Abstract

Nowadays, nanoscale zerovalent iron (nZVI) is a nanomaterial commonly used in remediation practice. Although worldwide applications of nZVI have shown its effectiveness in degradation and immobilization of a wide range of organic and inorganic pollutants, potential negative effects of nZVI on exposed organisms have not been sufficiently explored. To avoid possible environmental risks, understanding of the mechanism of nZVI toxicity and its overall effects on microbial populations indigenous to remediation sites is needed. The presented thesis summarizes current knowledge of nZVI toxicity, and, moreover, deals with the development and application of a new test for *in vitro* evaluation of acute toxicity caused by newly developed nZVI-based materials. Additionally, in this thesis, the risk associated with changes in the toxicity of the aforementioned materials during the aging process was examined. In the last part, the effect of several nZVI-based materials on microbial communities of a real contaminated soil was monitored and evaluated using artificial microcosms. In addition, in this part, the potential of nZVI and its derived materials in combination with a biostimulation step during nanobioremediation is outlined.