

A simple approach to making electrochemical biosensors

Byron D. Gates and Michael T.Y. Paul

Department of Chemistry and 4D LABS, Simon Fraser University, Canada

We aim to make electrochemical biosensors with increased sensitivity that can also be made by a relatively simple process. This sensitivity is important for electrochemically detecting low concentrations of biologically significant chemicals. The design constraints are meant to create a fabrication process that can be adapted for the incorporation of the sensor into multiple types of devices while also remaining simple in design and low in cost. Our approach uses a modified template guided process with colloidal particles of gold and polystyrene to achieve high surface area porous gold electrodes. This process is amenable to fine tuning the dimensions and surface area of these electrodes, which are confirmed by electron microscopy and electrochemistry techniques. We also demonstrate the ability to adapt this technique for incorporating the gold electrodes into a glass and polymer based platform using supplies that are readily available in the laboratory. To demonstrate the sensitivity of this electrochemical sensor, we immobilize glucose oxidase onto the surfaces of this electrode. These high surface area electrodes were tested for their sensitivity relative to planar gold electrodes. This testing included the response of each type of electrode to a range of glucose concentrations using a variety of cyclic voltammetry techniques. These studies provide further insight into electrochemistry processes of high surface area, porous gold electrodes, as well as simple methods to make electrochemical biosensors that have an improved sensitivity.

Biography

A Tier II Canada Research Chair in Surface Chemistry at Simon Fraser University (SFU), Byron Gates has built a research program to investigate the surfaces of nanostructured materials and the interface between these materials and biological systems. His current research interests include developing new approaches to biosensing, bioimaging, and biomimetic materials. Byron received his B.Sc. from Western Washington University, and his M.Sc. and Ph.D. from the University of Washington in Seattle, Washington while working with Professor Younan Xia. He was a postdoctoral fellow at Harvard University with Professor George M. Whitesides, before joining the faculty at SFU where he is an Associate Professor of Chemistry and Director of Nanofabrication Facilities at 4D LABS.

bgates@sfu.ca