Thin Film Electrodes Based on Zn_2SnO_4 on In_2O_3 Substrates Developed for Electrochemical Determination of Dopamine

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Abstract
Thin films provide several advantages for biosensors, such as high surface-to-volume ratio, conductivity, conductivity, stability, specificity, biocompatibility and strong electrochemical activity, depending on the material used. The electrodes of biosensors are modified with thin film coatings. These thin film-modified electrodes act like transducers, possessing physicochemical properties such as electrical, magnetic, mechanical, and optical characteristics. As a result, the signal generated from the analyte-electrode interaction can be converted into a measurable signal [1]. In recent advancements in biosensor technology, thin film electrodes have emerged as a significant area of development. Dopamine (DA) plays a crucial role in the onset and management of various diseases, including Alzheimer's and Parkinson's. Consequently, monitoring DA levels is essential, and biosensors offer a promising alternative to traditional methods, which are often time-consuming and costly [2,3]. This study, we present the application of Zn_2SnO_4 (ZTO) deposited onto an In_2O_3:SnO_2 (ITO) thin film as the electrode platform for biosensing applications targeting DA [4]. The ZTO thin film was deposited using the DC magnetron sputtering technique with a Zn_2Sn (ZT) target and O_2 gas. Electrochemical analysis were performed using cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and differential pulse voltammetry (DPV). Electrochemical results indicated that these developed electrodes successfully applied for sensitive determination of DA. Additionally, experiments conducted in the presence of potential interfering substances such as ascorbic acid (AA), uric acid (UA), bovine serum albumin (BSA), and fish sperm double-stranded DNA (fsDNA) demonstrated that the electrodes could effectively be used for the voltammetric determination of DA.

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