Electrochemical Sensor Based on Silver Nanoparticles/Multi-walled Carbon Nanotubes Modified Glassy Carbon Electrode to Detect Cyanide in Food Products

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In this study, silver nanoparticles/carbon nanotubes (Ag NPs/CNTs) was successfully synthesized on the surface of glassy carbon (GC) electrode using a facile chemical technique to evaluate determination of cyanide as a toxic substance in food products. The structural properties of synthesized CNTs and Ag NPs/CNTs were studied by scanning electron microscope, energy dispersive X-Ray and X-Ray diffraction analyses. The voltammetric and amperometric techniques were used for electrochemical studies of modified electrodes. The structural studies showed high density, porosity and aspect ratio of the Ag NPs/CNTs electrodes. The cycle voltammetric studies of Ag NPs/CNTs/GC electrode showed sharp and stable oxidation peak at 0.75 V in pH 7 for cyanide. Amperometry results exhibited that Ag NPs/CNTs/GC electrode was sensitive, selective and stable to determinate cyanide. The linear range, sensitivity, and detection limit of modified sensor were 0.1 to 210 μM , 0.7192 $\mu\text{A}/\mu\text{M}$ and 4 nM, respectively which were better values than those obtained in previous researches. Study on the interfere effect of Br^- , SO_3^{2-} , CH_3COO^- , I^- , $\text{C}_2\text{O}_4^{2-}$, Cl^- , SO_4^{2-} , CO_3^{2-} , Ni^{+2} , Co^{2+} , HPO_4^{-2} , F^- and Zn^{+2} analytes showed that there was not any interfere in determination of cyanide on Ag NPs/CNTs/GC electrode surface. The recorded amperometrogram results of real sample showed the modified electrode was successfully applied for cyanide detection in apricot juice.

Keywords: Carbon nanotubes; Ag nanoparticles; Cyanide; Electrochemical sensor; Apricot juice

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