DNA BASED TESTS OF QUANTUM DOTS TOXICITY UNDER UV IRRADIATION

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Abstract

Use of the biological and microbiological tests, in vitro assays and computational modeling for characterization of nanomaterials is presented and bioanalytical methods for sensitive and selective detection of nanomaterials effects towards selected biomolecules are evaluated. Among technical devices of this branch of bioanalytical chemistry, DNA-based biosensors have been numerously demonstrated as effective warning devices for tests of DNA affinity interactions and structural changes caused by chemicals and physical factors.

An effect of the CdTe and CdS quantum dots of various sizes and fluorescence intensity on a deep degradation of dsDNA under UV-C radiation was investigated. Electrochemical DNA-based biosensors composed of glassy carbon electrode with a dsDNA layer covered by the nanoparticles and cyclic voltammetry together with electrochemical impedance spectroscopy with the [Fe(CN)6]3-/4- redox indicator, as well as square-wave voltammetry of the guanine moiety signal were used for the evaluation of DNA degradation. To confirm the DNA degradation, gel electrophoresis after irradiation of the DNA solution containing CdTe or CdS has been performed as well. It was found that damage to DNA by UV-C is enhanced in the presence of quantum dots in dependence on their fluorescence ability.

Keywords: Nanomaterials, toxicity, UV-C irradiation, electrochemical biosensor, DNA degradation

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