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Analytical Chemistry 2018: On the pros and cons of some electrochemical techniques for analyzing microbiological corrosion (MIC) - Reza Javaherdashti - Parscorrosion Consultants

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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:. Electrochemical assisted copper-catalyzedazide-alkyne cycloaddition using copper nanoparticles. . Electrografting of 5-diazo-1H-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.

An immunosensor is a kind of affinity biosensor based on interactions between an antigen and specific antigen immobilized on a transducer surface. Immunosensors possess high selectivity and sensitivity due to the specific binding between antibody and corresponding antigen, making them a suitable platform for several applications especially in the medical and bioanalysis fields. Electrochemical immunosensors rely on the measurements of an electrical signal recorded by an electrochemical transducer and can be classed as amperometric, potentiometric, conductometric, or impedimetric depending on the signal type. Among the immunosensors, electrochemical immunosensors have been more perfected due to their simplicity and, especially their ability to be portable, and for in situ or automated detection. This review addresses the potential of immunosensors destined for application in clinical analysis, especially cancer biomarker diagnosis. The emphasis is on the approaches used to fabricate electrochemical immunosensors. A general overview of recent applications of the developed electrochemical immunosensors in the clinical approach is described.Electrochemical immunosensors are a type of integrated devices that provide selective quantitative or semi-quantitative analytical information using biorecognition phenomenon between an antibody (Ab) and antigen (Ag) with an electrochemical transducDue to the stable, strong and specific binding between these biomolecules, electrochemical immunosensors are characterized by high selectivity and These analytical devices have found application in different fields, including food, environmental, agricultural analysis, clinical diagnosis and others The interactions between Ab and Ag can be observed using different labels, such as radioactive, chemiluminescent and fluorophore compounds. Enzymes are another group of labels, including horseradish peroxidase (HRP), alkaline phosphatase (ALP), laccase and glucose oxidase (GOx), which need some substrates added to the testing solution, such as hydroquinone, catechol, o-aminophenol, naphthyl phosphate, p-aminophenol phosphate, ferrocene and glucose [3]. In the past few years, the enzyme-linked immunosorbent assay (ELISA) used for specific detection of different analytes has become very popular and commonly used in laboratory practice. This method, depending on the format of the assay (i.e., direct, sandwich or competitive) could be equally useful for the

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detection of both antigens and antibodies. It uses the secondary antibodies conjugated with a specific enzyme. After addition of a suitable substrate, the enzyme catalyzes a specific reaction, and the product can be quantified spectrophotometrically to measure the color intensity. Thus, in fact, ELISA is an optical approach, which has some disadvantages, such as requirements related to light sources, detectors.

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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