

Abstract

2-Nitrofluorene is a model representative of nitrated polycyclic aromatic hydrocarbons (NPAH) which belongs to a group of mutagens and carcinogens. Interaction of DNA with genotoxic 2-nitrofluorene was monitored by an electrochemical DNA biosensor made of a glassy carbon electrode (GCE) and low molecular weight DNA from salmon sperm. Techniques used are electrochemical impedance spectroscopy (EIS), cyclic voltammetry (CV) and square-wave voltammetry (SWV). Using the EIS technique, no damage to DNA, which would cause strand breaks in DNA, was observed, whereas using the CV technique, the intercalation of NF to the structure of DNA was observed, leading to the formation of a NF–DNA complex. The intercalation results in a reduction of electroactive sites which can be oxidized. It was verified using the SWV technique, by which a decrease of the peak heights of adenosine and guanosine was observed.

Because of the dangerous effect of NF on the structure of DNA, an electroanalytical method for its determination was developed. An applicability of the method was successfully tested on a model sample of sand. For the development of the technique, differential pulse voltammetry (DPV) was used in a mixture of the Britton-Robinson buffer of pH 7.0 and ethanol in a ratio of 7:3 (v/v) and with a periodic pretreatment of the electrode surface. The limit of quantification (L_Q) was $1 \cdot 10^{-7}$ M.