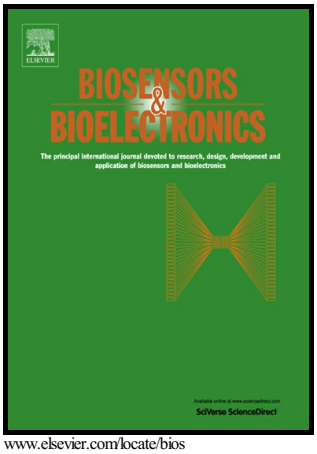

www.elsevier.com/locate/bios

Insights into a Hole Transfer Mechanism between Glucose Oxidase and a p-type Organic Semiconductor

Gintautas Bagdžiūnas, Šarūnas Žukauskas, Arūnas Ramanavičius

PII: S0956-5663(17)30782-0
DOI: http://dx.doi.org/10.1016/j.bios.2017.11.053
Reference: BIOS10129

To appear in: *Biosensors and Bioelectronic*

Received date: 4 October 2017
Revised date: 16 November 2017
Accepted date: 17 November 2017

Cite this article as: Gintautas Bagdžiūnas, Šarūnas Žukauskas and Arūna Ramanavičius, Insights into a Hole Transfer Mechanism between Glucos Oxidase and a p-type Organic Semiconductor, *Biosensors and Bioelectronic* http://dx.doi.org/10.1016/j.bios.2017.11.053

Insights into a Hole Transfer Mechanism between Glucose Oxidase and a p-type Organic Semiconductor

Gintautas Bagdžiūnas,[1,2]* Šarūnas Žukauskas,[2] Arūnas Ramanavičius[2]*

[1] Laboratory of Nanotechnology, Department of Material Science and Electrical Engineering, Center for Physical Sciences and Technology, Saulėtekio av. 3, Vilnius, LT-10257, Lithuania;
[2] Department of Physical Chemistry, Faculty of Chemistry and Geosciences, Vilnius University, Naugarduko str. 24, Vilnius, Lithuania.

*Corresponding authors are: Prof. Habil. Dr. Arunas Ramanavicius, e-mail: arunas.ramanavicius@chf.vu.lt and Dr. Gintautas Bagdziunas gintautas.bagdziunas@gmail.com.

Abstract

This manuscript describes a bioelectrochemical application of a new class of electrochemically generated hole-transporting (p-type) polymeric semiconductors (HTPS), which are based on carbazole core and the oxiran and thiiran reactive groups. Electrode based on transparent layer of indium tin oxide was electrochemically modified with a layer of HTPS and a monolayer of covalently immobilized glucose oxidase (GOx). The HTPS/GOx-based electrode was investigated for an evaluation of direct hole-transfer between the enzyme and electrode at a bio-electrochemically relevant potential *via* HTPS layer. The broad linear relationship between the peak-current density and glucose concentration from 2 to 15 mM and high stability of ITO/poly-CzS/GOx-electrode was observed. Moreover, it was determined that charge transfer rate constants are reliable for the establishment of advanced electron transfer between enzyme and electrode for the application of this HTPS/GOx-based electrode in long-lived biofuel cells and amperometric biosensors.

Keywords: Charge transfer, hole-transporting, organic semiconductor, carbazole, glucose biosensor, glucose oxidase.