

## Zero valent iron (ZVI) nanoparticles as an inducer of microbial oxidative stress and the possibility of its elimination

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Zero valent iron (ZVI) nanoparticles have strong reducing properties and therefore they are applied in remediation of groundwater contaminated by halogenated compounds etc. These reducing properties, however, induce oxidative stress in indigenous microflora, which often has an irreplaceable position with regard to complete mineralization of present contaminants. Finding a way to protect microorganisms against negative effects of ZVI nanoparticles in this and another situations would significantly extend the possibilities of their safe use. The microorganisms of different taxonomic category (*G<sup>+</sup>* bacterium *Rhodococcus erythropolis*, *G<sup>-</sup>* bacterium *Pseudomonas fluorescens* and yeast *Trichosporon cutaneum*) were exposed to commercially produced products NANOFER 25 and its stabilized form NANOFER 25S (Nanoiron, Ltd. Czech Republic). Inhibitory activity against above mentioned microorganisms was studied over time and concentration dependence, and compared with other agents that cause oxidative stress as menadione (100  $\mu$ M) and hydrogen peroxide (500  $\mu$ M). Application of both types of nanoparticles in the amount of 1.0 or 5.0 g/l caused a higher oxidative stress than the mentioned chemicals. Humic substances isolated from oxyhumolite (material occurred in overburden of brown coal deposits on the North part of the Czech Republic) are able to interact with microbial cells without significant changes of metabolic activity of microbial populations. Selected humic substances provided very good protection of the microorganisms against oxidative stress induced by ZVI nanoparticles. With regard to the origin and availability of these substances, they can be suitable additives for decontamination technologies, where both the ZVI nanoparticles activity and the biodegradation activity of microorganisms is needed.

### Biography

Alena Cejkova received Ph.D. at the Department of Biotechnology, Institute of Chemical Technology in Prague, where she is a Full Professor of biotechnology since 2002. Her research is focused on the physiology, communication and biotechnology applications of microorganisms. She is author of more than 40 publications in peer-reviewed scientific journals and monographs.

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