Abstract

Development and testing of new non-toxic electrode materials, their preparation and the development of analytical methods applicable for determination of selected substituted nitrobenzimidazoles is the main aim of this Ph.D. Thesis.

New working electrodes based on the modification of surface of polished silver solid amalgam electrode (p-AgSAE) by other electrodes materials which contain mainly mercury (mercury meniscus modified silver solid amalgam electrode (m-AgSAE), mercury film modified silver solid amalgam electrode (MF-AgSAE)), bismuth (bismuth film on silver solid amalgam electrode (BiF-AgSAE)) or carbon (electrode modified by microcrystalline natural graphite–polystyrene composite transducer (CFE)) were developed.

The optimum deposition time for preparation of film electrodes were discover and verified.

Their electrochemical behavior (stable and reproducible responses during measurement) were investigated and further used in voltammetric determination of mutagenic or carcinogenic environmental pollutants 2-amino-6-nitrobenzimidazole (ANBT) and 5-nitro-benzimidazole (5-NBIA). These analytes could be determined by direct current voltammetry (DCV) or differential pulse voltammetry (DPV).

The attempt at increasing the sensitivity using adsorptive striping DCV or DPV at all tested electrodes with both compounds was not successful. As an alternative method to decrease of the limit of quantification for DPV of 5-NBIA at p-AgSAE addition of cetiltrimethylammonium bromide (CTMAB) was used. Limit of quantification under the optimal conditions decreased about twice by addition of CTMAB in comparison with measurement in the absence of the surfactant with keeping good accuracy.

All newly developed electrodes were found to be suitable alternatives to toxic mercury electrodes and their applicability was verified also on the model samples of deionized, drinking and river waters.