

273f Development of Nanobiocatalysts for Biofuel Cells

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Currently there is a renewed interest in biofuel cells. At the same time, recent advances in nanoscale science and technology are fueling a new wave of revitalization in the field of biocatalysts. It appears to us that nanoscale engineering of the biocatalysts is greatly promising for the development of high performance biofuel cells. Our preliminary experimental research in this area will be discussed in this presentation. Glucose oxidase electrodes were prepared via forming composites with carbon fibers, carbon nanotubes and nanoporous carbon materials. Significant enhancement on electrochemical flux and reaction kinetics was observed on the composite-modified glassy carbon electrode by cyclic voltammetry. When the resulting electrodes were applied in a model glucose/O₂ biofuel cell as the anodes, a power density up to about 900 μW/cm² was achieved. According to the quantitative analysis of the processes involved in the anode, mass transfer of the mediator appeared to be the limiting factor to the power and current densities of the model biofuel cell. It is expected that the power density can be greatly improved by the elimination of mediator diffusion and optimization of the electrode structure.