

Abstract

Presented Bachelor Thesis is focused on the development and utilization of a simple and inexpensive electrochemical DNA biosensor for the detection of DNA damage caused by chemical carcinogens. A large-surface carbon film electrode (ls-CFE), having several advantages, such as its fast preparation, a simple mechanical renewal of the electrode surface, a good reproducibility of measurements, an absence of problems connected with “electrode history”, and simple chemical modification, was used for its preparation.

The initial part of the work is devoted to the investigation of the composition of a carbon ink suspension, which was optimized and tested using a $[\text{Fe}(\text{CN})_6]^{4-/3-}$ redox system by cyclic voltammetry (CV), further to the optimization of the DNA biosensor (DNA/ls-CFE) preparation and to its characterization, which was performed using two electrochemical techniques – CV and electrochemical impedance spectroscopy (EIS).

The second part of this Thesis deals with the application of the newly prepared DNA biosensor for the detection of DNA damage by model chemical carcinogens. The direct interaction of DNA with fluorene and 2-aminofluorene (2-AF) was investigated using CV and EIS at the DNA/ls-CFE. The obtained results confirmed that the interaction of DNA with fluorene and 2-AF causes DNA damage, leading to the formation of strand breaks, which falls off from the electrode surface. Thus, the applicability of this novel electrochemical DNA biosensor was verified, too.