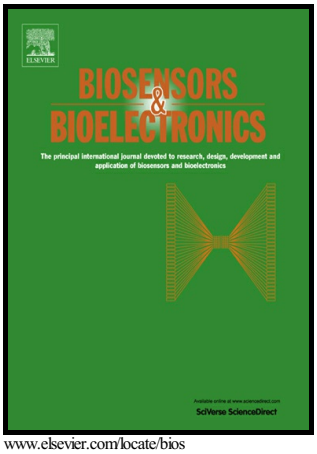


www.elsevier.com/locate/bios

Novel thin layer flow-cell screen-printed graphene electrode for enzymatic sensors

Hussein Kanso, María Begoña González García, Laura Fernández Llano, Su Ma, Roland Ludwig, Pablo Fanjul Bolado, David Hernández Santos

PII: S0956-5663(16)30826-0
DOI: http://dx.doi.org/10.1016/j.bios.2016.08.069
Reference: BIOS9066

To appear in: *Biosensors and Bioelectronic*

Received date: 4 June 2016
Revised date: 17 August 2016
Accepted date: 19 August 2016

Cite this article as: Hussein Kanso, María Begoña González García, Laur Fernández Llano, Su Ma, Roland Ludwig, Pablo Fanjul Bolado and Davi Hernández Santos, Novel thin layer flow-cell screen-printed graphene electrod for enzymatic sensors, *Biosensors and Bioelectronic* http://dx.doi.org/10.1016/j.bios.2016.08.069

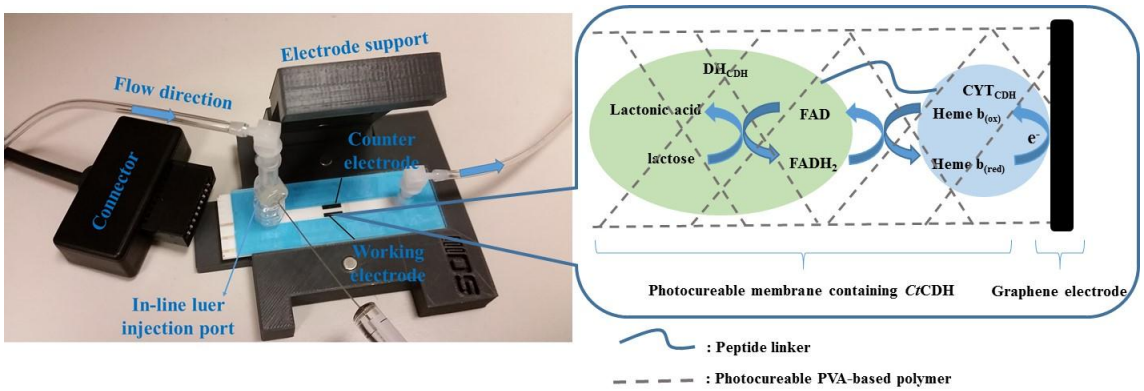
Novel thin layer flow-cell screen-printed graphene electrode for enzymatic sensors

Hussein Kanso,*[†] María Begoña González García,[†] Laura Fernández Llano,[†] Su Ma,[‡] Roland Ludwig,[‡] Pablo Fanjul Bolado,[†] and David Hernández Santos[†]

[†]DropSens, S.L., Edificio CEEI, Parque Tecnológico de Asturias, 33428 Llanera, Asturias, Spain.

[‡]Food Biotechnology Laboratory, Department of Food Science & Technology, BOKU-University of Natural Resources and Life Sciences, Muthgasse 18, A-1190 Vienna, Austria.

GRAPHICAL ABSTRACT



ABSTRACT

A new Screen-printed electrodes (SPE) integrated in one channel flow-cell was developed. The one channel flow-cell is attached and directly changeable with electrode. In the new flow-cell the injection is done through an "in-line luer injection port" which can be less aggressive than wall-jet flow cell for a biological recognition element immobilized on the surface of the electrode. The sample volume can be easily controlled by the operator through a syringe. In this novel thin layer flow-cell screen-printed electrodes, the working electrode was modified with graphene materials, and an enhancement of electroactive area to 388% over a standard electrode was found. This new configuration was applied to study the entrapped cellobiose dehydrogenase from the ascomycete *Corynascus thermophilus* (*Ct*CDH) in a photocrosslinkable PVA-based polymer. The calibration curve of lactose using optimized parameters shows a wide linear measurement ranges between 0.25 and 5 mM. A good operational stability of the *Ct*CDH-PVA-modified graphene electrode is obtained, which keeps the same initial activity during 8 h and exhibits a good storage stability with a decrease of only 9% in analytical response after 3 months storage at 4°C.

1. Introduction

Flow injection analysis (FIA) is a form of flow analysis developed by Ruzicka and Hansen in 1975 (Ŕužička and Hansen, 1975; Kissinger and Heineman, 1996; Tóth et al., 2004). It's a mature technique with well-defined principles of operation. In Flow Injection Analysis a defined sample volume is injected directly in a stream of a carrier (reagent, solvent, buffer solution) at consecutive intervals of time. As the flow goes through the flow cell and the detector, the analytical signal is continuously monitored by the recorder. The sample injection is highly reproducible and a large amount of samples could be analysed in short periods of time using a manual or automatic injection valve. FIA has many applications in the laboratory and in process control, as it is a powerful tool for analysis. Its versatility relies in its self-adaptation for different configurations depending on the chemical experiment designed. FIA is widely incorporated to sensor based systems and commonly used in food industries (O' Connell and Guilbault, 2001).