Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supplementary Information

A Self-Powered Electronic-Skin for Real-Time Perspiration Analysis and Application in Motion State Monitoring

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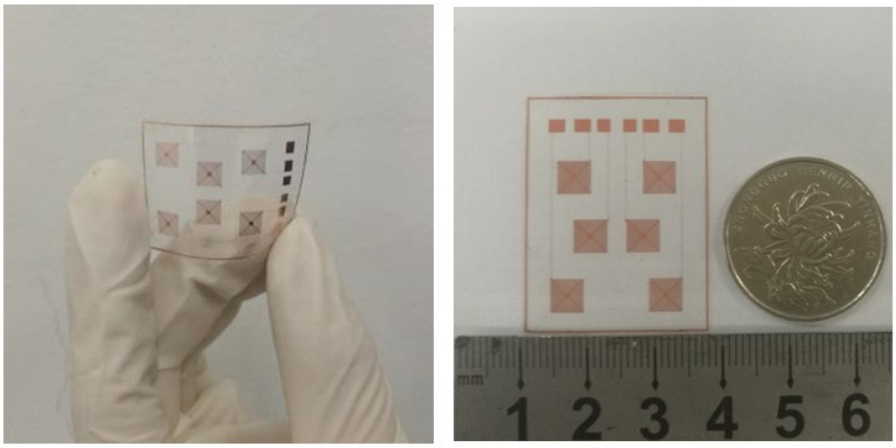

Fig. S1 Optical pictures of e-skin (without back electrode).

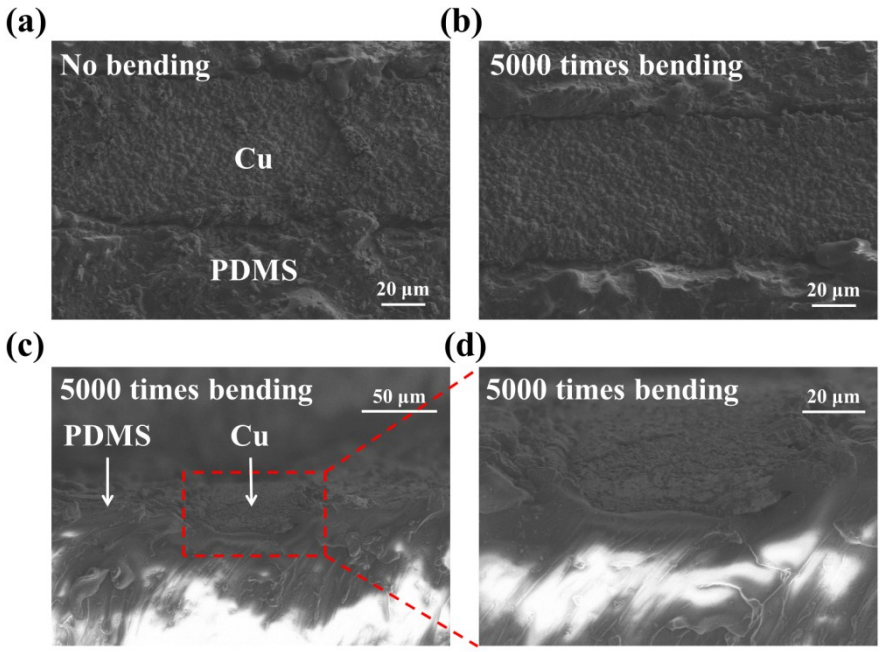

Fig. S2 SEM images of the border between Cu electrode and PDMS (a) and after 5000 times bending (b). (c) Sectional view of the border of Cu electrode and PDMS. (d) Enlarged view of the border of Cu electrode and PDMS.

