Synergistic effect of single-walled carbon nanotube decorated with silver nanoparticle for the estimation of glucose in real systems

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Abstract
Glucose detection is of great interest from several points of view ranging from medical applications of blood glucose sensing to ecological approaches, such as in wastewater treatment, in food and textile industries, in environmental monitoring, and so forth [1]. Many attempts have been made to determine glucose without the use of enzymes. The majority of these nonenzymatic electrochemical glucose sensors rely on the current response of glucose oxidation directly at the electrode surface. Early research on this subject have focused on the use of noble metals for developing nonenzymatic sensors [2, 3]. Herein, we report a study on the nonenzymatic glucose detection based on the Ag-single-walled carbon nanotube (Ag-SWNTs) nanostructure catalyst. The high density of Ag nanoparticles was grown on the surface of SWNTs and characterized with transmission electron microscope (TEM) and X-ray diffraction (XRD) techniques. We fabricated highly sensitive, stable, and fast response amperometric glucose sensors operating at physiological conditions (pH 7.4). The modification of a glassy carbon (GC) electrode with the Ag-SWNT nanostructures increases its active area and promotes the electron transfer for the glucose oxidation reaction via the SWNTs. The Ag-SWNT nanostructures not only catalyze glucose oxidation at a remarkably negative potential in enzyme-free solution but also are insensitive to potential interfering agents such as ascorbic acid and uric acid. This study demonstrates that Ag-SWNT nanostructures can be a potential catalyst in fabricating novel nonenzymatic glucose sensors with high sensitivity, selectivity, and stability.

Keywords: Glucose, Nonenzymatic reaction, Ag nanoparticle, Sensors.

References