Biofuntionalized surface for specific and selective trapping and detection of moth's pheromone, Disparlure.

Miguel Reis, McDiarmid Institute, University of Canterbury, NZ

Abstract (300 word limit)

We present a biomimetic approach for engineering a functionalized surface capable of selectively binding the female pheromone from *Lymantria dispar*, disparlure. The purpose of this surface is to provide a template to perform a sensing assay for a single volatile organic compound (VOC). To generate such surface, we selected the Pheromone Binding Proteins (PBP1 & PBP2) from *L. dispar*, which possess high affinity for both (+ and -) enantiomeric forms of Disparlure (Cis-7,8-epoxy-2-methyloctadecane). Gene sequences for each of these proteins were acquired and the signalling sequence was removed. A histidine tag was added to the N-terminal of both PBP's for easy purification in a nickel chromatography column. The modified gene for each protein (PBP1 & PBP2) was cloned into an expression vector, transformed into E. coli BL21 (DE3) and expressed. These proteins were then attached onto gold thin film electrodes. The attachment was performed using a 1-step functionalization by mixing solutions of the purified protein and carbon disulfide (CS_2) on top of the bare annealed gold electrodes. Annealing of gold provides a higher yield of (111) crystallite planes, which increases CS_2 functionalization of the electrode surface and therefore overall protein coverage. After PBP functionalization and prior to running any assay, the surface was blocked using Bovine Serum Albumin (BSA). The resulting surfaces were connected to a potentiostat to perform Electrochemical Impedance Spectroscopy (EIS) scans on various samples containing increasing concentrations of disparlure which lead to an increase in the impedance component of the EIS signal. This provides proof of concept for a biomimetic assay capable of selectively detect disparlure, by copying one of the molecular mechanisms used by the male moth for detecting the female pheromone. This is a first step for the fabrication of biomimetic miniature robots capable of tracking insects for pest management in agricultural and forestry sectors.

Recent Publications (minimum 5)

Narayanan Madaboosi, Catarina Realista Pedrosa, Miguel Reis, J.P. Conde. Microfluidic ELISA for sensing of prostate cancer biomarkers using integrated a-Si:H p-i-n photodiodes IEEE Sensors 201, 881-884

Biography (150 word limit)

Miguel Reis attended both the New University of Lisbon and University of Lisbon obtaining a Bachelors in Cellular and Molecular Biology and a Masters in Biotechnology respectively. He wrote his master thesis on the fabrication of a microfluidic device which uses a modified ELISA essay for the capture and detection of Prostate Specific Antigen (PSA). He worked briefly at a genetic screening company, identifying cancer related mutations in DNA, assessing data relevant for patient prognostics. He started his PhD in Electrical and Computer Engineering at University of Canterbury (New Zealand) in association with Scion. In his PhD journey he had the opportunity to work in Scion laboratories in Rotorua as well spending a summer internship at Simon Fraser University in Vancouver. His main research focus now is on the functionalization of surfaces for sensor applications as well as characterization of material's surfaces and properties.

Email: Miguel.reis@pg.canterbury.ac.nz



Notes/Comments: