Nanochemistry and biotechnology

Application of gold nanoparticles to improve characteristics of pH-FETs biosensor based on immobilized uricase

O.A. Zinchenko[1], O.O. Zinkina[2], L.V. Shkotova[1], O.P. Soldatkin[1]

1Institute of Molecular Biology and Genetics (National Academy of Sciences of Ukraine), Laboratory of Biomolecular Electronics
150 Zabolotnogo St., Kiev, 03680, UKRAINE
E-mail: helen_nazarenko@yahoo.com

[2]Institute of High Technologies, Taras Shevchenko National University of Kyiv, 4G Academician Glushkov Avenue, Kyiv, 03022, Ukraine.

Uric acid is the main final product of purine metabolism in humans. It is an important marker in clinical diagnosis because the elevated uric acid concentration in blood (hyperuricemia) is associated with a number of diseases, such as gout, insulin resistance, hypertension, and renal insufficiency [1,2]. High level of serum uric acid is also considered as a risk factor for myocardial infarction and stroke [3]. Therefore, the methods of rapid, sensitive and selective determination of uric acid in body fluids are of great interest in clinical chemistry.

A highly sensitive, selective potentiometric biosensor based on immobilized uricase from *Bacillus fastidious* was developed and its laboratory prototype was created. The enzyme was used as a sensitive element and pH-sensitive FETs were used as the transducers of a biochemical signal into electric.

The composition of a bioselective membrane based on uricase with gold nanoparticles was optimized. The Optimal conditions of biosensor's functioning, such as pH and ionic strength of the working buffer solution were selected. The Signals reproducibility of developed biosensor when analyzing uric acid concentration and its storage stability were studied. The characteristics of developed amperometric and potentiometric biosensors were compared.

The main advantage of potentiometric measuring method in comparison with amperometric one is the absence of interfering substances influence. It provides a possibility to use potentiometric biosensors for the real samples analysis without any additional subsidiary layers, which are required in amperometric biosensors.

1. *Lin K.C., Lin H.Y., Chou P. J.* The interaction between uric acid level and other risk factors on the development of gout among asymptomatic hyperuricemic men in a prospective study // J. Rheumatol.-2000.-**27.**-P. 1501-1505.
2. *Johnson R.J., Kang D.-H., Feig D., Kivlighn S., Kanellis J., Watanabe S., Tuttle K.R., Rodriguez-Iturbe B., Herrera-Acosta J., Mazzali M.* Is there a

pathogenetic role for uric acid in hypertension and cardiovascular and renal disease? // *Hypertension*.-2003.-**41.**P. 1183-1190.

3. *Bos M.J., Koudstaal P.J., Hofman A., Witteman J.C.M., Breteler M.M.B.*, Uric Acid Is a Risk Factor for Myocardial Infarction and Stroke // *Stroke*.-2006.-**37.**-P. 1503-1507.