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ORIENTED IMMOBILIZATION OF ANTIBODIES ON THE ELECTRODE SURFACE FOR IMPROVING THE ANALYTICAL CHARACTERISTICS OF ELECTROCHEMICAL IMMUNOSENSORS

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The electrochemical method of detection associated with specific immunochemical reactions occurring on the working area of the transducer is extremely attractive. Electrochemical immunosensors are characterized by simplicity, reliability, relatively low cost, the possibility of achieving low detection limits, simplicity of automation and miniaturization, small operating volumes.

Method of immobilization of antibodies on the working surface of the sensor played a key role in creating of immunosensors.

The robust and oriented immobilization of the bioreceptor increases the sensitivity and accuracy of detection, and also allows the regeneration of the surface, thereby increasing the life of the sensor. Immunosensors developed using covalent immobilization of antigens/antibodies are characterized by higher accuracy and reproducibility.

The search for new ways of targeted immobilization of protein receptors on the transducer surface using “friendly linkers“ is an extremely urgent task today, since it allows for a short time to provide the bioreceptor immobilization in aqueous solutions with physiological pH and temperature. Such immobilization methods do not degrade protein structures that reduce their recognition ability, and allow multiple reuses of antigen / antibody and greater variety of immunosensors designs.

Two methods of immobilizing antibodies on the transducer surface are proposed:

1. Electrochemical assisted copper-catalyzed azide-alkyne cycloaddition using copper nanoparticles.
2. Electrografting of 5-diazo-1H-[1,2,4]triazole-3-carboxylic acid followed by antibody immobilization by carbodiimide cross-linking.

Carcino-embryonic antigen/antibody (CEA) was used as a model. The working electrode was a glass-carbon disc (Metrohm). The electrochemical response was detected voltammetrically and using the electrochemical impedance spectroscopy method (mediator system was K4[Fe(CN)6] / K3[Fe(CN)6]).

The obtained results demonstrate the high strength and stability of bioreceptor immobilization in comparison with the physical sorption.

BIOGRAPHY

Kozitsina A has completed her PhD from Ural State University named after A.M. Gorkiy (Yekaterinburg, Russia). She is a head of department of analytical chemistry Institute of Chemical Engineering of the Ural Federal University named after the first President of Russia B.N.Yeltsin. She has published more than 30 papers in reputed journals.

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