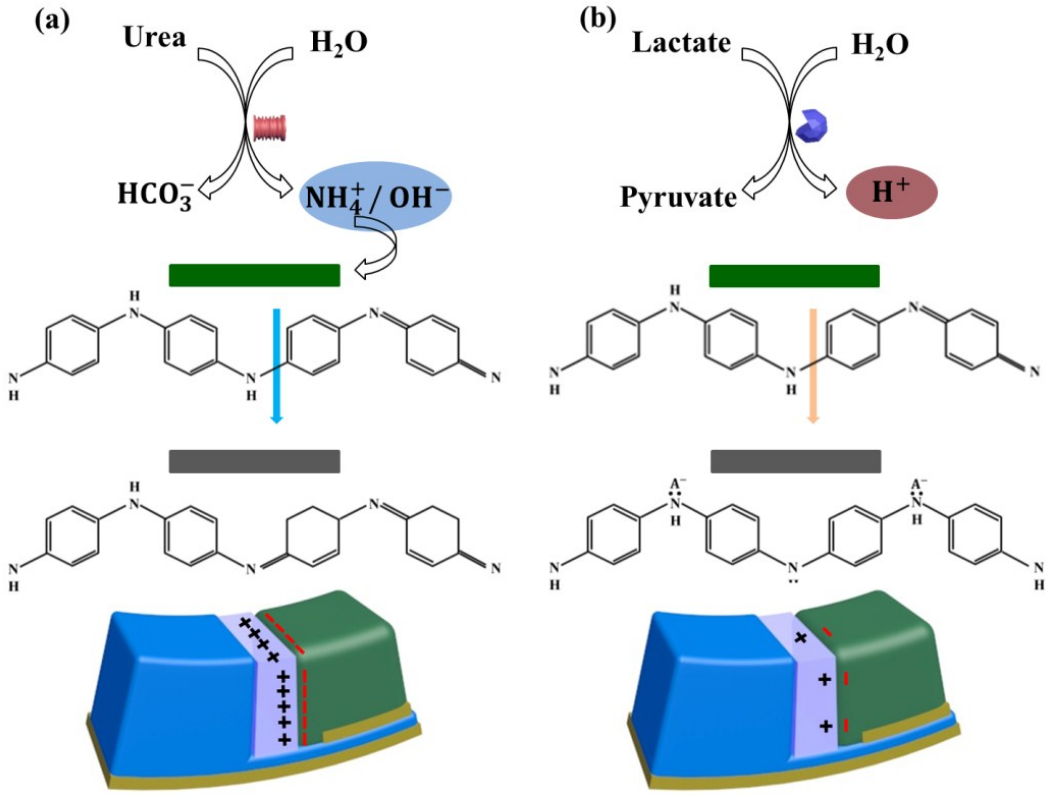

Fig. S3 (a) Primary material and structure of the electronic-skin. (b) Process of the enzymatic reaction. (c) The triboelectrification and urea biosensing coupling effect. (d) The triboelectrification and lactate biosensing coupling effect.

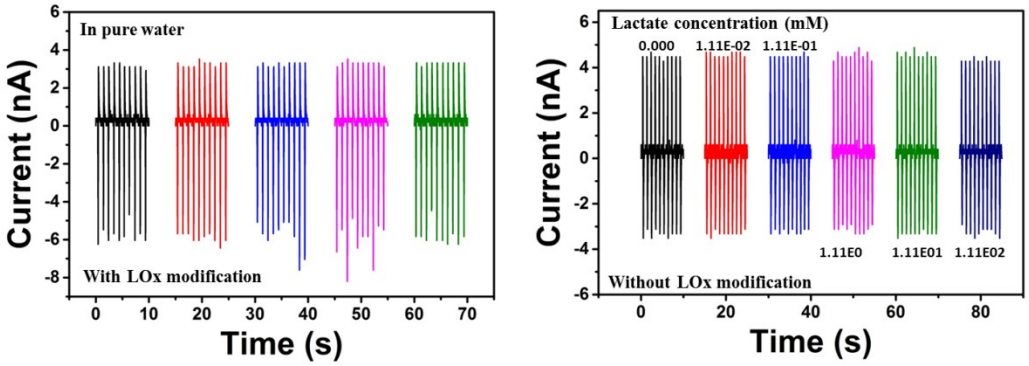

Fig. S4 The outputting triboelectric current of lactate biosensing unit with LOx modification against different volumes of pure water and lactate biosensing unit without LOx modification against different concentrations lactate solution.

