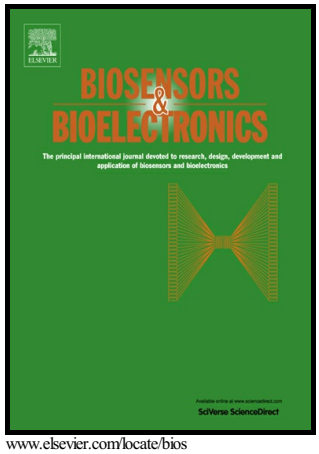
A glucose biosensor based on novel Lutetium bis-phthalocyanine incorporated silica-polyaniline conducting nanobeads

H. Al-Sagur, S. Komathi, H. Karakaş, D. Atilla, A.G. Gürek, T. Basova, N. Farmilo, A.K. Hassan



www.elsevier.com/locate/bios

PII: S0956-5663(17)30802-3
DOI: https://doi.org/10.1016/j.bios.2017.12.004
Reference: BIOS10149

To appear in: *Biosensors and Bioelectronic*

Received date: 30 August 2017
Revised date: 30 November 2017
Accepted date: 5 December 2017

Cite this article as: H. Al-Sagur, S. Komathi, H. Karakaş, D. Atilla, A.G. Gürek, T. Basova, N. Farmilo and A.K. Hassan, A glucose biosensor based on novel Lutetium bis-phthalocyanine incorporated silica-polyaniline conducting nanobeads, *Biosensors and Bioelectronic,* https://doi.org/10.1016/j.bios.2017.12.004

A glucose biosensor based on novel Lutetium bis-phthalocyanine incorporated silica-polyaniline conducting nanobeads

H. Al-Sagur[1], S. Komathi[1], H. Karakaş[2], D. Atilla[2], A. G. Gürek[2], T. Basova[3,4], N. Farmilo[1] and A. K. Hassan[1*]

[1]*Materials and Engineering Research Institute, Sheffield Hallam University, Sheffield, UK*

[2]*Gebze Technical University, Department of Chemistry, Gebze 41400, Kocaeli, Turkey*

[3]*Nikolaev Institutes of Inorganic Chemistry SB RAS, Lavrentiev Pr. 3, Novosibirsk 630090, Russia*

[4]*Novosibirsk State University, Pirogova Str. 2, Russia*

** Corresponding author*

Abstract

The facile preparation of highly sensitive electrochemical bioprobe based on lutetium phthalocyanine incorporated silica nanoparticles ($SiO_2(LuPc_2)$) grafted with Poly(vinyl alcohol-vinyl acetate) itaconic acid (PANI(PVIA)) doped polyaniline conducting nanobeads ($SiO_2(LuPc_2)$PANI(PVIA)-CNB) is reported. The preparation of CNB involves two stages (i) pristine synthesis of $LuPc_2$ incorporated SiO_2 and PANI(PVIA); (ii) covalent grafting of PANI(PVIA) onto the surface of $SiO_2(LuPc_2)$. The morphology and other physico-chemical characteristics of CNB were investigated. The scanning electron microscopy images show that the average particle size of $SiO_2(LuPc_2)$PANI(PVIA)-CNB was between 180-220 nm. The amperometric measurements showed that the fabricated $SiO_2(LuPc_2)$PANI(PVIA)-CNB/GOx biosensor exhibited wide linear range (1-16 mM) detection of glucose with a low detection limit of 0.1 mM. $SiO_2(LuPc_2)$PANI(PVIA)-CNB/GOx biosensor exhibited high sensitivity (38.53 $\mu A\, mM^{-1}\, cm^{-2}$) towards the detection of glucose under optimized conditions. Besides, the real (juice and serum) sample analysis based on a standard addition method and direct detection method showed high precision for measuring glucose at $SiO_2(LuPc_2)$PANI(PVIA)-CNB/GOx biosensor. The $SiO_2(LuPc_2)$PANI(PVIA)-CNB/GOx biosensor stored under refrigerated condition over a period of 45 days retains ~ 96.4 % glucose response current.

Key words: Silica nanoparticles, conducting nanobeads, lutetium phthalocyanine, glucose biosensor, PANI(PVIA)