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Application of silicalite for improvement of analytical parameters of conductometric biosensors for glucose and sucrose determination

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A possibility of efficient enzyme adsorption on silicalite for the purpose of enzyme biosensor creation with improved analytical characteristics was investigated in this research. Silicalite was chosen due to its hydrophobic properties which can enhance adsorption of enzymes on the surface of electodes and improve the analytical characteristics of biosensors subsequently. As a conductometric transducers we used two identical pairs of steel, gold or platinum electrodes made with vacuum evaporation of metal onto pyroceramic or glass substrate (0.5 x 2,75 $см^2$). To create glucose and sucrose biosensors we used glucose oxidase and three enzyme system (glucose oxidase, mutarotase and invertase), respectively. Biosensors for quantitative glucose and sucrose determination were developed using three type of enzyme immobilization (glutaraldehyde (GA) cross-linking, adsorbing on silicalite modified electrodes, and combination of previous two). These three methods of immobilization were studied and comparied. The enzyme biosensors modified by silicalite along with GA were characterized by much higher sensitivity compared with the biosensors based on others types of immobilization. It was concluded that GA with silicalite in complex sufficiently enhances enzyme adsorption on electrodes. These biosensors performed satisfied inter-reproducibility (RSD – 18%) and good intra-reproducibility (RSD - 7%). Thus, the method of enzyme immobilization using silicalite along with GA is highly effective for the creation of high sensitive biosensor with good signal reproducibility.

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