

Electronic Supplementary Information

Direct writing electrodes using ball pen for paper-based point-of-care testing

Zedong Li,^{a,b} Fei Li,^{*b,c} Jie Hu,^{a,b} Wei Hong Wee,^{a,b,d} Yu Long Han,^{a,b} Belinda Pingguan-Murphy,^d Tian Jian Lu^b and Feng Xu^{*a,b}

^aThe Key Laboratory of Biomedical Information Engineering of Ministry of Education, School of Life Science and Technology, Xi'an Jiaotong University, Xi'an 710049, P.R. China

^bBioinspired Engineering and Biomechanics Center (BEBC), Xi'an Jiaotong University, Xi'an 710049, P.R. China

^cDepartment of Chemistry, School of Science, Xi'an Jiaotong University, Xi'an 710049, P.R. China

^dDepartment of Biomedical Engineering, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia

**Corresponding authors: feili@mail.xjtu.edu.cn; fengxu@mail.xjtu.edu.cn*

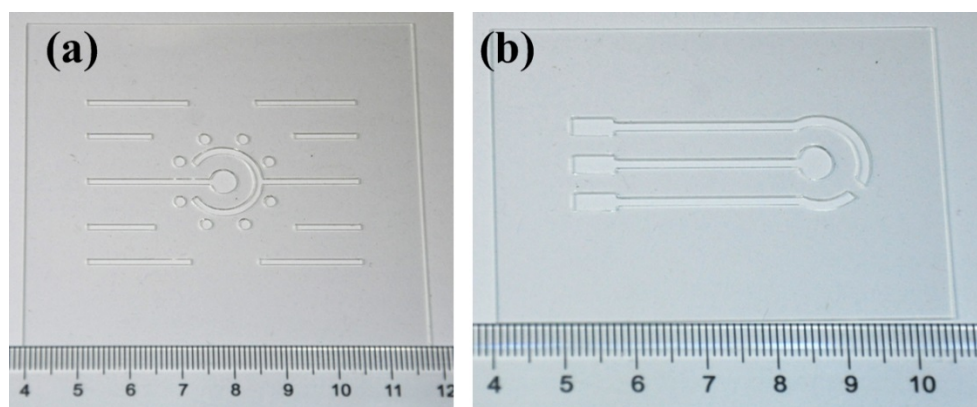


Fig. S1 Photographs of the PMMA masks designed with Corel Draw 12 software for (a) an eight-electrode array and (b) a three-electrode system.

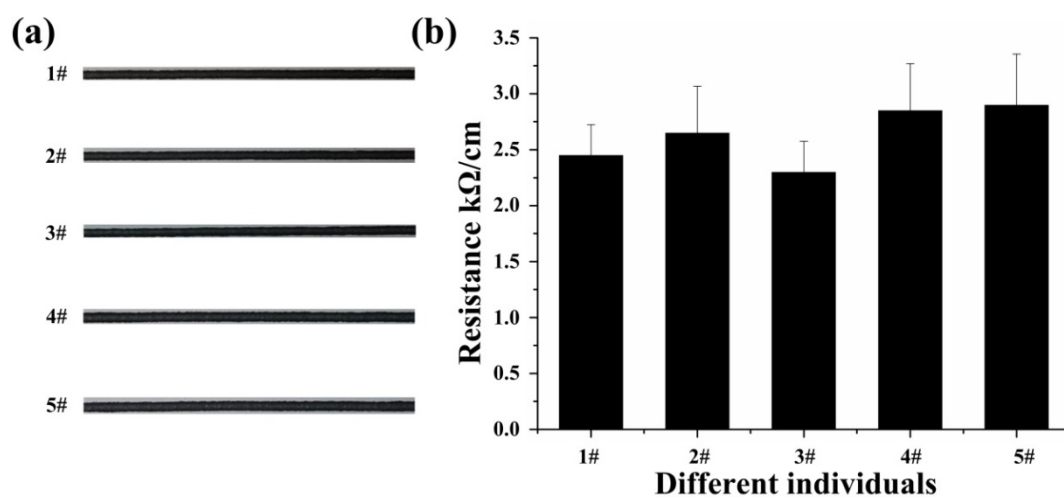


Fig. S2 (a) Photograph and (b) measured resistances of the five carbon electrode lines written by five different individuals using the fabricated pressure-assisted ball pen device.

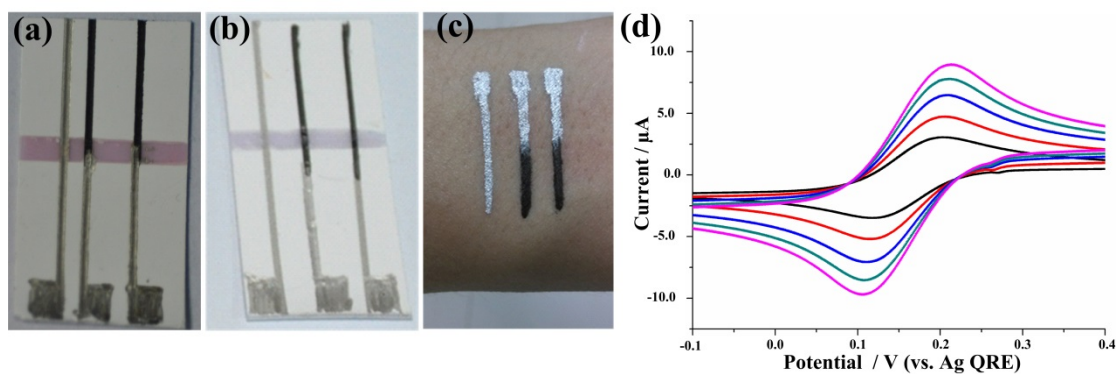


Fig. S3 Photographs of electrode patterns written on a (a) Whatman BA95 paper, (b) a Millipore HF180 paper and (c) human skin. In (a) and (b), the red lines on PEDs are the wax lines. (d) Cyclic voltammogram recorded in the aqueous solution containing 1.0 mM FcMeOH and 0.1 M NaCl using fabricated PED on a Whatman BA95 paper with different scan rates.