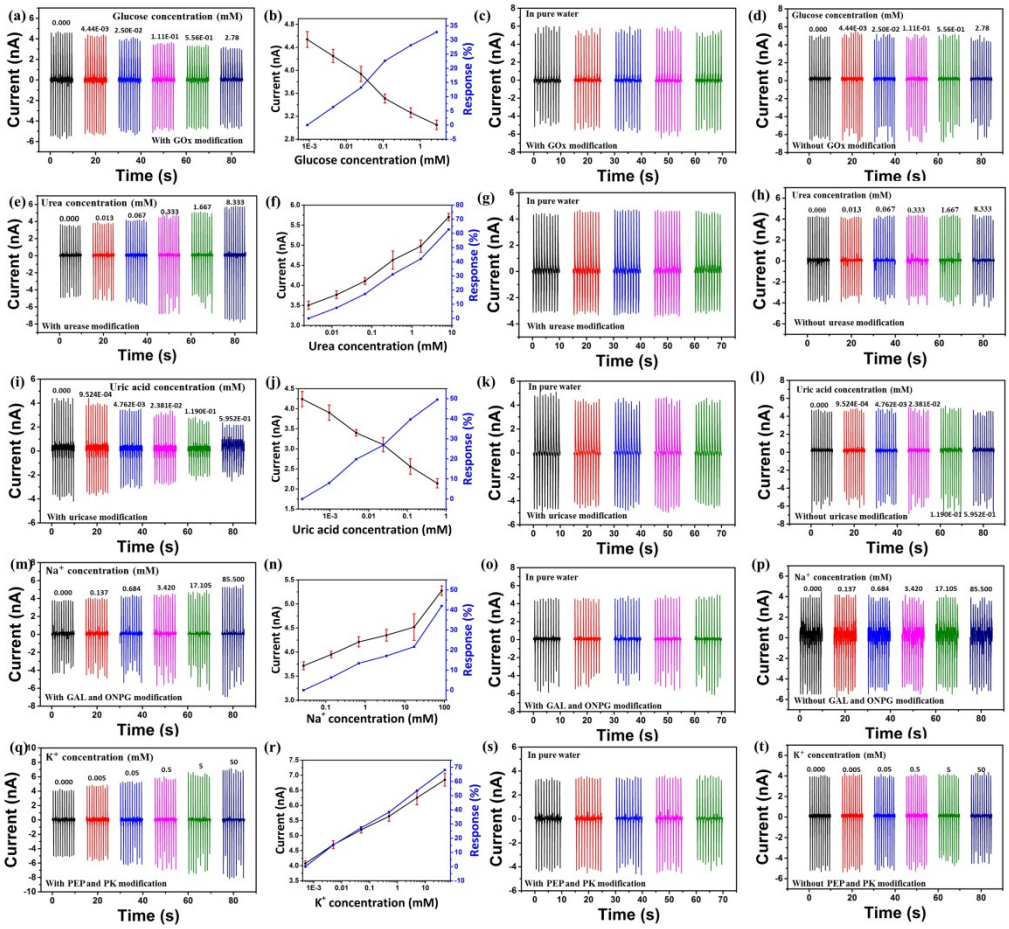

Fig. S5 (a, b) The outputting current signal and response of glucose biosensing unit with the concentration of glucose solution from 0 to 2.780 mM. (c, d) The control experiments results of the glucose biosensing unit. (e, f) The outputting current signal and response of urea biosensing unit with the concentration of lactate solution from 0 to 8.333 mM. (g, h) The control experiments results of the urea biosensing unit. (i, j) The outputting current signal and response of uric acid biosensing unit with the concentration of uric acid solution from 0 to 0.5952 mM. (k, l) The control experiments results of the uric acid biosensing unit. (m, n) The outputting current signal and response of Na^+ biosensing unit with the concentration of NaCl solution from 0 to 85.500 mM. (o, p) The control experiments results of Na^+ biosensing unit. (q, r) The outputting current signal and response of K^+ biosensing unit with the concentration of KCl solution from 0 to 50 mM. (s, t) The control experiments results of K^+ biosensing unit.

