2.8.23

Surface properties of industrial Fe-oxide nanoparticles: Mechanisms of bio-degradation, bio-accumulation and mutagenic effects

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The interest in nanotechnology has led to substantial increases in scientific publications over the last 10 years. Nanotechnology promises medical advances; smarter and lighter materials; cleaner energy; faster and more efficient electronics; and better ways to detect, prevent, and treat pollution. But there also could have risks, and the perception of those risks is growing in American and European society. Briefly, many voices raise in order that environmental and toxicological risks linked to the nanotechnologies are studied before their massive development. One of the most immediate concern is to know how nanomaterials interact with people and the ecosystem.

In that context an international consortium of laboratories initiated experiments to better understand the way nanoparticles interact with prokaryote and eukaryote cells in presence or absence of heavy metals: surface properties, in term of energy and efficiency to sorb heavy metals and adhesion to biofilms have been characterized. The bio-degradation of nanoparticles by micro-organisms from soil and the role of exopolymers have been studied. Experiments to determine the genotoxicity of various type of nanoparticles towards bacteria and mammalian cells have also been initiated. The effect of nanoparticles on the transfer of heavy metal within the cell i.e. enhancement or decrease has been initiated.

2.8.24

Physico-chemical and biological interactions between Ce^{III}, Ce^{IV} nanoparticles and Escherishia Coli

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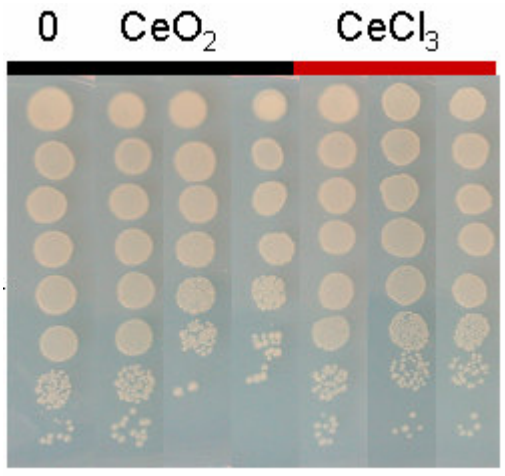
Abstract

The production of nanoparticles (such as carbon nanotubes, fullerene, inorganic quantum dots, etc…) is increasing exponentially for applications covering a very broad spectrum from electronic, chemistry and biology.

This very fast development rise questions about the impact of these man-made new nanomaterials on environment and human health. We have studied the impact of cerium on gram-negative bacteria (Escherishia Coli). A model dispersion of Ce^{IV} nanoparticles (8nm CeO_2 oxydes) and Ce^{III} ions were tested. Quantification of Ce toxicity for both speciation reveal strong differences. It is possible to link the coverage of the bacterium cell wall with Ce^{IV} nanoparticle to their viability. Insight into the toxicity mechanism is proposed.



Survival tests after contact with Ce^{IV} nanoparticles and Ce^{III} ions.