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Summary of Doctoral Thesis

Biocatalysts immobilized in ordered layers applied in biosensor construction

Biosensors - modern devices used in chemical analysis, due to the short response time, high selectivity, sensitivity and possibility of miniaturization of the setup, have found wide application, e.g. in medical diagnostics, environmental monitoring, control of technological processes. Although, for many years extensive research have been carried out in the field of sensors, there is still a great need to develop cost-reasonable and efficient diagnostic equipment, enabling fast and accurate detection of the analyte.

The research purpose of the doctoral dissertation was to design of layered sensor systems using oxidoreductive enzymes, i.e. the chemical electrode modification and the development of an efficient method of immobilization of laccase or tyrosinase on the prepared substrates. The Langmuir-Schaefer technique, electropolymerization and *spin-coating* were used to obtain stable solids that had provided proper enzyme contact with the substrate. An important aim of the project was to determine the activity, as well as the stability of enzymes immobilized in such systems. The main aim of the study was to verify possibility of using new semiconducting heterocyclic compounds, which were synthesized in Professor Jadwiga Sołoducho's group, in the construction of biosensors and to determine their effect on the catalytic activity of the immobillized proteins. The macromolecules used in the research are electronically conductive compounds, the free electron flow is determined by the conjugated double bonds. Additionally, the long alkyl chains, which present in their structures, facilitate formation of well-ordered layers and immobilization of the biocatalysts on their surfaces. The final step of the doctoral thesis was to build a model of optical biosensor for the determination of phenolic compounds in water solutions. This kind of device could, in the future, be used for monitor of the environmental pollutions.