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APPENDIX

APPENDIX A

STUDY THE USED COMPONENT IN THE BIO-FUEL CELL

This section will describe the effect of each component such as yeast, glucose, methylene blue and ferricyanide (FeCN). The 2515010 compartment was used for studying these components. Each electrode had a surface area of 50 cm^2. The concentration of yeast, glucose, MB and ferricyanide that dissolved in 0.1 M, pH 7.0 PB were 10 mg/ml, 0.1M, 1mM and 1mM, respectively. Yeast, glucose and MB were added in the anodic compartment while the ferricyanide was added in the cathodic compartment.

Fig. A1 shows the voltage-current density characteristic of one added component in the bio-fuel cell chamber. The result shows that the open circuit voltage generation of MB or glucose was lower than 10 mV. Thirty mV and 82 mV of open circuit voltage when adding yeast and ferricyanide, respectively, were obtained. The current density of yeast and ferricyanide adding were about 0.47 mA/m^2 (10kΩ) and 1 mA/m^2 (5.1kΩ), respectively. It shows that only yeast and ferricyanide affects the small voltage and current generation of the BFC.

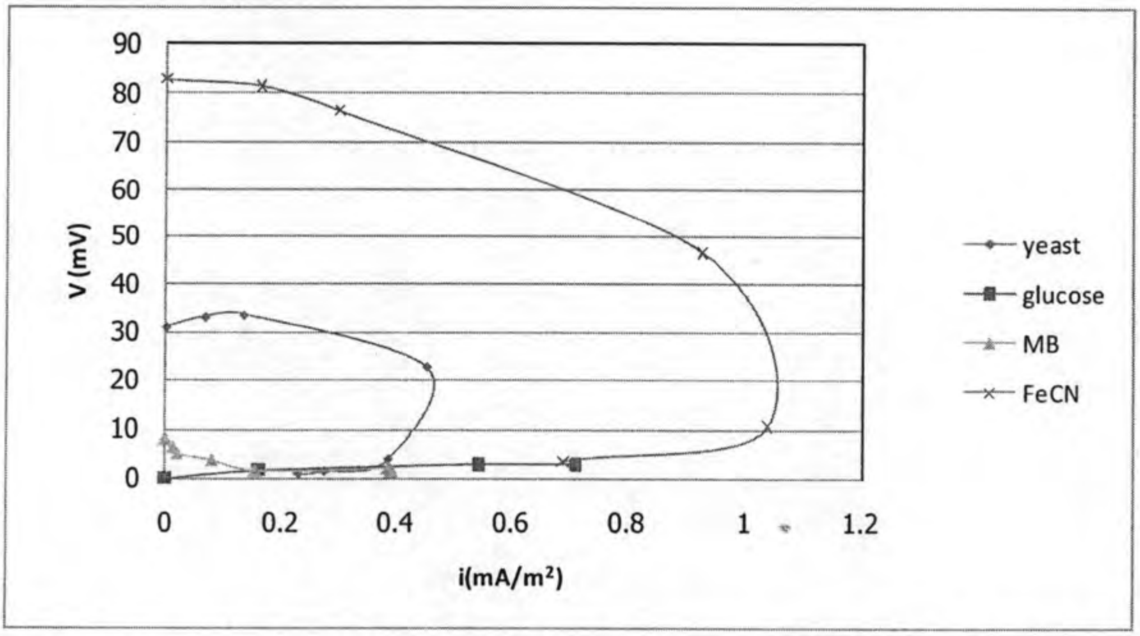

Fig. A1 Voltage-current density generation of each component in the bio-fuel cell

Fig. A2 shows the power density-load characteristic of each component. The result shows that yeast and ferricyanide can give the small power density about 10 $\mu W/m^2$ (10kΩ) and 45 $\mu W/m^2$ (10kΩ), respectively.

