Motion

Sensation

Zhipeng Liao, [a] Weihua Liu,[*a] You Wu, [a] Chen Zhang, [a] Yan Zhang,[b,c] Xiaoli Wang,[a] Xin Li[a]

[a]Department of Microelectronics, School of Electronics and Information Engineering,

Xi'an Jiaotong University, Xi'an 710049, China, E-mail: lwhua@mail.xjtu.edu.cn;

[b]Beijing Institute of Nanoenergy and Nanosystems,   Chinese Academy of Sciences,

[c]Beijing 100083, China; Institute of Theoretical Physics, and Key Laboratory for

Magnetism and Magnetic Materials of MOE, Lanzhou University, Lanzhou 730000,

China

How to determine the acceleration of the sliding motion

The frequency was determined by the reciprocal of the pulse width. The time of

peaks was sampled from the positive peak point. We calculate the first 10 pulses in
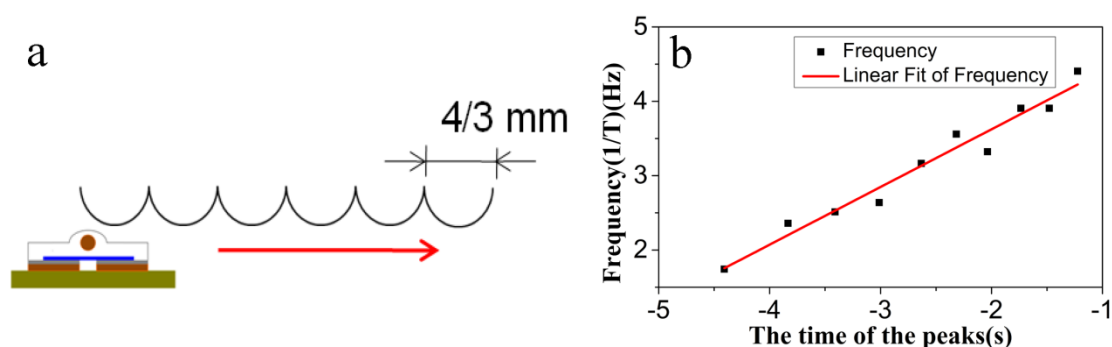
the acceleration phase.

Figure S1. (a) Schematic of the ribbon wire test. (b) The frequency (1/T) versus the

time of the peaks.

We calculated the acceleration by the follow formula:

$$T = \frac{L}{V},$$

$$f = \frac{1}{T} = \frac{V}{L} = \frac{V_0}{L} + \frac{Acc}{L} \times t,$$

Hence
$$Acc = L \times \frac{df}{dt}$$

Where T is the period of a single pulse as shown in Figure 4c，L is the pitch of the ribbon wire，V is the scanning velocity, f is pulse repeat frequency, which equals the reciprocal of T; Acc is the acceleration. We derived the frequency from the pulses as shown in Figure 3c. $\frac{df}{dt}$ is derived from the slope of the linear fitting shown in Figure S1 b.

$$\frac{df}{dt} = 0.77565,$$

$$Acc = 1.034 mm/S^2,$$

$$Relative\ error = \frac{|1.034 - 1|}{1} \times 100\% = 3.4\%.$$

Control experiment:

The control experiment of a device without artificial finger-print: We fabricated a device without artificial finger print. There is no observable electric pulse output by the device as it sliding on a ribbon wire. Figure S2 shows the test result.
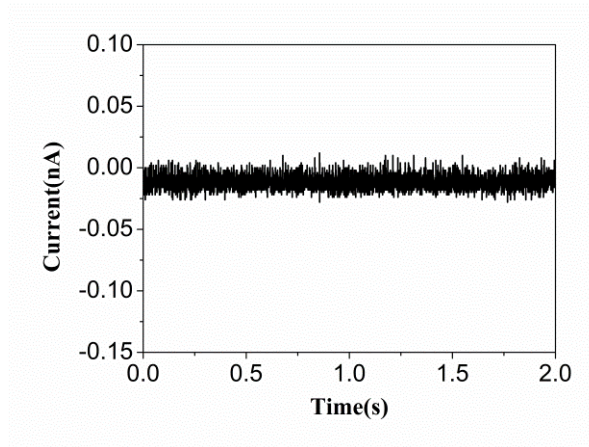
Figure S2. Ribbon wire texture detecting result with a device without artificial finger-

print.

Piezovoltage Measurement:

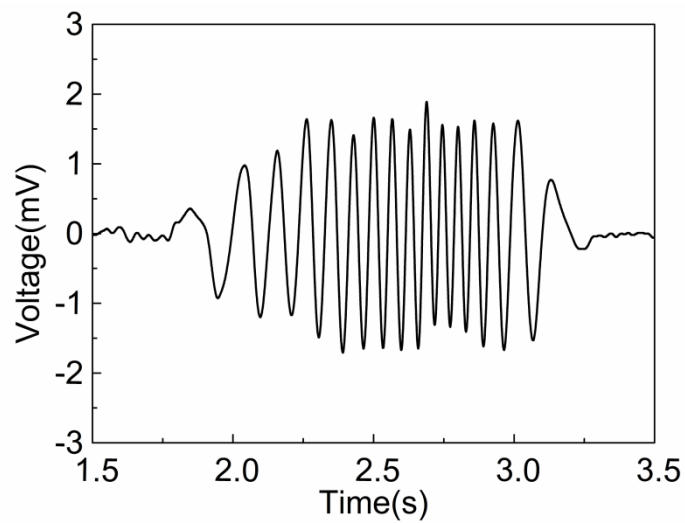The piezovoltage signal output by the device in a ribbon wire test.

Figure S3. The piezovoltage pulses output by the device in a ribbon wire texture

detecting test. The scanning range is set as 20 mm. The acceleration is set at 30

mm/S^2 and the maximum velocity is set at 15 mm/S.