Short Communication

Poly-ortho-phenylenediamine Modified Pt/Ir Microelectrode as Impedimetric Biosensor

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A low impedance between the microelectrode surface and brain biological tissue interface is important for a good signal quality during immunosensor recording to prevent tissue damage during electrical stimulation. The incorporation of a conducting polymer on a microelectrode surface with an internal diameter of 50 μm can significantly reduce the electrode-electrolyte (brain lysate) impedance. An impedimetric immunosensor assay was developed by exploiting the Poly ortho-phenylenediamine (PoPD) conducting properties and has been electrodeposited on the Pt/Ir microelectrode surface. The modified PoPD-Pt/Ir was further biofunctionalised with glutaraldehyde (GA) that act as a crosslinker to mouse monoclonal A β antibody (mA β ab) immobilisation on PoPD-Pt/Ir. An immunosensor is a simpler and faster method for real-time monitoring of amyloid beta (A β 40) based on antigen-antibody binding properties compared to the microdialysis technique in a real-time neurochemical study. This Pt/Ir-PoPD-GA- mA β ab immunosensor was tested with a trace amount of A β 40 in the brain tissue lysate sample. Nyquist plots revealed the specific binding of mA β ab-amyloid beta (A β 40) to the biofunctionalised PoPD modified microelectrode surface. Furthermore, proposed equivalent circuits were developed in conjunction with each stage of biofunctionalisation layers on modified Pt/Ir microelectrode to fit and interpret the circuit components that could further explain certain chemical processes and mechanisms of the immunosensor system such as the effect of the electrical component of PoPD film formed during fabrication and its physicochemical properties. The advantages of this needle-like immunosensor include the use of a minimal amount of protein immobilisation reagents with a highly sensitive, selective, and rapid detection technique.

Keywords: Electrochemical Impedance Spectroscopy, Equivalent circuit, Amyloid Beta, Immunosensor, Platinum microelectrode.

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