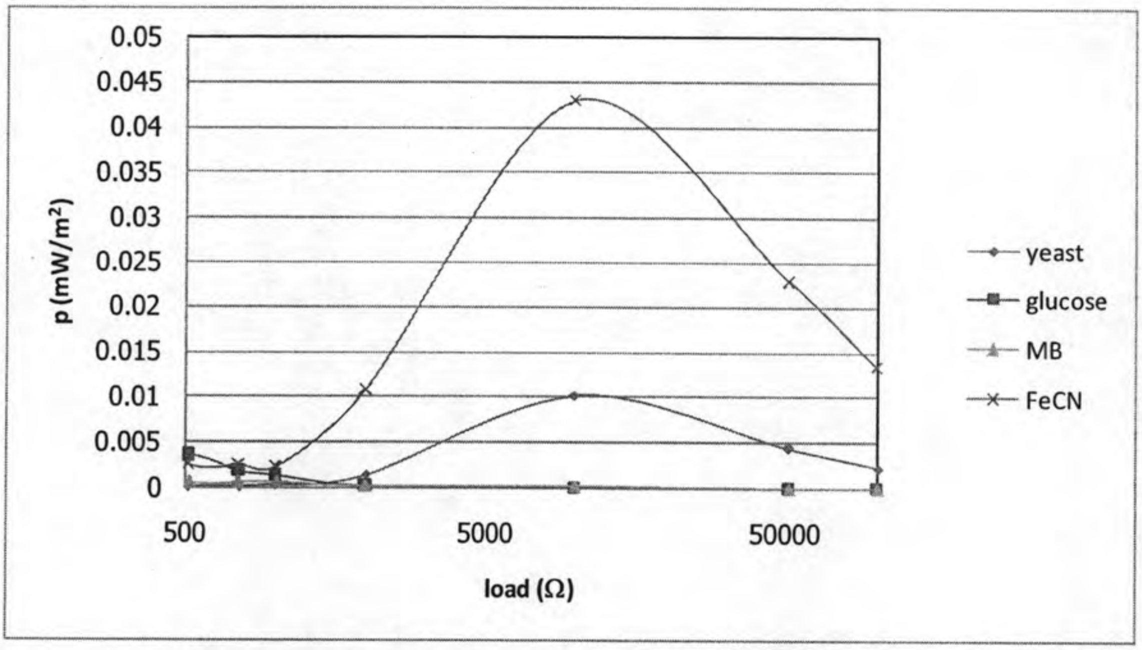

Fig. A2 Power density-load of each component in the bio-fuel cell

Fig. A3 shows voltage-current generation characteristic when adding two components in the BFC. It was found that the voltage generation from yeast and glucose was zero. This result shows that if the BFC consists of yeast and glucose, the BFC can not generate the voltage and current. The effect of combination of glucose and MB gave 37 mV of open circuit voltage and low current density (<1mA/m^2). When using ferricyanide with glucose or methylene blue, the open circuit voltage and current density of the BFC were in the range of 145-152 mV and 1.5-2 mA/m^2 (5.1-10kΩ), respectively.

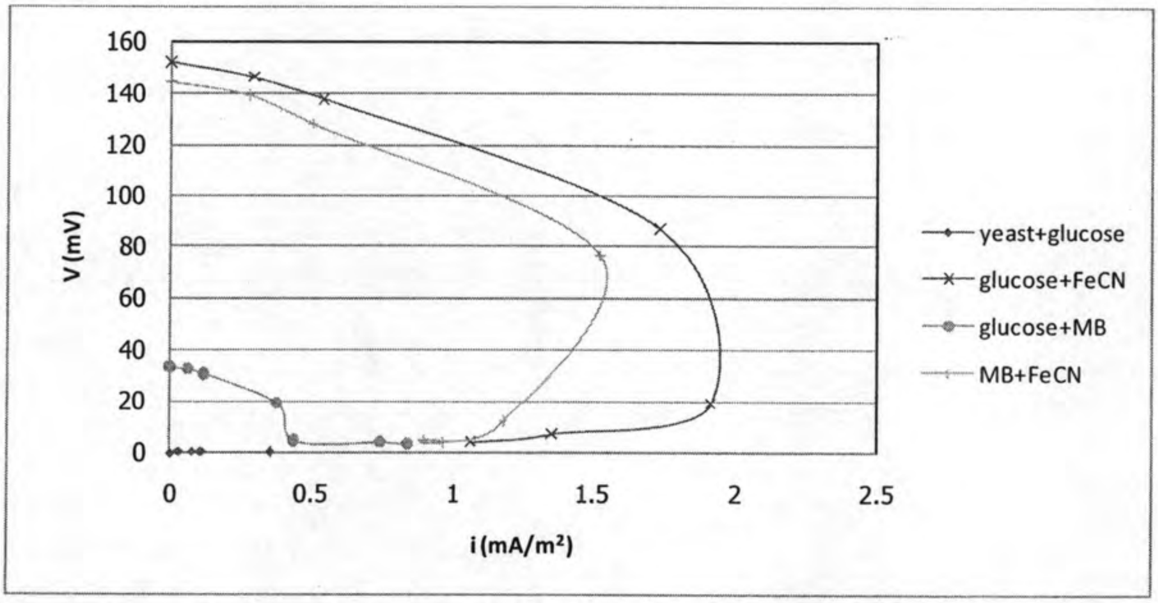

Fig. A3 Voltage-current density generation when adding two components in the bio-fuel cell

Fig. A4 shows power density-load when adding two components in the BFC. It shows that two components with ferricyanide gave the power density in the range of 0.12-0.15 mW/m^2 (10kΩ). For other components (without ferricyanide) gave the power density lower than 0.01 mW/m^2 (10kΩ). Moreover, the effect of two components (with ferricyanide) increased the power density higher than only used ferricyanide.

