

Nanochemistry and Nanobiotechnology

The application of the nanosized zeolites for optimization of the acetylcholinesterase based biosensors for determination of the aflatoxin B1

K.V. Stepurska^{1,2}, O.O. Soldatkin^{1,2}, V. M. Arkhypova¹, A.P. Soldatkin^{1,2}, S.K. Kirdeciler³, S. Galioglu³, B. Akata³, F. Lagarde⁴, S.V. Dzyadevych^{1,2}

¹ *Institute of Molecular Biology and Genetics of National Academy of Sciences of Ukraine, Zabolotnogo Str., 150, Kyiv-03680, Ukraine.
E-mail: stepurskaya@gmail.com*

² *Institute of High Technologies, Taras Shevchenko National University of Kyiv, Volodymyrska Str., 64, Kyiv-01601, Ukraine.*

³ *Middle East Technical University, Ankara, 06531 Turkey.*

⁴ *University Claude Bernard Lyon 1, Institute of Analytical Sciences, UMR5280 CNRS/UCBL/ENS, 5 rue de la Doua, 69100 Villeurbanne, France*

In recent years the environmental monitoring is becoming increasingly urgent task. There are many toxic compounds, such as aflatoxins, which require environment toxic control. Aflatoxin B1 is the most commonly found in food and also the most toxic. Organization of the express control of the concentration of the aflatoxin B1 is an actual task for environmental monitoring. One of the promising trends in research for determination of aflatoxin B1 is the biosensorics, namely the development of the enzyme electrochemical biosensors. Usage of the nanosized zeolites for enzyme immobilization is an advanced approach that enables creation of the biosensor without using toxic compounds such as glutaraldehyde. It is hoped that usage of the zeolites can improve the characteristics of the biosensor such as linear range, sensitivity, operational stability etc.

In this work a potentiometric biosensor based on acetylcholinesterase (AChE) immobilized by adsorption on the different zeolites for the determination of the aflatoxin B1 was developed. The calibration curves for determination of the concentration of aflatoxin B1 were obtained. Signal reproducibility and operational stability of the biosensor were studied. The possibility of controlled change of characteristics of AChE-based biosensors was demonstrated and that is important for the environmental monitoring.

The authors gratefully acknowledge the financial support of this study by Project European IRSES-NANODEVICE and by NASU in the frame of Scientific and Technical Program "Sensor devices for medical-ecological and industrial purposes: metrology and trial performance".