DIRECT ELECTROCHEMISTRY OF CYTOCHROME C AT A GLASSY CARBON ELECTRODE MODIFIED WITH SINGLE-WALL CARBON NANOTUBES

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Single-wall carbon nanotubes (SWNTs) have been the focus of intense interest due to their unique structure and properties since their discovery in 1993 [1]. However, the electrochemistry of SWNTs is less studied so far. Only four papers are reported about the cast films of SWNTs [2-5].

In this paper, the SWNTs were oxidized in air during the purification process [6]. A suspention of SWNTs in N, N-dimethylformamide was cast on a glassy carbon (GC) electrode to form a carbon nanotube film. After the SWNT film-modified electrode had been activated in the potential range from 1.5 to –1.0 V at a scan rate of 1 V s^{-1} for 1.5 minutes, a pair of well-defined redox waves of cytochrome c were obtained at the activated SWNT-modified electrode in 0.1 M phosphate buffer solution (pH=6.24), Ep_a=50.8 mV and Ep_c= -22.9 mV at a scan rate of 0.02 V s^{-1}, while no electrochemical response of cytochrome c was observed at a bare GC electrode activated in same conditions. These indicate that the activated SWNT-modified electrode has good promotion toward the reduction/oxidation of cytochrome c. The experimental results show that the activated SWNT-modified electrode has good reproducibility and stability. The dependence of reduction peak current on the concentration of cytochrome c is a linear relationship in the range from 5.0×10^{-5} to 7.0×10^{-4} mol dm^{-3}. When the Signal Noise Ratio is 3, the detection limit is 3.0×10^{-5} mol dm^{-3}. The reduction peak current of cytochrome c at the activated SWNT film-modified electrode increases linearly with the square root of scan rate in the range from 0.05 to 0.32 V s^{-1}, which suggests that the electrode reaction of cytochrome c is a diffusion-controlled process. Furthermore, the interaction of cytochrome c with adenine was characterized by electrochemistry, FTIR and UV-Vis.

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