Layer by Layer Immobilization Technique for Preparation of Ionic Liquid/Catalase/Titanium Nitride Nanocomposite: Fabrication of Nitrite and Hydrogen Peroxide Biosensors

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Enzymes deposited in ordered monolayer or multilayer systems are important challenge in fabrication of biosensors and bioelectronic devices [1]. Many kinds of methods have been used for construction of ordered enzymatic monolayer or multilayers [2-3]. Among the various reported methods, the layer-by-layer (LBL) self-assembly technique based on electrostatic interaction attracted extensive interest due to its simplicity of the procedure, wide choice of materials that can be used, and precise control of the composition and thickness of the layer on the molecular level [4]. Due to favorable properties of ionic liquids(ILs) they are increasingly attracting the attention in various areas of electrochemistry [5]. Combination of biomolecules with nanomaterials is a new strategy in fabrication of novel biosensors due to unique electronic, optical, and catalytic properties of metal and semiconductor nanomaterials. Furthermore the synergic effects of ionic liquids with nanobiomaterials increase the analytical properties and stability of modified electrode. In the present research, a simple procedure was developed for the preparation of glassy carbon electrodes modified with a multilayer containing titanium nitride nanoparticles (d=15± 5nm), ionic liquid and catalase enzyme. The multilayer assembly exhibited good stability and excellent electrochemical reversibility for redox systems in the pH=7. It was found that seven monolayers could be deposited onto a titanium nitride film with well defined redox behavior. The modified electrode shows excellent electrocatalytic activity towards reduction of nitrite and hydrogen peroxide. The catalytic activity of the modified electrode depends to layer numbers.

REFERENCES