

ABSTRACT BOOK

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Seminar Microscopy of the Nanoworld – Abstracts

In this presentation the approach on ecotoxicity testing of NP in soil organisms and bio-imaging methodologies for evaluating fate will be discussed.

Session 8 – Moderator: Filomena Caeiro

Aquatic ECOTOxicology of NANOMaterials – from Ecotoxicology to Nano(eco)toxicology – What Is the Matter?

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ABSTRACT

The term ecotoxicology, introduced by Truhaut by the end of the sixties, was defined as "the branch of toxicology concerned with the study of toxic effects, caused by natural or synthetic pollutants, to all levels of biological organization from the molecular to whole communities and ecosystems, in an integral context" (Truhaut, 1977). The earliest acute toxicity tests are dated mid nineteenth century, where toxic chemicals in industrial waters were the matter of, the first standard method was not published until 1945 (Hoffman et al, 1995). The crustacean *Daphnia magna* began to be used to evaluate pollution (Ellis, 1937 in Hoffman et al., 1995) and the use of aquatic organisms to evaluate wastewaters gave raise to its description as bioassays (Doudoroff et al. 1951). Measuring the effects of emergent pollutants and of nanomaterial-related in particular, is a challenge in the new era of nanotechnology. Nanomaterials are no more new as they are involved in hundreds of products already competing in the market. Nanoecotoxicology, seen as a scientific discipline by its own, was born with the purpose of generating data and knowledge about nanomaterials effects on humans and on the environment, and was defined as the "science of engineered nanodevices and nanostructures that deals with their effects in living organisms (Oberdörster et al., 2005). Nanomaterials have significant technological potential but new strategies are needed regarding nanomaterials use, effects and disposal in a sustainable Society. In fact, there are huge differences between conventional/bulk and nanomaterial-related scenarios. Adjectives to qualify properties of NP are being used, such as "small length scales dramatically alter the properties of nanoscale objects compared to their bulk counterparts (...)" (Brown et al., 2007). Expressions like "multiple stressors", "relationship among stressors" or "bio-interaction" gain new life due to the different properties of NP and the measure of effects is hardly meaningful in the absence of particle chemical characterization more than mass concentration, e.g. surface area, number of particles, particle size or reactivity properties. What about fate, interaction with organisms or mode of action? It is claimed that little progress is being made towards determining fate, transport, transformation, and ecotoxicological behaviour of these materials once released into the environment. Ecotoxicological information on nanomaterials is limited. Only a very limited number of ecotoxicological studies have been performed on the effects of NP, namely nanoAg, nanoTiO₂, nanoZnO, C60, on environmentally relevant species, e.g. bacteria, algae, crustaceans, fish and plants. Society is facing the new paradigm of the Nanoworld era once nanomaterials do not behave in a predictable way. With this in mind the discussion is opened related to the need for revision of the European regulation on chemicals – REACH.