CATALASE BIOMIMETIC SENSOR BASED ON METALS

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Introduction

In recent years, there has been development in the creation of biomimetic sensors, in which bioselectors are replaced by enzyme analogues that combine high sensitivity and stability. The requirements of modern analysis are sensitivity, selectivity, low cost, simplicity and expressness. Biomimetic sensors perfectly meet these requirements. This work is devoted to the study of a catalase biomimetic sensor using a smart material, where metals such as Pb, Ag, Al were used as transducers.

Methods

Experimental studies of the electrode potential of the catalase reaction as a function of time were carried out using the potentiometric method. The experiments were carried out in an electrochemical cell consisting of a reference electrode ($Ag/AgCl/AgCl^-$) and biomimetic sensors. Double-distilled water served as a background solution.

Results

The experiments were carried out at various concentrations of H_2O_2. The presence of hydrogen peroxide in the system leads to a change in the value of ΔE, and an increase in the H_2O_2 concentration increases the jump in the electrochemical potential. The results showed that biomimetic sensors based on metals (Pb, Ag, Al), using smart material ($TPhPFe^{3+}/Al_2O_3$) exhibit high sensitivity and detect the lowest trace concentrations of hydrogen peroxide in an aqueous solution.

Conclusions

The developed biosensors $TPhPFe^{3+}/Al_2O_3/Pb$, $TPhPFe^{3+}/Al_2O_3/Al$, $TPhPFe^{3+}/Al_2O_3/Ag$ of the catalase type are active and make it possible to determine trace concentrations of H_2O_2 in an aqueous solution.

Synthesized catalase biosensors are characterized by long-term stability, high sensitivity and reproducibility. The maximum sensitivity to the concentration of H_2O_2 in an aqueous solution for $TPhPFe^{3+}/Al_2O_3/Pb$ was 10^{-8} wt.%, for $TPhPFe^{3+}/Al_2O_3/Al$ –10^{-6} wt.% and for $TPhPFe^{3+}/Al_2O_3/Ag$ – 10^{-8} wt. %.