The Department of Chemistry and Biochemistry

Seminar Series

Presents a Seminar Titled:

"Nanoparticle Networks in Protein Electrochemistry and Doped in Xerogel Matrices –Fundamental Research for Clinically Relevant Biosensors"

Presented By

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First-generation amperometric glucose biosensors incorporating alkanethiolate-protected gold nanoparticles, monolayer protected clusters (MPCs), within a xerogel matrix are investigated as model systems for nanomaterial-assisted electrochemical sensing strategies. These sensing strategies have been developed based on fundamental studies of protein monolayer electrochemistry at nanoparticle film assemblies. The resulting xerogel biosensors are comprised of platinum electrods modified with composite films of (3-mercaptopropyl)trimethoxy silane xerogel embedded with glucose oxidase enzyme, doped with $Au_{225}(C6)_{75}$ MPCs, and coated with an outer, blended, polyurethane layer. Electrochemistry and scanning/transmission electron microscopy, including cross-sectional TEM, show sensor construction, humidity effects on xerogel structure, and successful incorporation of MPCs. Analytical performance of the biosensor scheme with and without MPC doping of the xerogel is determined from direct glucose injection during amperometry. The MPC-doped xerogels yield significant enhancement of several sensor attributes compared to analogous films without nanoparticles. Studies suggest that the MPC-induced enhancements are critically related to particular structure-function relationships within the film assembly structure that may enable the strategy to be a more general approach to sensor design with the specific materials able to be easily adapted to other specific targets of interest. For example, the integration of MPCs as a functional component of amperometric biosensor schemes has implications for future development of biosensors targeting clinically relevant species such as lactate and uric acid for monitoring sepsis and preeclampsia, respectively.

Friday, September 27, 2013 at 3:00 p.m. in OCNPS 100