

Introduction

Screen-printed technique has been widely applied to the fabrication of enzyme electrodes because it has the following merits:

- Drawing precise pattern of μm order
- A wide variety of inks
- High reproducibility
- Low cost

Enzyme-containing Ink has been used for fabricating of enzyme electrode by screen -printing technique[1].

However, available enzymes applying to the enzyme ink are limited since these enzymatic activities are often inhibited by the other ink components.

Recently, we newly prepared an enzyme and mediator -containing microcapsule for the enzyme ink[2]. Enzyme and mediator -containing microcapsule has the following merits:

- Protection effect for an organic solvent and binder.
- Elution inhibition

In this study, we fabricated biosensor using microcapsulated glucose oxidase ink and the electrochemical performance was evaluated.

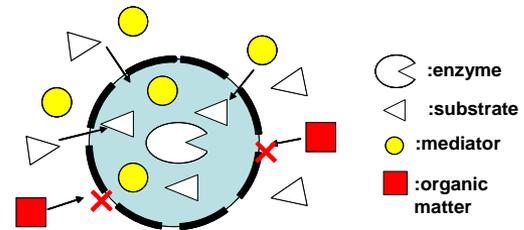
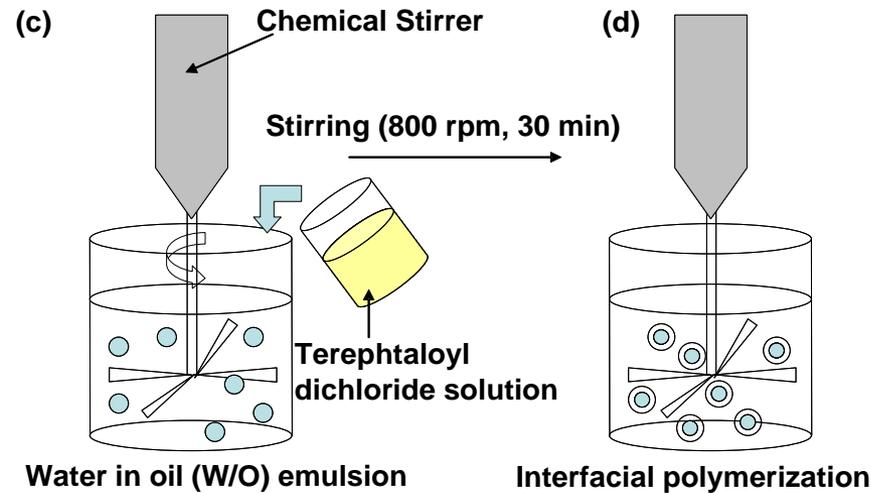
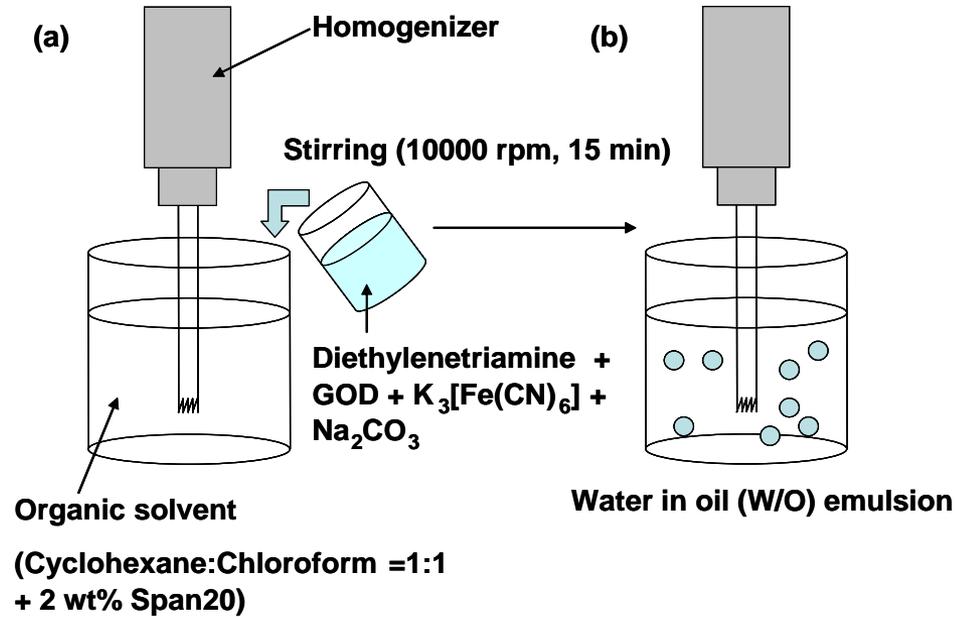


