

## Surfactant/carbon nanofibers-modified electrode for the determination of vanillin

Ziyatdinova G., Kozlova E., Ziganshina E., Budnikov H.  
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

---

### Abstract

© 2015 Springer-Verlag Wien. Glassy carbon electrode (GCE) modified with carbon nanofibers (CNF) and surfactants has been tested for the determination of vanillin in Britton-Robinson buffer. Cationic cetylpyridium bromide (CPB), nonionic Triton X100, and anionic sodium dodecylsulfate surfactants under different concentrations have been tested as modifier of CNF/GCE. The best form of CVs and voltammetric characteristics of vanillin have been obtained on CPB (0.5 mmol dm<sup>-3</sup>)/CNF/GCE when the 1.4-fold increase of oxidation peak currents has been observed in comparison with CNF/GCE. The electrode has been characterized by scanning electron microscopy and electrochemical impedance spectroscopy. These data indicate that CPB/CNF coverage significantly increases the charge transfer ( $R_{ct} = 0.24 \pm 0.04$  vs.  $4.6 \pm 0.1$  k $\Omega$  for GCE). Mechanism of vanillin oxidation on CPB/CNF/GCE is suggested. The electrooxidation is diffusion-controlled irreversible process with participation of two electrons and two protons and formation of o-quinone. Differential pulse voltammetry has been used for the quantification of vanillin. The working conditions for the vanillin detection (pH 2.0, pulse parameters) have been found. The linear dynamic ranges of the vanillin determination are 0.50-75.0 and 75.0-750  $\mu\text{mol dm}^{-3}$  with the limits of detection and quantification 0.14 and 0.46  $\mu\text{mol dm}^{-3}$  of vanillin, respectively. The developed approach has been applied for the vanillin quantification in foodstuff (vanilla sugar, vanilla pods, and cream milk powder). The results obtained are in good agreement with the data of standard spectrophotometric method.

<http://dx.doi.org/10.1007/s00706-015-1559-8>

---

### Keywords

Carbon nanofibers, Chemically modified electrodes, Sensors, Surfactants, Vanillin, Voltammetry