Nanostructured surfaces

Improvement of amperometric transducer selectivity using nanosized phenylenediamine films

V.N. Pyeshkova[1,2], O.Y. Dudchenko[1,2], O.O. Soldatkin[1], S.V. Dzyadevych[1,2]

[1]Institute of Molecular Biology and Genetics of NASU, Laboratory of Biomolecular Electronics, 150 Zabolotnogo Str., 03680, Kyiv, Ukraine,
E-mail: victoriya.p@gmail.com

[2]Institute of High Technologies, Taras Shevchenko National University of Kyiv, prosp. Glushkova 4-g, 02033 Kyiv, Ukraine

One of the main directions in biosensor development is improvement of working characteristics of electrodes. The modification of electrodes surfaces by some special layers has been the major area in electrochemical sensors in recent years. Nowadays polymerized films are widely used to increase sensitivity and selectivity of biosensor. To create nanosized polymerized film on the electrode surface commonly electrochemical polymerization is applied. Electrochemical polymerization has a lot of advantages such as short process and low cost. Moreover the film thickness and composition can be easily controlled using required electrochemical parameters during the polymerization process.

Polyphenylenediamine (PD) is an aromatic polymer exhibiting high thermostability and has found important applications in biosensor development. In this work to obtain a highly selective detection of hydrogen peroxide, in the presence of different interfering compounds (ascorbic acid, uric acid, etc.), an nanosized semi-permeable polymer film was formed on the surface of platinum electrode by electropolymerization of phenylenediamine.

A number of modifications of PD layer for biosensor applications were investigated in this paper. The parameters of ortho-, para-, meta- PD coating on the platinum electrodes were studied. The significant difference in the properties of the electrodes covered by different polymers was observed. The transducers covered by meta-PD polymer showed the best selectivity. Conditions of phenylenediamine electropolymerization on the surface of amperometric transducer were optimized. Operational and storage stability of nanosized polymer membranes were studied.

Thus, application of additional nanosized electropolymerized phenylenediamine films can significantly improve the selectivity of amperometric biosensors.