

Nanochemistry and biotechnology

Evaluation of potential toxicity of nanomaterials used as admixtures in cement-based composites

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Intensive development of nanotechnology enables the production of advanced composites in many fields of science including civil engineering – especially cement-based composites technology (e.g. cement mortars and concretes). Excessive usage of nanomaterials in daily life is likely to become a significant source of nanoparticle pollution if they are not properly handled or recycled. Release of nanomaterials can be very important issue in case of cement-based materials which are constantly exposed to environmental conditions. These undesirable conditions cause the degradation of composite and a possible release of nanomaterials into water, soil and air. Microorganisms are the first organisms that start interaction with such pollutants in the environment, nevertheless studies on the toxicity of cement additives on microbial models are still limited.

The aim of the project is to investigate the effect of the most popular metallic nanostructures used to produce cement-based composites on selected microorganisms.

Four nano-oxides including Al_2O_3 , Fe_3O_4 , ZnO , and CuO were used in experiments. Characterization of the toxicity of released nanostructures as well as their influence on selected functional parameters was determined by microbiological tests on model and environmental microorganisms from genera *Escherichia*, *Staphylococcus*, *Pseudomonas*, and *Candida*.

Studied nanoparticles had various effects on selected microorganisms. Toxicity was dependent on the material and probably on its dispersion. Each type of used microorganisms showed different set of features in response to studied nanooxides which leads to the conclusion that experiments should not be restricted to only one microorganisms. Furthermore, problems with determination of MIC indicated poor dispersion of studied nanoparticles.

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