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Supporting Information

Temperature and pressure sensitive ionic conductive elastomer for respiratory monitoring and human motion sensing

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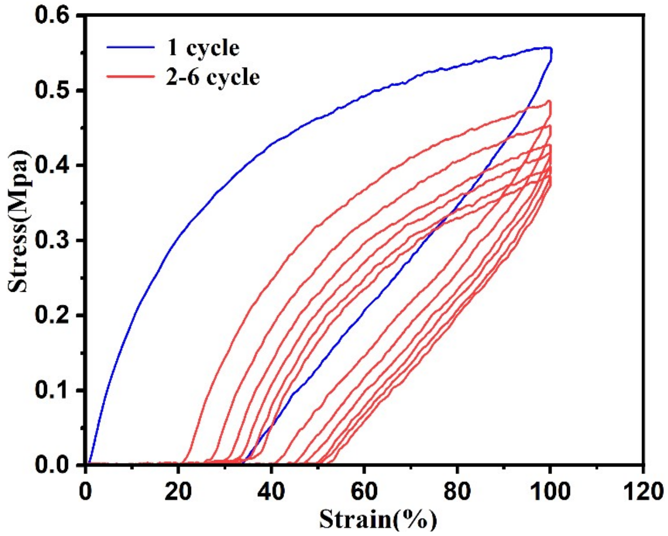

Figure S1. Consecutive cyclic tensile curves of PU/LiTFSI-3 at a strain of 100%

Cyclic tensile tests of PU/LiTFSI-3 as the optimal mechanical properties were performed to evaluate the self-recoverability of PU/LiTFSI-3 at a constant loading/unloading rate of 50 mm min^{-1}. In addition, seven successive loading-unloading cycles tests were performed to further evaluate the self-resilience of PU/LiTFSI-3 at a strain of 100% (Figure S1). The cyclic curves displayed a pronounced hysteresis and a 34.2% residual strain. The first cycle displayed the larger hysteresis loop and the hysteresis area of the following 2-6 cycles decreased remarkably, which could be attributed to the partially unrecovered dissociated dynamic bonds from the first cycle. This time-dependent self-recovery property mainly depended on the reversible dissociation/reassociation of B-O bonds and S-S bonds in the dynamic hard domains.

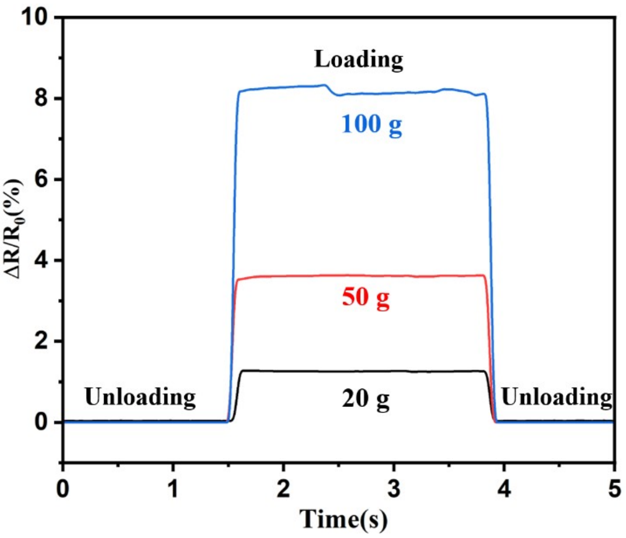

Figure S2. The relative resistance for different weights loaded on the surface of sensor

The pressure sensing data has been supplemented in Figure S2, and different weights were loaded on the surface of sensor. It can produce the obvious changes of relative resistance, for example, the relative resistance change was 8.29% with a load of 100 g.

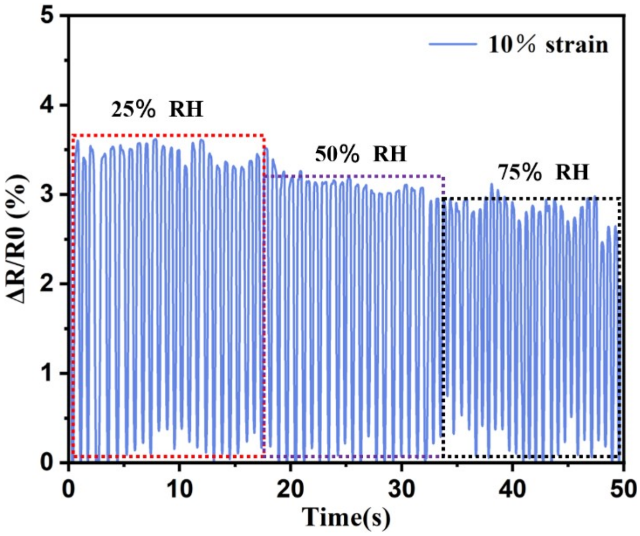

Figure S3. The relative resistance under different humidity conditions

In order to test the relative resistance changes of sensor under different humidity conditions, the relative resistance changes of sensor were tested at 25%, 50% and 75% relative humidity (RH) at a periodic strain of 10% (Figure S3). The relative resistance value decreased by only 0.5%, indicating that humidity exhibited negligible effect to respiratory sensing.

