Glucose and Ethanol Powered Biofuel Cells

Y. Oztekin\textsuperscript{1,2}, A. Kausaite\textsuperscript{1,3}, E. Zor\textsuperscript{4}, E. Bilici\textsuperscript{2}, A. Ramanaviciene\textsuperscript{1,3}, V. Krikstolaityte, A. Ramanavicius\textsuperscript{3*}

\textsuperscript{1} Vilnius University, Faculty of Chemistry, Naugarduko 24, LT-03225, Vilnius, Lithuania
\textsuperscript{2} Selcuk University, Faculty of Science, Department of Chemistry, Konya, Turkey
\textsuperscript{3} State Research Institute Center for Innovative Medicine, Zygimantu 9, LT-01102, Vilnius, Lithuania
\textsuperscript{4} Selcuk University, Faculty of Education, Department of Chemistry, Konya, Turkey
\textsuperscript{*} e-mail: arunas.ramanavicius@chf.vu.lt

Enzymatic biofuel cells are promising sources for powering of implantable biomedical devices [1]. In these systems, efficient electron transfer to/from enzymes is very important for the generation of electric potential and current between the anode and cathode. For this reason, electrochemistry of redox proteins or enzymes is on the research focus for many years. In this study, the efficiency of both anode and cathode was significantly advanced by phenanthroline derivatives, which were served as redox mediators. Most efficient phenanthroline derivatives were selected for design of biofuel cells [2]. Electropolymerization of phenantroline derivatives was applied in order to increase electrochemical properties of newly designed electrodes. During here presented research few enzymatic biofuel cells based on enzyme-modified anodes and cathodes powered by ethanol [3] and/or glucose [4] operating at ambient environment are described. Application of immobilized enzymes and the harvesting of the same and/or different types of fuels at both electrodes (cathode and anode) avoided the compartmentization of enzymatic biofuel cell. The maximal open circuit potentials of mentioned biofuel cells as well as other electrochemical characteristics of newly designed biofuel cells were evaluated.

It is believed that the efficiency of biofuel cell could be possibly even more improved by using gold nanoparticles and carbon nanotubes in combination with here evaluated enzyme-based system.

Acknowledgement: Financial support by postdoctoral fellowship funded by European Union Structural Funds project “Postdoctoral Fellowship Implementation in Lithuania”, SF-PD-2009-08-17-0151 is acknowledged.

References