High Performance and Stability of Glucose Oxidation Reaction (GOR) Enzymatic Biofuel cell (EBC) adopting Poly(ethylenimine) and Pyrenecarboxaldehyde

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Glucose based catalysts combined with Poly(ethylenimine)(PEI) and Pyrenecarboxaldehyde (PCA) are suggested to improve glucose oxidation reaction (GOR) and layer by layer (LbL) enzymatic biofuel cells (EBCs) adopting biocatalyst are fabricated. GOx/PEI/CNT, GOx/PCA/CNT, and GOx/PCA/PEI/CNT are fabricated as the biocatalysts. Electrochemical characterizations are performed to evaluate electron transfer in absence of any mediator. GOx/PCA/PEI/CNT has the highest catalytic activity regarding GOR with high electron transfer rate constant and low Michaelis-Menten constant. It means that combination between PCA and PEI makes a dominant role in GOx immobilization on CNT. In EBC performance using membrane, GOx/PCA/PEI/CNT can reach 2.19 mWcm-2, while in performance of membraneless EBC, its power density can reach 0.74 mWcm-2 under glucose solution of pH 3. Related to long term stability, the power density of EBC can maintain up to 92.6% of its initial value even after 4 weeks.