Fig. Function of microcapsule

[1] R. Nagaoka, K. Yokoyama, H. Durliat, M. Comtat, S. Ann, I. Karube, *Electroanalysis*, 11, 1027(1995).

[2] I. Shitanda, M. Konya, M. Itagaki, K. Watanabe, Y. Asano, *Electrochemistry*, 76, 569 (2008).

■ Preparation of microcapsule



■ Preparation of Screen-printed biosensor

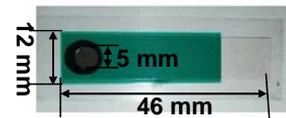
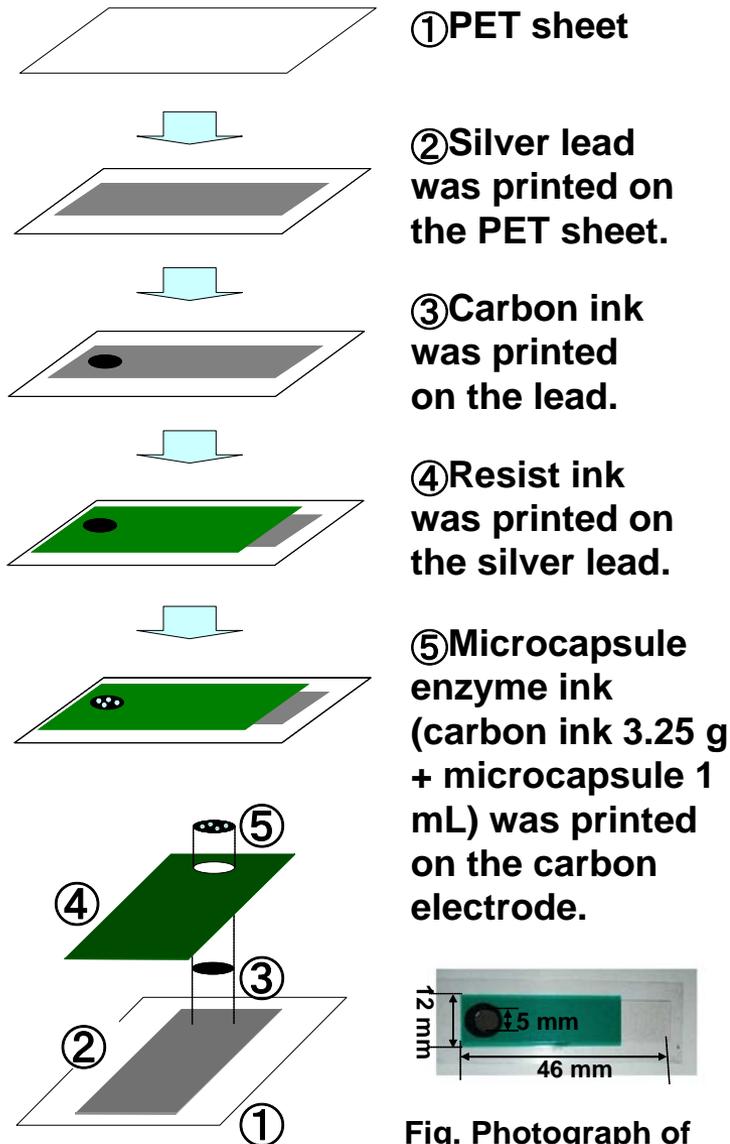
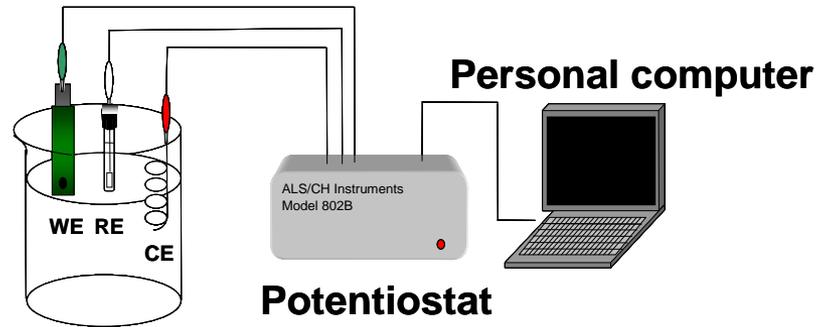


