Sunday Afternoon, October 19, 2008

Biomaterials Plenary
Room: 202 - Session BP-SuA

Bio-inspired Catalysis, Energy Production and Transduction: Opportunities and Challenges

Moderator: B. Kasemo, Chalmers University of Technology, Sweden

3:00pm **BP-SuA1 New Insights Into Lignocellulose Conversion by Termite Gut Microbes**, ***J.R. Leadbetter***, California Institute of Technology **INVITED**

Termites and their complex hindgut microbiota are able to convert wood lignocellulose into hydrogen and other products used to fuel their metabolisms. Recent gene and genome based analyses on the gut community have revealed novel insights into many bacteria-mediated, important symbiotic functions. The system-wide gene analysis of a microbial community specialized towards plant lignocellulose degradation has both basic and applied implications.

3:40pm **BP-SuA3 Artificial Photosynthesis and Bio-Inspired Chemistry: Combining Technology with Biology for Efficient Solar Energy Conversion**, ***T. Moore***, *A.L. Moore*, *M. Hambourger*, *D. Gust*, Arizona State University **INVITED**

Provided significant challenges can be met, solar powered, bio-inspired constructs can contribute to renewable energy resources to meet human energy needs. The central challenge is using renewable energy sources to reverse the combustion process by efficient water oxidation and reductive synthesis of CO_2 to fuels. Nature's catalysts direct these oxidation/reduction reactions along coordinates that have low activation barriers and almost no side reactions. In principle, these reactions can be driven by electricity provided by sustainable sources. In order to accomplish this, it will be necessary to switch nature's catalysts from their usual source of redox potential - electron/proton carrying redox species - to emf at appropriate electrical potentials. Taking a step in this direction, we have assembled a hybrid system in which a porphyrin-sensitized Grätzel-type nanoparticulate wide band gap semiconductor photoanode is used as an interface between emf and redox potential for the photochemical reformation of biomass to hydrogen.

4:20pm **BP-SuA5 Bioelectrocatalysis in Diabetes Management**, ***A. Heller***, University of Texas at Austin **INVITED**

FreeStyle NavigatorTM, introduced this year by Abbott Diabetes Care, accurately monitors minute by minute the glucose concentration in the subcutaneous fluid. The system alerts the diabetic user to actual and impending high and low glucose levels. It is intended to eliminate the constant worry of diabetic people about their having or not having the desired level of glucose. The system was approved for use in the 27 countries of the European Union in 2007 and by the FDA in 2008. The sensor of Navigator, implanted in the fat under the skin at 5 mm depth, is the first and only one having a bioelectrocatalyst at which glucose is directly electrooxidized. The bioelectrocatalyst is a thick-film of a water-swollen redox polymer, which 3-dimensionally envelopes and penetrates the glycoprotein of the enzyme glucose oxidase, forming a unique crosslinked hydrated network in which electrons, glucose, and ions diffuse. Electrons cascade across small potential gradients from glucose to the reaction centers of the enzyme; from the enzyme to the hydrated redox polymer; and through the hydrated polymer to the anode of a miniature electrochemical cell. Navigator follows FreeStyle, the first mass manufactured sub-microliter fluidic device, introduced in 2000 and available worldwide, which made the monitoring of glucose in withdrawn blood samples painless. Its core is a 300 nL thin-layer microcoulometer, in which glucose is electrooxidized in a two-step process diffusionally mediated by PQQ-glucose dehydrogenase and a complex of osmium.

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