

DESCRIPTION FOR THE GENERAL PUBLIC

Effect of metallic nanostructures release from cement-based composites on the selected microorganisms

Intensive development of nanotechnology enables the production of advanced composites in many fields of science. One of the fields of science which find its high interest in application of nanomaterials is civil engineering - especially cement-based composites technology (e. g. cement mortars and concretes). Amount of used nanomaterials in daily life are likely to become a significant source of nanoparticle pollution if not properly handled or recycled. The number of nanomaterials-based publications has increased significantly over the years; however, the majority of publications are focused on the synthesis and development of novel nanomaterials and the effect of nanomaterials on the environment seems to have secondary interest. Release of nanomaterials might be very important issue in case of cement-based materials which are constantly exposed to environmental conditions. These undesirable conditions causes degradation of composite and possible release of nanomaterials into the waters, soil and air, which may constitute a threat to humans and the environment. So far, release phenomenon of nanomaterials from cementitious composites and their impact on the environment has not yet been recognized.

The life cycle of a cement-based composite (e.g. concrete) can be divided into three main phases: building of the construction (and curing), the use of the element involving the deterioration of the composite (abrasion, cycles of freezing and thawing, the impact of aggressive environment) and dismantling/demolition of the object.

The aim of the project is to investigate the effect of the release of most popular metallic nanostructures used to produce cement-based composites (during the lifetime of composite) on selected microorganisms. Characterization of the toxicity of released nanostructures will be determined by microbiological tests on selected environmental bacteria.

In the presented project the toxicity of released nanomaterials from cement-based composites during first days of curing and during its exploitation will be characterized.

The proposed research methodology it will allow to accelerate and imitate processes of degradation such as: aging of composites, wear, freeze-thawing cycles and exposure of aggressive environments (sulfur acid and chlorides).

The proposed project will allow to characterize in what amount nanomaterials are released from the composite cement (depending on environmental conditions), and what is the effect of potentially released nanostructures on selected microorganisms. Obtained results will contribute to improve the knowledge and increase of the awareness on the issue of application of nanomaterials in the construction industry (especially cement-based composites). The results of the project can contribute to improve the environmental awareness and increase safety of the society.