Silver Nanoparticle Impregnated Porous Carbon as a Nonenzymatic Hydrogen Peroxide Sensor

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doi: 10.20964/2016.07.04

Received: 14 March 2016 / Accepted: 3 May 2016 / Published: 4 June 2016

In this work, a non-enzymatic hydrogen peroxide sensor has successfully been realized based on Ag nanoparticles doped carbon modified carbon paste electrode (AgNPs/C-CPE) in pH = 7 phosphate buffer solution (PBS). The Ag nanoparticles doped carbon composites (AgNPs/C) were synthesized by a simple one-step carbonization method using sucrose with AgNO₃ as the carbon precursor. AgNPs/C-CPE for electrochemical responds of hydrogen peroxide was explored by using cyclic voltammetry (CV) and amperometry. Besides, contents of AgNPs and pH values were optimized. The AgNPs/C-CPE containing 13.5 wt% AgNPs exhibits the highest electrocatalytic activity for the detection of hydrogen peroxide in pH = 7 PBS. At an applied potential of 0 V, the non-enzymatic sensor of hydrogen peroxide also showed a good linear relationship in a wide concentration range of 0.5–400 μM with a correlation coefficient of 0.9987, a detection limit of 0.3 μM at a signal-to noise ratio of 3, and a high sensitivity of 309.4 μA cm⁻² mM⁻¹. The amorphous carbon-supported AgNPs not only avoided the use of chemical reductants but also improved the electrocatalytic activity and stability of Ag NPs.

Keywords: Nano-silver, hydrogen peroxide determination, nonenzymatic sensor, sucrose, electrocatalysis

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