ABSTRACT

Main goal of this Ph.D. thesis is to develop voltammetric methods for the electrochemical study of novel antimycobacterial compounds hydroxynaphthalene-carboxamides.

Firstly, this study was focused on the miniaturization of voltammetric methods and construction of an electrochemical microcell due to usually small volume of samples that are associated with an analysis of biologically active compounds in biological matrices. Therefore, all aspects of the voltammetric procedure were studied in a relation to miniaturization. Microcells were based on commercially available electrodes: glassy carbon electrode as a reliable electrode material with well-described characteristics and a novel silver solid amalgam electrode. This study was carried out with analytes 4-nitrophenol, pesticide difenzoquat, and 1-hydroxy-*N*-(4-nitrophenyl)naphthalene-2-carboxamide. Attention was paid especially to the optimization of oxygen removal procedures in the drop of a solution. Developed miniaturized methods had the same parameters for the determination of studied compounds as in bigger volumes. The proposed electrochemical microcell can be generally used for voltammetric analysis of those samples of biological or environmental origin that are usually available in very limited volumes.

Second part of the thesis was focused on the electrochemical study of novel antibiotics. A model compound, 1-hydroxy-*N*-(4-nitrophenyl)naphthalene-2-carboxamide, was used for the pilot study concerning investigation of reduction and oxidation of the model analyte by voltammetric methods. The model analyte was used to carry out the optimization of parameters of determination such as composition of supporting electrolyte and pH of the solution by cyclic, differential pulse, square wave and adsorptive stripping voltammetry in developed electrochemical microcell on a glassy carbon electrode. This investigation continued by a study of twenty-two ring-substituted 1-hydroxynaphthalene-2-carboxamides. These compounds were studied by cyclic voltammetry with a goal to correlate their oxidation potentials and structure via Hammett substituent constants. Furthermore, relationship between biological activity and oxidation potential of derivatives was closely investigated with a goal of finding a correlation between the electrochemistry and pharmacology that can provide relevant information about a design of novel antibiotic agents.