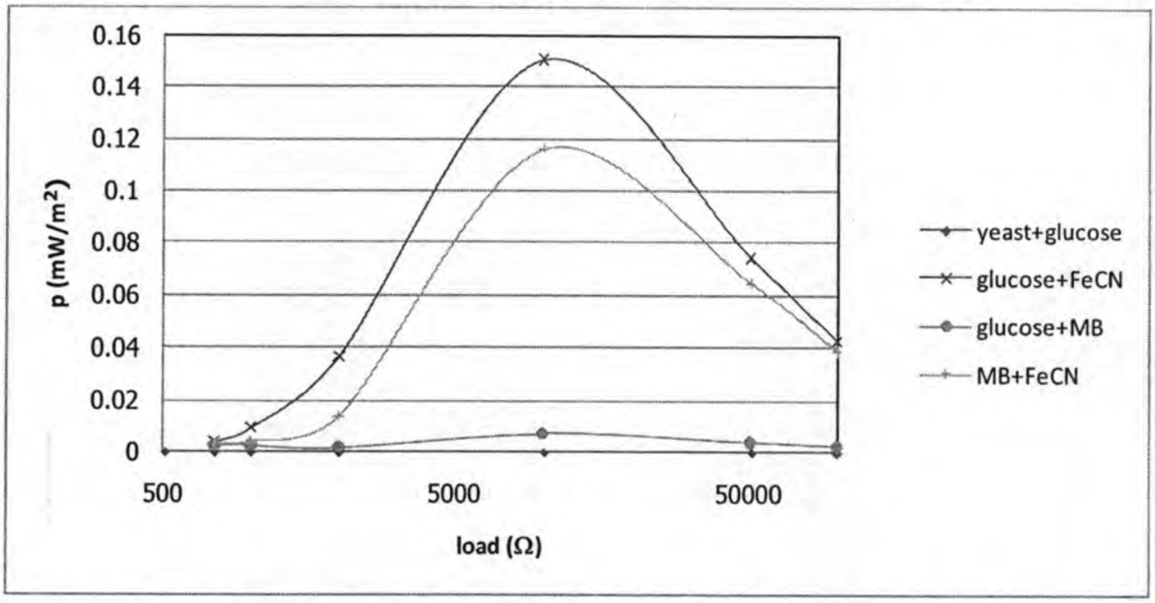

Fig. A4 Power density-load of two components in the bio-fuel cell

Fig. A5 shows voltage-current generation of 3-4 components in the BFC. In the study of 3 components, it was found that 3 components (with ferricyanide) gave the open circuit voltage and current density generation about 135 mV and 2 mA/m^2 (5.1-10kΩ) that were nearly the effect of one and two components (with ferricyanide) as mentioned above. Therefore, the effect of ferrciyanide increases the open circuit of the BFC. Considering 3 components (without ferricyanide), the result which is the effect of combination from glucose, yeast and MB shows that the open circuit voltage and current density generation of 3 components were up to 230 mV and 15mA/m^2 (100Ω), respectively. It shows that MB can transfer electron from yeast to electrode. Therefore, the open circuit voltage and current density of the BFC in the anodic compartment depend on the glucose, yeast and MB. When ferricyanide (4 components) was added in the cathodic compartment, the open circuit voltage and current density of the BFC were up to 300 mV and 18 mA/m^2 (510Ω). It shows that the open circuit voltage generation of the BFC increased 70 mV (near the open circuit voltage of one component (with ferricyanide)) higher than 3 components (with glucose, yeast and MB). Therefore, the open circuit voltage was the summation of 3 components (with glucose, yeast and MB) and ferricyanide in the anodic and cathodic compartment, respectively.