Fig. Photograph of fabricated biosensor

■ Electrochemical measurements



WE: Fabricated biosensor

RE: sat. Ag/AgCl

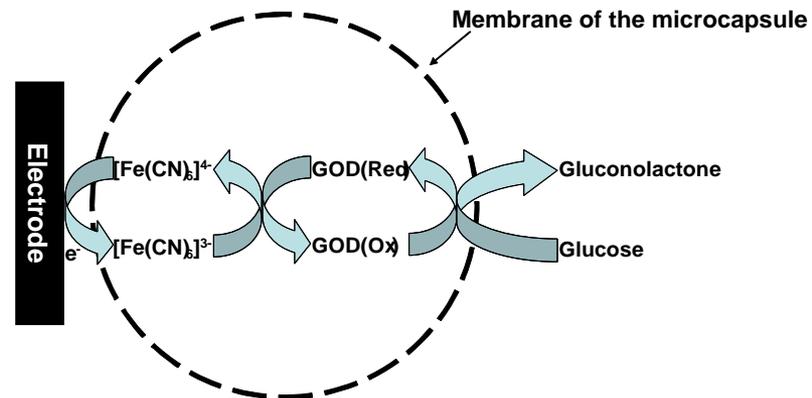
CE: Pt wire

Enzyme: 2000 U GOD

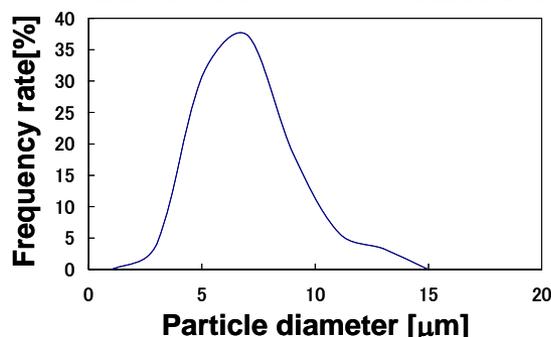
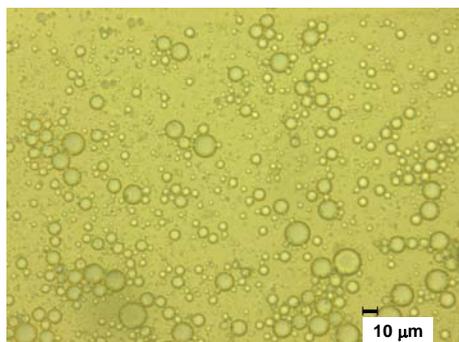
Electrolyte solution: Phosphate buffer (pH 7.4)

All measurements were carried out at 25°C.

