# Fabrication of Paper-based Screen-printed Chromatographic Electrochemical Biosensor

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There has been a considerable recent interest in paper based biosensors, owing to low price, good flexiblity. For example, Nie et al. fabricated microfluidic paper-based electrochemical devices that are capable of quantifying the concentrations of various analytes in aqueous solutions, including biological fluids such as urine, sermu and blood[1]. Vella et al. fabricated microfluidic paper-based device that measures two enzymatic markers of live function and total serum protein[2].

Screen-printing technique has been widely applied to fabrication of electrochemical devices such as dye-sensitized solar cells[3], biosensors[4-6] and corrosion sensor[7] since it has following merits: (a) drawing precise pattern of μm order, (b) a wide variety of inks, (c) high reproducibility, and (d) low cost.

In this study, we fabricated on a paper-based chromatographic electrochemical biosensor by screen printing. Figure 1 shows schematic illustration of the paper-based chromatographic electrochemical biosensor. A resist ink, a carbon ink, a silver ink, and a silver/silver chloride ink on a paper by using a screen-printing machine (NEWLONG SEIMITSU KOGYO, LS-150TV).

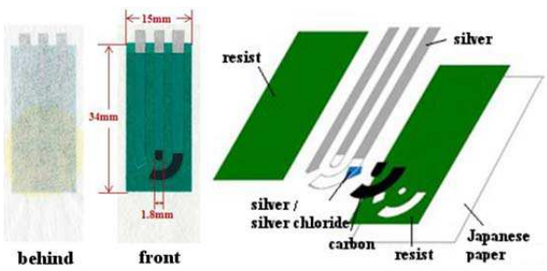


Fig. 1. Photograph and schematic illustration of the paper-based chromatographic electrochemical biosensor.

TTF (tetrathiafulvalene) and glucose oxidase (GOD) were immobilized on the carbon electrode by casting the solutions on the paper. Figure 2 shows the schematic illustration of the experimental set-up. When the electrochemical measurements were performed, only the bottom of the papar was immersed in electrolyte solution.

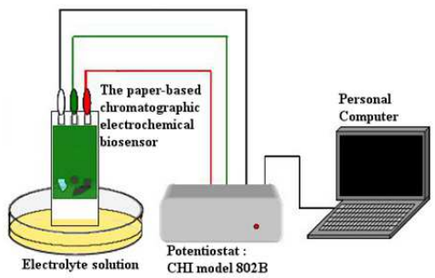


Fig. 2. The schematic illustration of the experimental set-up.

Figure 3 shows the cyclic voltammetry of the biosensor in an 66.6 mM phosphate buffer solution containing 0 and 0.5 M glucose at 25 °C. Catalytic CV was obtained under 0.5 M glucose solution, indicating that the GOD and TTF immobilized in the paper works as an electrocatalytic system of the oxidation of glucose.

Figure 4 shows the calibration curve of the paper-based biosensor for glucose. The linear relation was observed between 0.001-0.1 M with good reproducibility.

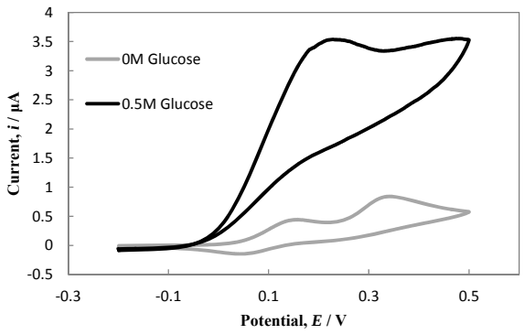


Fig. 3. The cyclic voltammogram of the biosensors.

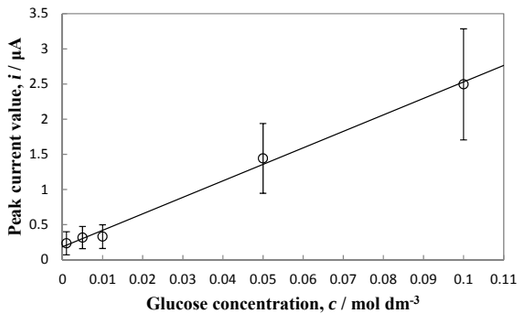


Fig. 4. The calibration curve of the paper-based biosensor for glucose. *i* means the peak current value without the background current value.

References

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