ABSTRACT

The subject of research work was described on the basis of the monothematic publication cycle which concerns the use of various carbon nanomaterials as surface modifiers of commercially available carbon–based electrodes, such as glassy carbon (GCE), boron–doped diamond (BDDE), and ultra–trace graphite (UTGE), and the application of developed modified electrodes in voltammetric analysis of selected biologically active compounds, such as pesticides (dichlorophen, metobromuron, carbendazim), and a veterinary drug (nitroxinil).

In this work, comprehensive microscopic and electrochemical characterizations of the developed electrodes were conducted by means of atomic force microscopy (AFM), electrochemical impedance spectroscopy (EIS), and cyclic voltammetry (CV).

The next stage of the research was to develop the procedures for the quantitative voltammetric determination of selected compounds. For this purpose, experimental conditions, *i.e.* supporting electrolyte and its pH, and techniques parameters, such as square–wave voltammetry (SWV) and square–wave adsorptive stripping voltammetry (SWAdSV), were optimized. Further, the utility of the proposed procedures was verified by the quantitative analysis of selected analytes in various real samples, including environmental (river water and soil) and food (milk), using standard addition method. Moreover, the selectivity of the developed procedures using modified electrodes was tested. Furthermore, the information about mass transport in diffusion layer and the nature of the electrochemical processes of the selected compounds at the working electrodes surfaces (diffusion– or adsorption–controlled) was obtained by cyclic voltammetry.

The subject of my doctoral dissertation have been enriched with additional research goals, such as (i) the determination of the dissociation constant of the pesticide dichlorophen using potentiometric titration, (ii) the establishment of the stoichiometry of the β-cyclodextrin-dichlorophen in inclusion complex using spectroscopic methods, (iii) the determination of the corrosion properties of stainless steel used to produce garden tools in the presence of pesticide carbendazim using electrochemical and microscopic methods.