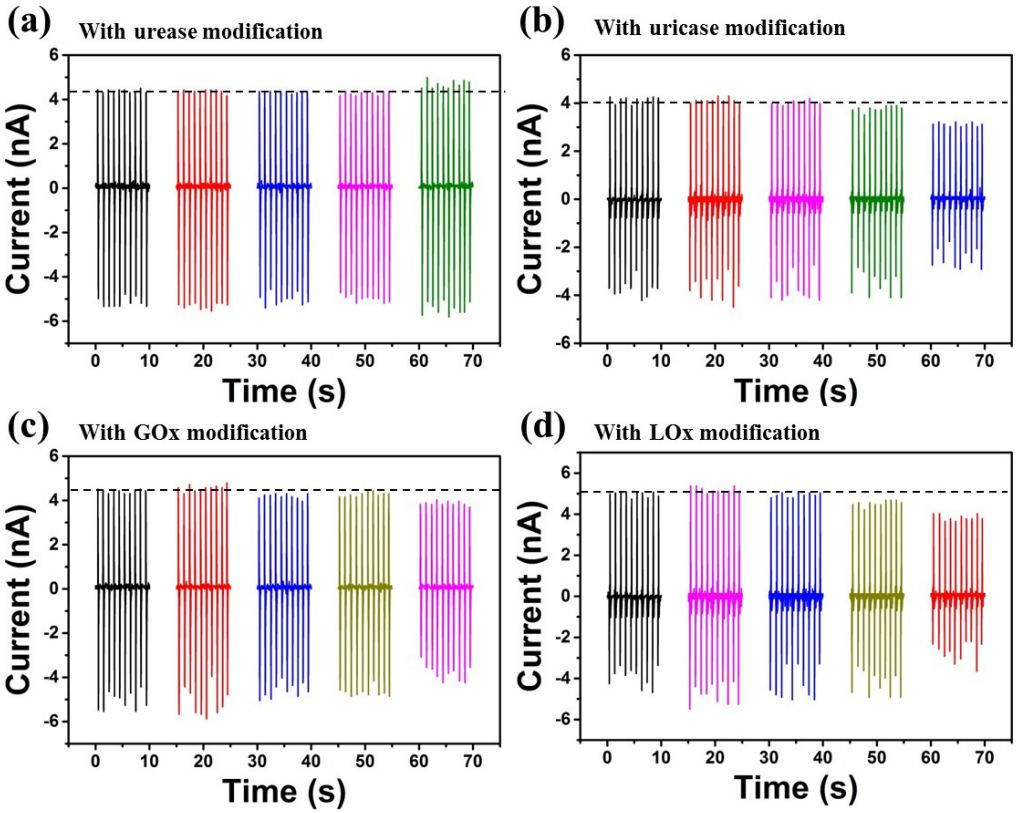

Fig. S6 (a) The outputting current signal of urea biosensing unit against pure water, 111 μM lactate, 25 μM glucose, 60 μM urea and 29 μM uric acid. (b-d) The outputting current signal of uric acid, glucose and lactate biosensing units.

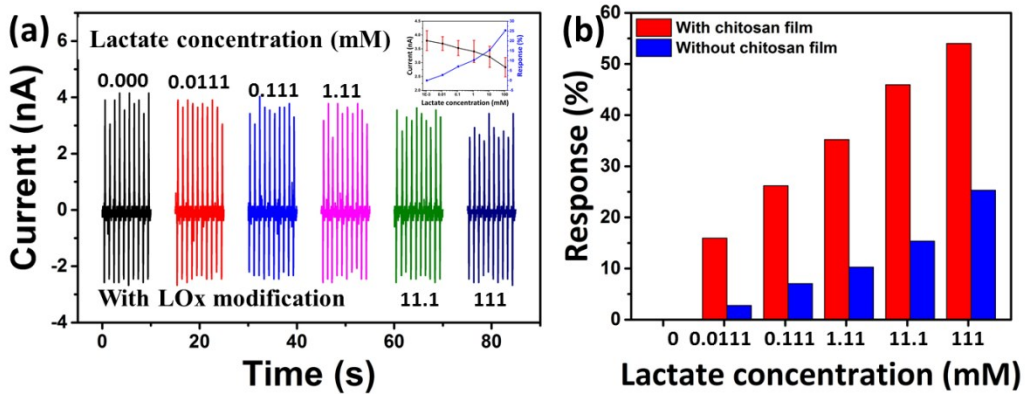

Fig. S7 (a) The outputting current and response of biosensing unit without chitosan film against the lactate solution concentrations form 0 to 111.11 mM. (b) Response comparison of different lactate biosensing units.

