

## NanoFATE Deliverable 4.3

### Research report and associated research paper addressing the current state-of-the-art in analysis of ENP property effects on toxicity property-effect relationships

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#### Research Report Summary

This Deliverable 4.3 summarizes progress made within NanoFATE Work package 4 (WP4), focusing specifically on the factors affecting fate and effects of Engineered Nanoparticles (ENPs) in soil. Progress of most of the WP4 work has recently been summarized in Deliverable 4.2 and therefore will not be repeated in this deliverable. This deliverable includes two manuscripts.

The first one is a review paper (Tourinho et al., 2012), which describes factors affecting the fate, bioavailability and toxicity of ENPs in soil. This paper is a follow-up of Deliverable 4.1. This deliverable emphasized the importance of proper characterization of ENP exposure for testing, and mentioned pH and organic matter contents as two of the most important factors determining ENP fate and bioavailability.

The second one is a manuscript on the longterm fate and effects of ZnO ENPs in soil, both coated and uncoated ones, in regard to the springtail *Folsomia candida* (Waalewijn-Kool et al., 2012). This manuscript has been accepted for publication and currently (March 2013) is in press. Results show that coated ZnO ENPs may be more toxic than uncoated ones. The coating also affects dissolution behaviour of the ENPs in soil, with toxicity of the coated ZnO ENPs being similar to that of the uncoated ones only after equilibration for one year. Toxicity of the uncoated ZnO ENPs decreases with time of equilibration, even though dissolution continues throughout the one-year equilibration period. Results show that soil pH is a main factor in determining toxicity of the ZnO ENPs.

In response to the findings of both manuscripts, studies are currently running on the effects of soil pH and organic matter contents on the toxicity of ZnO ENPs for soil invertebrates. Research manuscripts on this work will be presented in Deliverable 4.4, together with an integration and compilation of all data on the bioavailability of ENPs gathered within NanoFATE WP4.

## References

Tourinho, P.S., van Gestel, C.A.M., Lofts, S., Svendsen, C., Soares, A.M.V.M. & Loureiro, S. 2012. Metal-based nanoparticles in soil: fate, behaviour and effects on soil invertebrates. *Environmental Toxicology and Chemistry*, 31, 1679-1692. doi:10.1002/etc.1880

Waalewijn-Kool, P.L., Diez Ortiz, M., van Gestel, C.A.M. 2012. Effect of different spiking procedures on the distribution and toxicity of ZnO nanoparticles in soil. *Ecotoxicology* 21, 1797–1804. doi: 10.1007/s10646-012-0914-3

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