

Abstract of the Diploma Thesis

In this Diploma Thesis, the electrochemical behavior of 4-nitrophenol (4-NP) was studied at a newly prepared large-surface carbon film electrode (ls-CFE) using techniques of DC voltammetry (DCV) and differential pulse voltammetry (DPV) with the aim to develop sensitive analytical methods for its determination. Voltammetric behavior of 4-NP was investigated in the region of anodic potentials, in dependence on the pH of the medium used (realized using Britton-Robinson buffer). The optimum pH values for the determination of 4-NP were chosen as follows: pH 3.0 (for DCV) and pH 7.0 (for DPV). During anodic oxidation of 4-NP on the ls-CFE at the concentration of the analyte of $1 \cdot 10^{-4}$ mol/l, the passivation of the electrode surface occurred. Thus, it was decided to record series of measurements always at a new carbon film.

Using the sample of 4-NP (at the concentration of $1 \cdot 10^{-4}$ mol/l), the repeatability of the application of individual carbon films was tested, with obtained *RSD* values of 3.7% and 3.6% for DCV and DPV, respectively. Under optimum conditions, the calibration dependences of 4-NP were measured in the concentration range from $1 \cdot 10^{-6}$ to $1 \cdot 10^{-4}$ mol/l, with the limits of quantification (L_{QS}) of $1.5 \cdot 10^{-6}$ mol/l (for DCV at the ls-CFE) and $4.6 \cdot 10^{-7}$ mol/l (for DPV at the ls-CFE). The applicability of the newly developed methods for the determination of 4-NP was verified on model samples of drinking and river water. The L_{QS} thereby obtained were of the same concentration order as those in the samples of deionized water.

Furthermore, the optimum conditions were found for the use of preliminary preconcentration of the analyte by a solid phase extraction (SPE) with subsequent measurement of DP voltamograms of 4-NP at the ls-CFE; the L_Q thus achieved was of $1.4 \cdot 10^{-8}$ mol/l at the SPE from 100 ml of the original sample to 1 ml of the measured sample. The applicability of this methodology was tested on the model samples of drinking and river water, in which the L_{QS} achieved were in all cases in the order of 10^{-8} mol/l. The yield of 4-NP after the SPE from deionized water was over 97% and, even in the model samples of river water, it was more than 95%, which is the yield significantly higher than in the majority of papers dealing with this topic.

The electrochemical conversion of 4-NP was studied using cyclic voltammetry (CV) at the ls-CFE in acidic, neutral and alkaline media.