

Single-walled carbon nanotube/tungsten-modified glassy carbon electrode as a novel sensor for the electrochemical determination of ascorbic acid

ABSTRACT

A novel electrochemical sensor based on a hybrid of single-walled carbon nanotube and nanoparticle modified glassy carbon electrode was prepared by using mechanical attachment technique. The nanocomposite immobilized on the surface of a glassy carbon electrode offers substantial enhancement in the sensitivity and lower detection limit for the electrochemical determination of ascorbic acid. Voltammetric characterization indicated that the anodic peak current increased about 3.5 times in comparison with the bare glassy carbon electrode. A linear calibration plot was obtained in the ascorbic acid concentration range of 0.2–10 mM which is described by the equation $y = 23.82x + 7.043$. The detection limit and sensitivity were determined to be $1.89 \mu\text{M}$ and 24 mA M^{-1} , respectively. The morphology study using a field emission scanning electron microscope showed that single-walled carbon nanotube/tungsten nanocomposite was successfully attached to the surface of the electrode. Moreover, the modified electrode was satisfactorily used for the analysis of commercial vitamin C tablets. This work provides a sensitive and simple electrochemical approach for the selective determination of ascorbic acid.

Keyword: Ascorbic acid; Cyclic voltammetry; Glassy carbon; Single-walled carbon nanotubes; Tungsten