NanoFATE Deliverable 3.2

Chronic ENP ecotoxicity: Comparative assessment of the ecotoxicology of pure ENPs in relation to test organisms and biological endpoints

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Research Report Summary

The aim of this deliverable D3.2 was to derive (eco)toxicity endpoints from chronic tests upon Ag and ZnO nanoparticles exposures for selected soil organisms (the earthworm Eisenia fetida, the collembolan Folsomia candida, the isopod Porcellionides pruinosus and the nematode Caenorhabditis elegans) and water organisms (the algae Pseudokirchneriella subcapitata, Chlamydomonas reinhardtii, the diatom Cyclotella meninghiana, the cyanobacterium Synechoccocus leopoldensis and the gram-negative bacterium Pseudomonas putida, the cladocera Daphnia magna, and the bivalve Mytilus galloprovincialis).

After protocol adaptations (D3.1), tests were carried out considering the nanoparticles to be tested but also their free metal ions (using $AgNO_3$ and ZnCl2) or the microsized chemical compounds (ZnO). Toxicity results from aquatic and soils organism exposures were compared and whenever possible endpoints were derived (NOEC, LOEC, EC10, EC20, EC50).

Silver nitrate was always more than or as toxic as silver nanoparticles, for the soil and aquatic species tested here. The reproductive response of Daphnia magna (expressed as number of neonates per daphnid) to $AgNO_3$ and Ag ENP was the most sensitive endpoint of all tested.

For zinc, it was observed that ZnO ENPs of 30 nm were more toxic to algae than $ZnCl_2$. For D. magna there were no differences in toxicity for reproduction between ZnO ENPs. On the

other hand, for Mytilus galloprovincialis, and in general neither zinc nor zinc particles were very toxic.

For Folsomia candida, Eisenia fetida and Porcellionides pruinosus, the free zinc ion, tested as $ZnCl_2$, showed a higher toxicity than any of the ENPs tested. In case of the NanoSun ENPs, the use of different spiking methods did not influence toxicity results.

In the pilot study to test the toxicity of Ceria nanoparticles, there was no evidence of toxicity to earthworms at concentrations as high as 10000 mg Ce ENP/kg. But the ionic form showed toxicity to earthworms at much lower concentrations.

Ecotoxicity results presented in this deliverable will lead-out to WP6, in order to feed models for Risk Assessment calculations and also for applying the Species Sensitivity Distribution approach.

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