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Fabrication and Characterization of Electrochemically Prepared Bioanode (Polyaniline/Ferritin/Glucose Oxidase) for Biofuel Cell Application

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ABSTRACT

Porous matrix of polyaniline (PANI) has been electrodeposited along with the entrapment of biocompatible redox mediator ferritin (Frt) and glucose oxidase (GOx) on the surface of glassy carbon (GC) electrode. The characterizations have been carried out by Fourier-transform infrared spectroscopy (FTIR), X-ray Diffraction (XRD) and Transmission electron microscopy (TEM). The enhanced electrochemical signal transfer rate from enzyme to the electrode surface was due to the intimate contact of the enzyme with the electrochemically polymerized conducting PANI matrix. The PANI/Frt/GOx modified GC bioanode was used to investigate the electrocatalytic activity as a function of the concentration of glucose in the range of 10-60 mM. It was confirmed by the electrochemical impedance spectroscopy (EIS), the thick deposition of PANI layer becomes more compact due to which the charge transfer resistance of PANI matrix becomes higher. All the electrochemical measurements of the electrode were carried out by using cyclic voltammetry (CV) and linear sweep voltammetry (LSV). CV curves were recorded at different scan rates (20-100 mV/s) at 50 mM of glucose in 0.3 M potassium ferrocyanide. A normalized saturation current density of $22.3 \pm 2 \text{ mA/cm}^2$ was observed for the oxidation of 50 mM glucose at a scan rate of 100 mV/s.

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