Abstract

This thesis deals with optimization and application of assays for determination of ecotoxicity of nanomaterials based on nanoscale zero-valent iron (nZVI), which are used in remedial technologies. After *in situ* application of nZVI, a significant decrease in toxicity of polluted environment was detected; however, a potential negative effect of nanoparticles has not been sufficiently investigated yet. Standard used tests were found to be incompatible with nZVI for toxicity determination. Specific characteristics of nZVI, such as high reactivity and sorption, complicate determining the toxicity by routinely used ecotoxicity tests. Concentration ranging from 0,1 to 10 g/l that are used in practise for decontamination were tested. These concentrations resulted in formation of turbidity, which prevented the use of standard tests. In this work, a new method has been optimized for *in vitro* toxicity testing of nZVI and derived nanomaterials using bacteria. The principle of this assay is determination of oxidative stress (OS). The disbalance between formation and degradation of reactive oxygen species (i.e. OS) leads to irreversible changes in biomolecules of organisms and formation of undesirable products. A toxic and mutagenic product - malondialdehyde (MDA) is formed during lipid peroxidation and it is a marker of the cell damage due to OS. MDA was determined in this work with HPLC - FLD method and then the toxic effect of several iron nanomaterials was compared and evaluated.

Key words

Nanoscale zero-valent iron, nZVI, toxicity, malondialdehyde, nanomaterials, oxidative stress