



University of Hawai'i at Mānoa

Hawai'i Natural Energy Institute

School of Ocean & Earth Science & Technology

Hierarchically-Structured Biofuel Cell Anodes

Hydrophobically-modified chitosan has been proposed for enzyme immobilization and stabilization at bioelectrodes in biofuel cells. In this presentation, we analytically evaluate the attributes of employing hydrophobically-modified chitosan molded into high-porosity scaffolds to improve enzyme activity and mass transport of malate dehydrogenase bioelectrodes. Results suggest that the hydrophobically-modified chitosan can alter catalytic activity of malate dehydrogenase and that scaffold structure improves power density over chitosan thin films. Fluorescence measurements are also presented that correlate the improved activity to alterations in the amphiphilic nature of the chemical microenvironment (immediately surrounding the enzyme) that the modified chitosan affords. Commentary is also given on how mass transport through the chitosan matrix can be improved (in order to achieve higher power densities) and how the electrodes can be applied to microbial fuel cells.

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Tuesday, September 15, 2009
3:00 – 4:00 PM
POST 723

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