“Immobilized Biocatalysts - Application in Enzymatic and Microbial Fuel Cells”

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Biological fuel cells provide electricity by breaking down substrates to release the energy stored in chemical bonds. Unlike conventional fuel cells, the precious metal catalysts are replaced by enzymes or microbes for fuel oxidation in the anode, and potentially for oxygen reduction in the cathode. The catalytic breadth of enzymes allows the use of energy dense substrates including carbohydrates and macromolecules as fuel sources. In order for the released energy to be captured, the biocatalysts must be electronically linked to the anode and cathode. One step toward that link is to fix the catalysts into close associations with the electrode surfaces. The approach intends to build a hierarchical, catalytic architecture that is amenable to practical systems. Contemporary tools in nanotechnology, biomimetic assembly, and materials chemistry provide many methods to design and create the biocomposite materials. Our laboratory applies combinations of these tools for materials development and characterization, along with assessment of the biochemical activity. Recent in-house experimental results provide systematic advances in enzymatic fuel cell technology and address materials approaches that achieve direct electron transfer between enzyme redox cofactors and electrode surfaces. In parallel, microbial fuel cell (MFC) research results have provided insight to bacterial physiology that is directly related to MFC output by developing new experimental methods that will advance MFC understanding and design.

3:30- 4:30pm
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