Streszczenie w języku angielskim (Summary in English)

Analytical methods such as gas chromatography, high performance chromatography liquid, capillary electrophoresis or spectroscopic methods allow to determine a lot of biologically active compounds. The mentioned techniques demand a time-consuming sample preparation procedure and the cost of the apparatus is very high. A good alternative for them are electrochemical methods. Electrochemical techniques such as square wave voltammetry (SWV), differential pulse voltammetry (DPV), or adsorptive stripping voltammetry (AdSV) are successfully used for analysis of many biologically active compounds or for determination of numerous metal ions. The current trends in electrochemistry demand searching of new environmentally friendly electrode materials.

The presented PhD thesis entitled „Preparation and application of carbon ceramic electrodes for determination of selected biologically active compounds" was focused on the preparation and characterization of entire volume modified carbon ceramic electrodes. This kind of electrode material was first introduced by Lev and his co-workers in 1990. They are produced using a well know sol-gel method, which is based on hydrolysis and condensation processes. Typically, to an inert silicone matrix graphite powder (GP) is introduced. During my experiment four different materials were used as a modifier. I proposed the carbon ceramic electrodes modified using carbon nanotubes, ferrierite, bismuth oxide nanoparticles and reduced graphene oxide. Each of the developed sensor was characterized in the term of electrochemical properties using cyclic voltammetry. It was shown that the proposed electrodes possess a good stability in time, high repeatability and renewable surface. Additionally, I proved that they can be successfully used for determination of the selected biologically active compounds. I proposed the determination procedures for different compounds: 4-chloro-3-methylphenol, estradiol, syringic acid and gallic acid. The effects of the pH value of supporting electrolyte, instrumental parameters, as well as possible interferents were tested. It was also shown that the proposed electrodes possessed better analytical properties compared with the bare electrode. The lower limit of detection (LOD) and lower limit of quantification (LOQ) was observed.

In addition, I confirmed usefulness of the developed methods for the determination of selected substances in real samples such as red wine, tea, tap water or a pharmaceutical tablet. It is worth to notice, that during the experiments I also proposed a new construction of a ceramic carbon electrode which allowed to eliminate the problem related with the tight-fitting of carbon-silica composite to the electrode body because of its tendency to shrink during the drying step. This disadvantage was eliminated by construction of the electrode body made of the epoxy resin instead of the classical teflon tube.