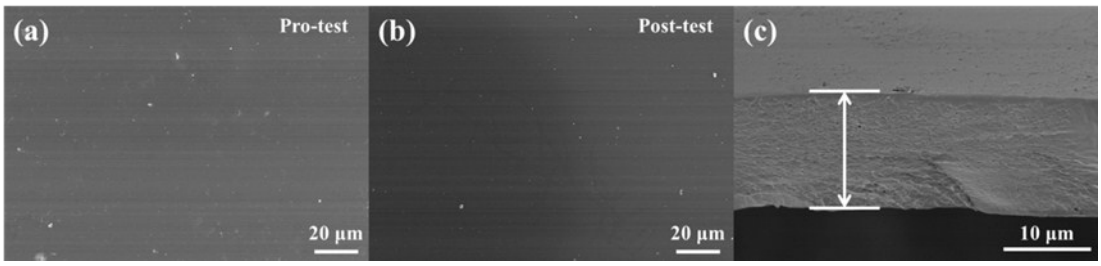

Fig. S8 (a, b) The SEM image of pro-test and post-test chitosan film. Comparison of the SEM images of Pro-test and Post-test chitosan film shows that test will not destroy the morphology. (c) Cross-section SEM image of chitosan film.

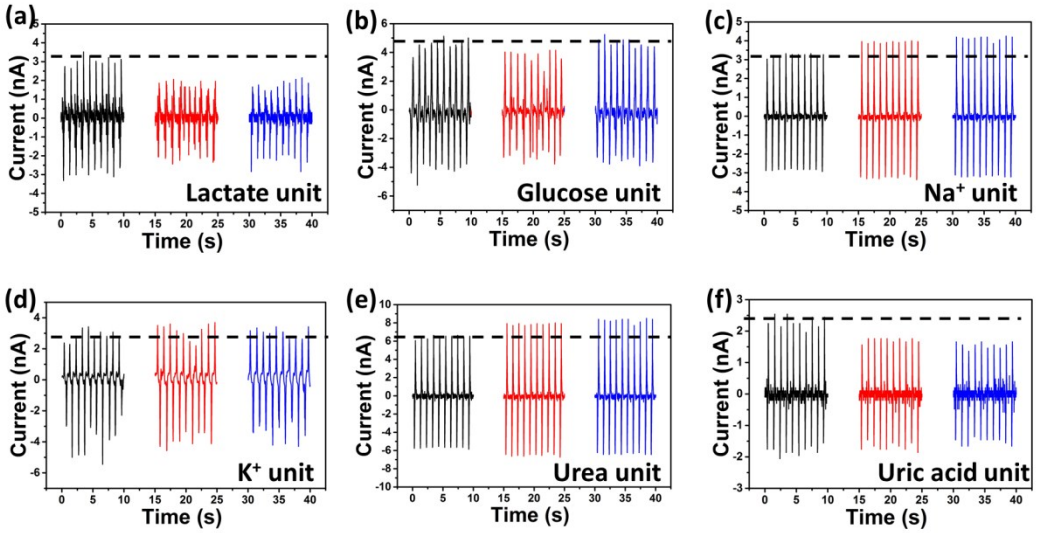

Fig. S9 The outputting current of lactate, glucose, Na^+ , K^+, urea and uric acid biosensing units at 0, 10 and 30 min.

Equations:

In these equations, y presents the response of the outputting current of e-skin, and x presents the corresponding concentrations of biomarker (lactate, glucose, Na^+, K^+, urea and uric acid).

Lactate fitting curve:

$$y = 4.164\ lnx + 35.025 \quad \text{(S1)}$$

Glucose fitting curve:

$$y = 4.236\ lnx + 29.815 \quad \text{(S2)}$$

Na^+ fitting curve:

$$y = 4.947\ lnx + 14.010 \quad \text{(S3)}$$

K^+ fitting curve:

$$y = 5.727\ lnx + 44.483 \quad \text{(S4)}$$

Urea fitting curve:

$$y = 8.393\ lnx + 41.580 \quad \text{(S5)}$$

Uric acid fitting curve:

$$y = 6.397\ lnx + 52.660 \quad \text{(S6)}$$