Abstract

The aim of this thesis is to identify the ecotoxicity of contaminated soil and water during bioremediation. Different test organisms were selected for the battery of ecotoxicity tests such as the bacterium *Vibrio fischeri*, the terrestrial plants *Sinapis alba*, *Lactuca sativa*, and *Hordeum vulgare*, the water plant *Lemna minor*, the earthworm *Eisenia fetida*, and the crustaceans *Daphnia magna* and *Heterocypris incongruens*. A comparison of individual biotests with various organisms and endpoints should demonstrate their suitability and sensitivity for the ecotoxicity evaluation of contaminated soil and water. The bioassays were used for the evaluation of the bioremediation of hydrocarbon-contaminated soil, composting of PAH-contaminated soil and remediation of contaminated groundwater.

The ecotoxicity of hydrocarbon-contaminated soil originating from a brownfield was evaluated during a 17-month biodegradation pilot test (experiment I). The initial concentration of total petroleum hydrocarbons (TPH) in the soil was 6380 $\mu g.g^{-1}$ dry weight; the concentration of TPH in the soil decreased by 65.5 % after bioremediation. The highest toxicity was detected in the first period of bioremediation; however, certain toxic effects were detectable during the whole bioremediation process. The contact tests were the most sensitive of all of the bioassays. The ecotoxicity results did not always correlate with the decrease in TPH concentrations in the soil during bioremediation.

The ecotoxicity of PAH-contaminated soil originating from a brownfield site was evaluated during a 12-month composting pilot test (experiment II). The initial total content of polycyclic aromatic hydrocarbons (PAH) in the soil was 1723.5 $\mu g.g^{-1}$ dry weight; the composting process showed to be an efficient tool in the removal of PAHs from the soil. The highest ecotoxicity was detected in the first period of composting. The decrease in PAH concentrations correlated with the reduction of soil toxicity during composting; however, the ecotoxicity results varied according to the type of the biotest.

Bioassays were also used to evaluate ecotoxicity of contaminated groundwater during remediation (experiment III). The ecotoxicity was detected with the particular bioassays; the significant correlation was found between the results of some tests.

The results of the experiments confirmed the urgency to evaluate bioremediation not only according to chemical analysis, but also with the ecotoxicity tests.