

Title of the project: *FABRICATION OF AN ELECTRODE SURFACE BASED ON NANOTUBE-NANOPARTICLE HYBRID NETWORK FOR HYDROGEN PEROXIDE BIOSENSING*

Aim:

The aim of the project is to improve scientific develop, optimize and deploy the three-dimensional (3D) conductive biomolecules network with nanostructured materials to construct bioelectronics devices. Bioelectronics devices are particularly interesting class of biosensor based on the integration of biomolecules with electronic elements. Establishing efficient electrical communication between biomolecules and the electrode is the most challenging task for a bioelectronics system. A key issue in this area is biotic-abiotic interfaces that should not degrade over time for high-impact applications, such as functional prosthetics and diabetes management. Therefore, a high performance, robust, and reliable bio-abiotic interface is required.

Accomplished work

Lab work: The fabrication of the sensor surface modified with different type of nanoparticles, and enzymes were accomplished by PI and a postgraduate student. Experimental results showed that the direct electrical communication between enzymes and an electrode was established through fabrication. Based on these, different kinds of biosensors were developed those are for H₂O₂ and superoxide.

Paper works: Under this project, total **FIVE (5)** journals have been published. The performance of the proposed biosensor showed very high sensitivity and stability.

1) **A.K.M. Kafi**, Samiul Alim, Rajan Jose, Mashitah M. Yusoff, Hemoglobin immobilization on Multiporous nanofibers of SnO₂ and chitosan composite for hydrogen peroxide sensing,

Accepted in *Journal of Nanoscience and Nanotechnology*.

- 2) **A. K. M. Kafi**, M.J. Crossley, M. Naqshabandi, Mashitah M. Yusoff “Improved peroxide biosensor based on Horseradish Peroxidase/Carbon Nanotube on a thiol-modified gold electrode. In press, in *Enzyme and Microbial Technology*.
- 3) **A. K. M. Kafi***, Jose Rajan and Mashitah M. Yusoff Preparation of a SnO₂ Nanofibers/Polyaniline/Hb modified electrode as a novel platform for enhanced direct electrical contact of heme and application in biosensing, *Microchimica Acta*, 2017, 184 (Issue 11), 4443–4450.
- 4) **A. K. M. Kafi**, C. C. L. Yam, N. S. Azmi, and Mashitah M. Yusoff, Carbonyl Functionalized Single-Walled Carbon Nanotube-Hb Crosslinked Network: A Novel Platform for Studying Bio-Electrochemistry and Electrocatalysis of Hemoglobin. **2018**, 18, 2422–2428, *J. Nanosci. Nanotechnol.*
- 5) **A.K.M. Kafi**, Maxwell J Crossley, N.S. Azmi, Mashitah M. Yusoff, Superoxide radical biosensor based on a 3D enzyme/carbon nanotube conductive networks. *J. Nanosci. Nanotechnol.* 17, 5896–5899 (2017)

Conferences: I have presented my work in conference at 3RD ADVANCED MATERIALS CONFERENCE 2016, at langkawai, **2016**. My newly developed biosensors based on nanostructured materials networks has attracted the attention of many researchers.

Post graduate student:

Samiul Alim : MKT16004 Worked in a project.

The logo of Universiti Malaysia Perlis (UMP) is a large, stylized shield shape. It is divided into four quadrants by a white cross. The top-left quadrant is yellow, the top-right is light blue, the bottom-left is teal, and the bottom-right is light purple. The letters 'UMP' are written in white, bold, sans-serif font across the center of the shield.

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