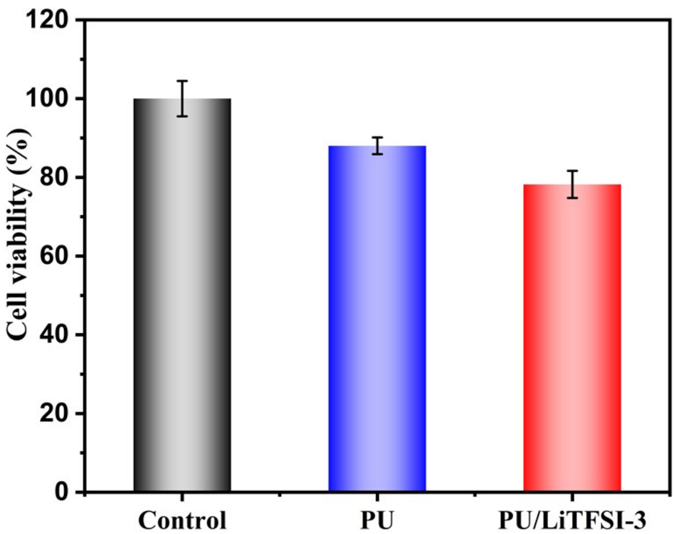

Figure S4. Cell viability of HaCut cells after 24 h of incubation with the elastomer.

HaCut epithelial cells were cultured to measure the cytotoxicity of elastomer sensor. HaCut cells were implanted into the 48-well plate in the form of 1.5×10^5 cells per well. Then PU and PU/LiTFSI-3 were added to the medium when HaCut cells were attached to the wall of the 96-well plate. Each sample was placed in three holes. Finally, MTT method was used to detect the proliferation of cells after 24 hours.

Cytotoxicity is a crucial indicator to assess the biocompatibility of conductive elastomer. Thus, the cytotoxicity of PU/LiTFSI-3 elastomer was evaluated. As shown in Figure S4, the cell viability of PU/LiTFSI-3 elastomer maintained above 75%, suggesting that PU/LiTFSI-3 elastomer had low cytotoxicity.

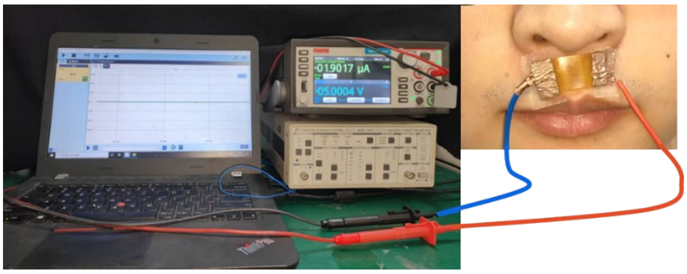

Figure S5. The sensor was placed to monitor breathing under the nose

The ionic conductive elastomer was prepared into a 1 cm × 3 cm sensor and placed to monitor the respiratory rate under the nose after different exercises. At the same time, the prepared sensor was attached to the finger and other parts for human movement monitoring. Resistance data was collected via a digital source meter (Keithley 2450) in Figure S5.

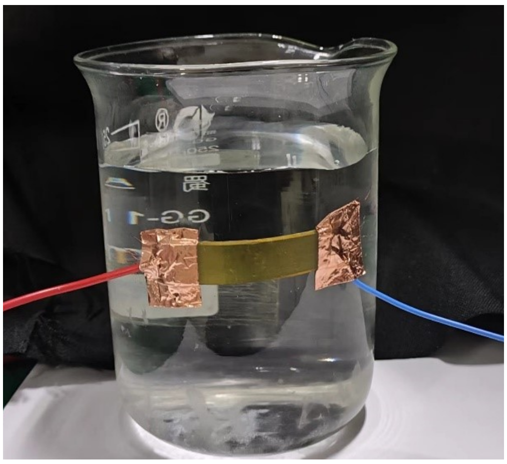

Figure S6. The sensor was placed to monitor the changes of relative resistance on the beaker wall