■ Reaction mechanism

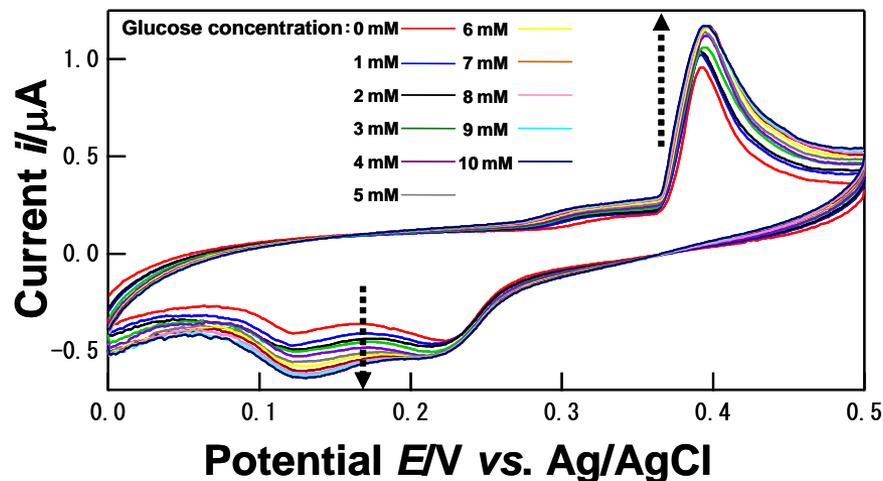


■ Photograph of the microcapsules and distribution curve of its diameter



- The spherical microcapsule was found to be prepared.
- The size of the microcapsule was distributed from 3 μm to 15 μm.
- The average diameter of the microcapsules was 8.6 μm.

■ Cyclic voltammogram of the biosensor



<CV>

- Potentiostat: ALS/CH Instruments Model 802B
- Scan rate: 5 mV/sec

- The oxidation current increased with the increase of glucose concentration.
- The peak of oxidation current was observed around 0.39 V.

Calibration curves for glucose



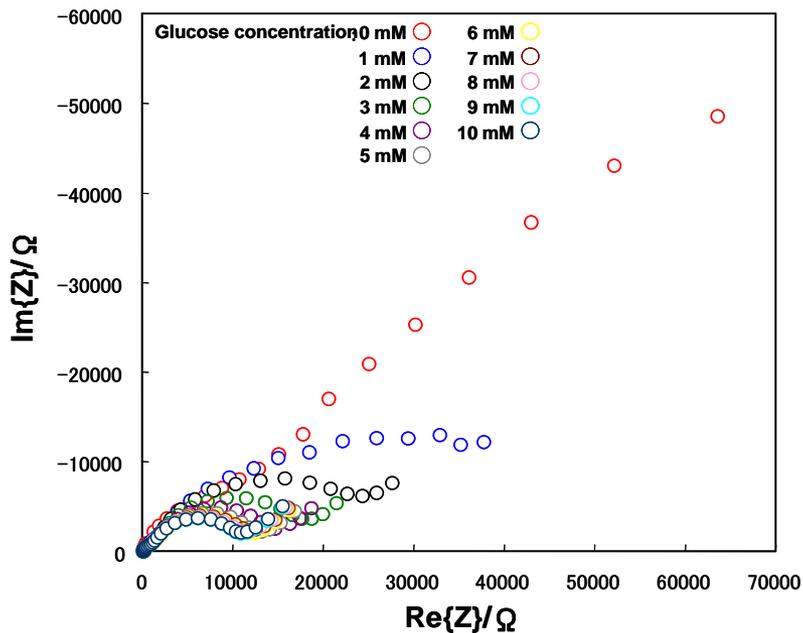
(* Δi : Difference of oxidation current value at 0.395 V)

- The linear correlation coefficient was 0.9958. (4 mM-10 mM)



These results indicated fabricated biosensor can be applied for the determination of glucose.

Nyquist plots of the biosensor



<Impedance measurement>

- Potentiostat: Compact stat
- Frequency range: 10 mHz to 100 kHz
- AC amplitude: 10 mV
- Applied potential: 0.4 V vs. Ag/AgCl

- When glucose was added to the cell, a capacitive semicircle and Warburg impedance were observed.
- The diameter of semicircle decreased and effect of diffusion increased with the increase of glucose concentration.

Conclusions

- **Biosensor using microcapsulated glucose oxidase could be fabricated by screen-printing.**
- **The fabricated biosensor available for the glucose detection.**