

Modification strategy of screen-printed carbon electrode with functionalized multi-walled carbon nanotube and chitosan matrix for biosensor development

ABSTRACT

Biosensor is a rapid technique to determine the analyte based on the incorporation of bioactive materials with physio-chemical transducing element. In this work, multi-walled carbon nanotube (MWCNT) was functionalized with carboxylic groups and mixed with chitosan (CS) prior to drop casting on screen-printed carbon electrode (SPCE). The acid treatment of multi-walled carbon nanotube by using mixture of H₂SO₄ and HNO₃ in 3:2 ratio was better compared to treatment by piranha solution, in terms of carboxylic group attachment and capacitance effect on the current response. The functionalized carbon nanotubes were characterized by using fourier transform infrared spectroscopy, field emission scanning electron microscopy and cyclic voltammetry analysis. Few modification parameters have been optimized to maximize the performance of working electrode including ratio of MWCNT:CS, coating volume and drying method. The addition of MWCNT/CS matrix on the screen-printed carbon electrode greatly enhanced the electron transfer rate and increased the electrode active surface area for further immobilization of bioactive components.

Keyword: Screen-printed carbon electrode; Multi-walled carbon nanotube; Chitosan; Biosensor