

ABSTRACT

The objective of the present work is the study of the electrochemical behaviour of two diagnostic tumor markers of great importance, vanillylmandelic acid (VMA) and homovanillic acid (HVA), on carbon-based electrodes by using cyclic and differential pulse voltammetry. A comparison was made among non-modified glassy carbon electrode (GCE) and GCE modified by multi-walled carbon nanotubes, Nafion (Nafion/GCE) and poly(neutral red) (PNR/GCE), and further boron doped diamond (BDD) electrode which was activated by anodic polarization ($E_{\text{akt}} = +2,4 \text{ V}$, $t = 30 \text{ s}$) or by polishing on alumina slurry. Significant differences in the voltammetric responses of VMA and HVA were found, not only among utilized electrode materials which also influenced the way of controlling the oxidation process, but also they depend on the pH value of aqueous media in which these acids occurred. An acidic environment is the most suitable for their determination. Calibration dependences were measured in $0.1 \text{ mol}\cdot\text{l}^{-1}$ phosphate buffer pH 3.0 which was chosen as an optimal supporting electrolyte for differential pulse voltammetric determination. Achieved detection limits were 0.6, 0.9, 0.8 and $1.2 \text{ }\mu\text{mol}\cdot\text{l}^{-1}$ for HVA and 0.4, 1.5, 2.4 and $1.1 \text{ }\mu\text{mol}\cdot\text{l}^{-1}$ for VMA at BDD electrode, non-modified GCE, Nafion/GCE and PNR/GCE, respectively. Limits of quantification for both organic compounds on all tested electrode materials are sufficient for their analysis in urine. Verification of the possibility of simultaneous determination of the studied compounds in mixture was also carried out. Anodically oxidized boron-doped diamond electrode was applied for measurements in real urine samples directly and after solid phase extraction by using a pre-optimized procedure.