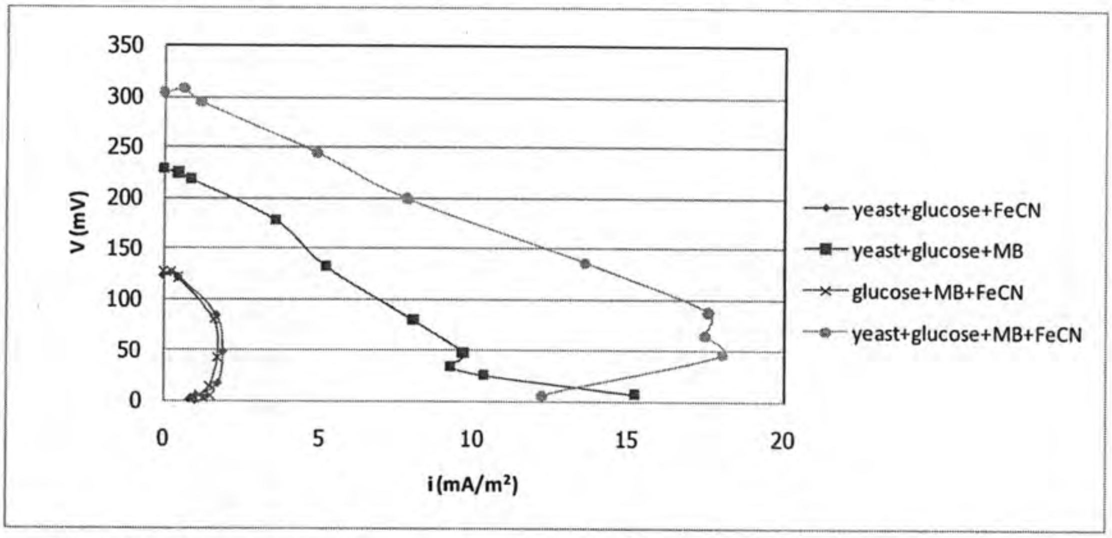

Fig. A5 Voltage-current density generation of 3-4 components in the bio-fuel cell

Fig. A6 shows power density-load of 3-4 components in the BFC. Three components (with ferricyanide) gave the power density in the range of 0.17 mW/m^2 (10kΩ). This range of power density was nearly one and two components (with ferricyanide). The power density of 3 components (with glucose, yeast and MB) increased the power density generation up to 0.7 mW/m^2 (5kΩ). When ferricyanide was added in these conditions, 1.8 mW/m^2 of power density was obtained from the BFC.

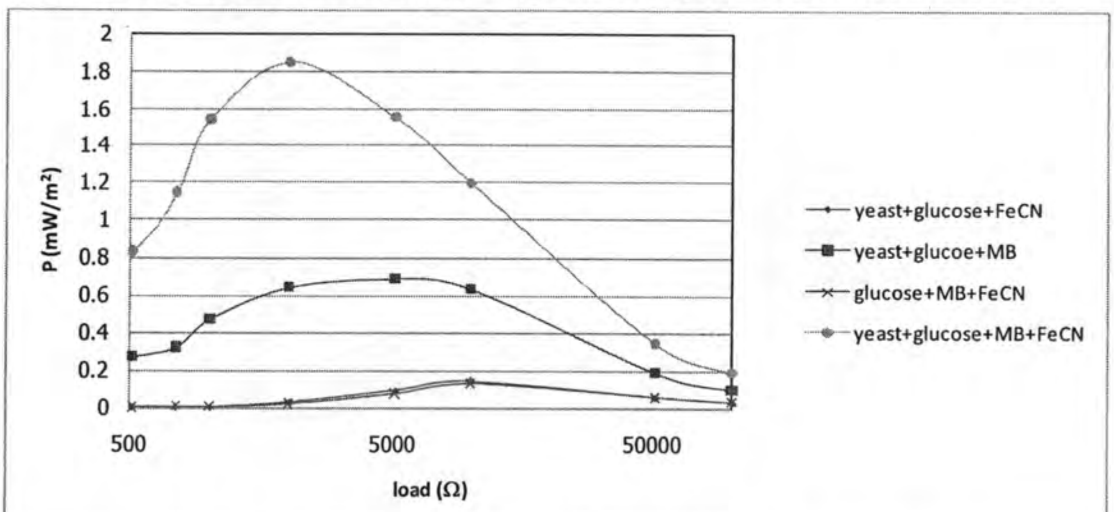

Fig. A6 Power density-load of 3-4 components in the bio-fuel cell

APPENDIX B

PUBLICATIONS AND PRESENTATIONS

Ouitrakul, S., Sriyudthsak, M., and Kakizono, T., Preliminary Study on Bio-Fuel Cell using Baker Yeast. The 4th JSPS-NRCT Joint Seminar on Development of Thermotolerant Microbial Resources and Their Applications, Kyushu University, Fukuoka, Japan, 2004. November 7-10: 123

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Ouitrakul, S., Sriyudthsak, M., and Kakizono, T., Effect of Electron Acceptor in Bio-Fuel Cell. Proceedings of the 1st IEEE International Conference on Nano/Micro Engineered and Molecular Systems, Zhuhai, China, 2006. January 18-21: 1432-1435

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Vitae

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