

Abstract

This Diploma Thesis is targeted on the determination of 5-nitrobenzimidazole (5-NBIA) using following techniques: DC voltammetry (DCV) and differential pulse voltammetry (DPV). As working electrodes, a silver amalgam paste electrode (AgA-PE), which was constructed for this determination in the form of a new prototype, a bismuth film electrode (BiFE), at which the optimum conditions for the deposition of the bismuth film at a suitable substrate (glassy carbon electrode and gold electrode were tested for this purpose) were initially optimized, and a glassy carbon electrode (GCE) were used.

The optimum conditions for the voltammetric determination of 5-NBIA at the AgA-PE (in a medium of Britton-Robinson buffer (BR-buffer) of pH 7.0 for both DCV and DPV), at the BiFE with gold substrate (BR-buffer of pH 9.0 for both DCV and DPV; the film was deposited “ex situ” in a stirred plating solution (1000 mg L⁻¹ Bi(III) solution in 0.1 mol L⁻¹ acetate buffer of pH 4.5) for 300 s), and at the GCE (BR-buffer of pH 5,0 for both DCV and DPV). Under these conditions, calibration dependences were measured in the concentration ranges of 0.1 – 100 μmol L⁻¹ (pro DCV a DPV na AgA-PE) and 1 – 100 μmol L⁻¹ (pro DCV a DPV na BiFE a GCE), and the limits of quantification (L_{QS}) were calculated for particular methods: $L_Q \approx 1.2 \mu\text{mol L}^{-1}$ (both DCV and DPV at the AgA-PE), 0.54 μmol L⁻¹ (DCV at the BiFE), 2.0 μmol L⁻¹ (DPV at the BiFE), 0.8 μmol L⁻¹ (DCV at the GCE), and 1.2 μmol L⁻¹ (DPV at the GCE).

The practical applicability of the newly developed methodology was verified for the direct determination of 5-NBIA in drinking and river water model samples, with $L_{QS} \approx 1 \mu\text{mol L}^{-1}$.