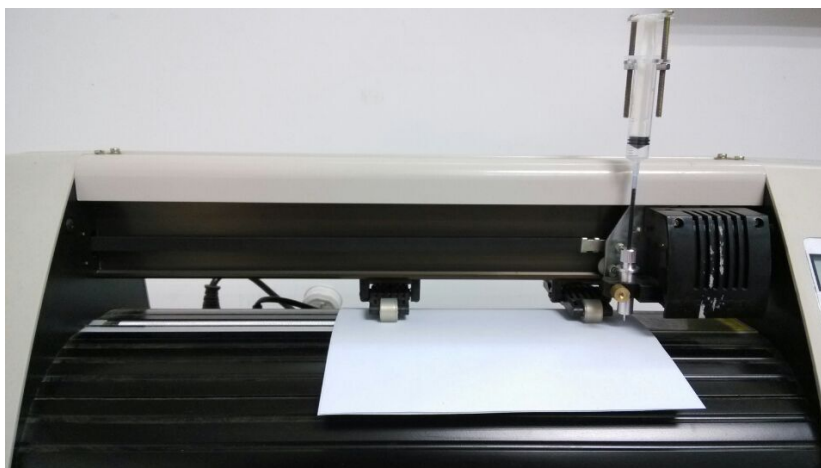


Fig. S4 Photograph of combination of the fabricated pressure-assisted ball pen device with a commercial plotter.

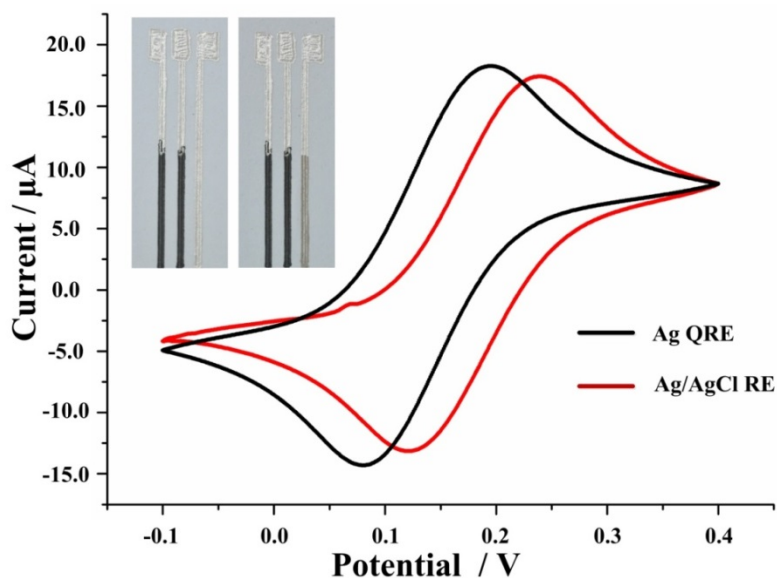


Fig. S5 Cyclic voltammograms recorded in the aqueous solution containing 1.0 mM FcMeOH and 0.1 M NaCl using fabricated PEDs with Ag QRE (black curve) and Ag/AgCl RE (red curve). Scan rates: 20 mV s^{-1} . The inset is the photographs of two PEDs with Ag QRE (left) and Ag/AgCl RE (right), respectively.

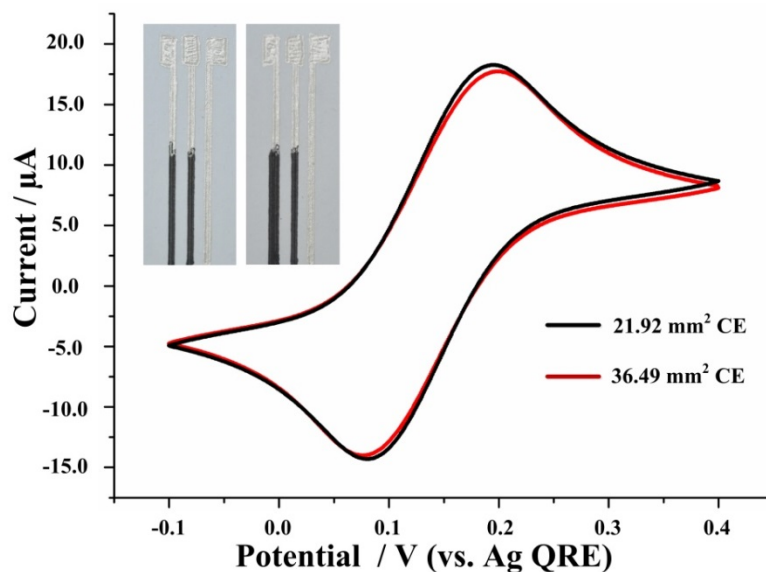


Fig. S6 Cyclic voltammograms recorded in the aqueous solution containing 1.0 mM FcMeOH and 0.1 M NaCl using fabricated PEDs with the carbon counter electrodes with areas of 21.92 mm^2 (black curve) and 36.49 mm^2 (red curve). Scan rates: 20 mV s^{-1} . The inset are the photographs of PEDs with carbon CEs with areas of 21.92 mm^2 (left) and 36.49 mm^2 (right).