

Realizing enzymatic biofuel cells through nano-engineering

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Enzymatic biofuel cells are attractive for micro- and nano-power source applications. To enable effective operation of these biofuel cells, we need to gather substantial expertise to develop unique micro-architecture to build optimized 3-D electrode configurations to overcome two major impediments: low power density and short operating lifetime, in current biofuel cell operation. To realize such micro-architecture, we need to employ unique materials processing and engineering to provide macro- and meso-scale porosity and a wide range of dispersed pore size and interconnectivity to achieve a balance between high active surface area and intricate pore structure to allow prolonging stability of enzymes and effective use of fuels. A few interesting approaches to develop such delicate macro-meso-pore structures and to utilize a suite of in-situ, real-time, and non-invasive characterization techniques to realize material processing and enzyme activity will be discussed in this presentation.