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Voltammetric detection of synthetic water-soluble phenolic antioxidants using carbon nanotube based electrodes

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Abstract

Glassy carbon electrodes (GCE) modified with carbon nanotubes (CNT) have been created for detection of phenolic compounds-one of the important group of antioxidants in life sciences. The surface of electrode has been characterized by atomic force microscopy. The presence of CNT leads to an at least 20-fold increase in the surface roughness of the electrode. The CNT layer displays closely intertwined vermicular structures with high degree of homogeneity at CNT suspension concentration of 0.2-0.5 mg L -1. Synthetic water-soluble antioxidants (hydroquinone, catechol, pyrogallol, and their derivatives) are electrochemically active on bare GCE and CNT-modified GCE in phosphate buffer solution pH 7.4. Effect of substitutes in molecular structure of phenolic antioxidants has been evaluated. In several cases, oxidation at CNT-modified GCE occurs at potentials that are less positive by 100-200 mV in comparison to bare GCE. The electrodes were studied with respect to their capability of phenols voltammetric sensing. CNT-modified GCE display an enlarged linear range in the calibration graphs and lower detection limits. Voltammetric method for determination of hydroquinone, catechol, pyrogallol, and their derivatives has been developed. © Springer-Verlag 2010.

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Keywords

Carbon nanotubes, Chemically modified electrodes, Phenols, Synthetic antioxidants, Voltammetry