Non-Enzymatic Electrochemical Sensing of Glucose by MWCNT Modified with Aluminium / Zinc Layered Hydroxide-Ferulate Nanocomposites

Mohamad Syahrizal Ahmad
Department of Chemistry, Faculty of Science and Mathematics, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia

Illyas Md Isa
Department of Chemistry, Faculty of Science and Mathematics, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia

Rozihan Saari
Methodist Secondary School, 35900 Tanjong Malim, Perak, Malaysia

Mohamad Hafiz Ahmad Tajudin
Faculty of Applied Sciences, Universiti Teknologi MARA, Perak Branch, Tapah Campus, Tapah Road, 35400 Tapah, Perak, Malaysia

Abstract

A high sensitivity and a wide working range electrochemical sensor for the determination of glucose (GLC) has been fabricated using multi wall carbon nanotubes (MWCNT). The introduction of aluminium/zinc layered hydroxide-ferulate (Al/ZLH-FA) as the conducting matrix has enhanced the conductivity of MWCNT. This was achieved by studying the electrochemical behaviour of GLC on Al/ZLH-FA/MWCNT paste electrode, using square wave and cyclic voltammetry analysis. Under the optimized experimental conditions (pH, scan rate), a linear plot for GLC concentrations 3.0 µmol L-1 to 300 µmol L-1 (R2 = 0.9984) and calculated LOD is to be 1.3 µmol L-1. Transmission electron microscopy (TEM) and scanning electron microscopy (SEM) have been used to characterize the morphology of Al/ZLH-FA and Al/ZLH-FA/MWCNT, respectively. The fabricated Al/ZLH-FA/MWCNT electrode was successfully applied to glucose drinks, exhibiting excellent stability and reproducibility, which made it worthwhile for analytical applications.

Keywords

Aluminium / zinc layered hydroxide-ferulate, electrochemical sensor glucose, multi wall carbon nanotubes.