GOLD ELECTRODES MODIFIED WITH POLYELECTROLYTE FOR BIOELECTROCHEMICAL APPLICATIONS

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Due to steadily increasing demand for electricity and gradual depletion of fossil fuels, the search for alternative energy sources has been gaining more and more attention from researchers. Simultaneously, the environmental awareness of society is rising, and the postulates of the so-called "Green Chemistry" are being taken into consideration [1]. Interdisciplinary fields of research such as bioelectrochemistry (mainly bioelectrochemical systems, BESs) are intensively developing because they could potentially be used as a solution of mentioned above energetic problems [2, 3]. BESs are electrochemical setups with a biological component which is represented by microorganisms (specific types of bacteria, yeast or algae). Those organisms can colonize an electrode or occur as planktonic forms in the electrolyte and are able to convert chemical energy from organic matter (e.g., pure glucose or a mixture of organic compounds from wastewater) to electric energy. It is worth mentioning that the current efficiency of those setups strongly depends on biological, thermodynamical and technical factors. One of the key ones is the bioelectrode – a material type, morphology, conductivity, toxicity toward microorganisms, stability during long term study, etc. Commonly utilized electrodes are made of carbon (e.g., cloth, brushes and paper). However, they have some drawbacks which leads to searching for a new type of electrode materials.

Herein, we present novel bioelectrodes consisting of copper foil covered by a thin gold film (sputtered and then electrochemically thickened), cationic derivatives of natural polymers (by using Layer-by-Layer technique) and a biofilm from *Lactobacillus rhamnosus* [4]. The morphology of as-prepared electrodes was characterized, among others, by scanning electron microscopy (SEM), infrared

spectroscopy (IR), and atomic force microscopy (AFM). The metabolic activity of lactic acid bacteria after culturing on the electrode surface was examined by the MTT assay. What is more, both samples, with and without living component, were tested electrochemically (voltammetric measurements). The study reveals that a well-developed lace-like bacteria network was formed at substrates. Furthermore, bacteria probably exhibited electrochemical activity. Preliminary studies revealed that tested system could pottentialy be used in BESs.

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