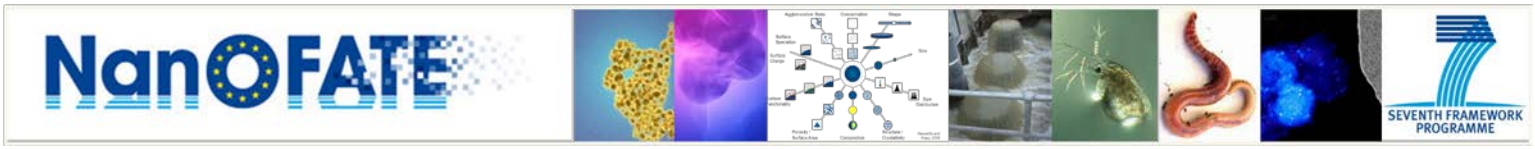

NanoFATE Deliverable 4.4

Research manuscripts focussing on the interplay between soil and water chemistry with ENP properties and resulting effects on ENP physical presentation, bioavailability and toxicity.

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Research Report Summary

This Deliverable 4.4 summarizes results within NanoFATE Work package 4 (WP4) regarding the influence of factors affecting fate and effects of Engineered Nanoparticles (ENPs) in soil and water. Within Deliverable 4.1 pH and (dissolved) organic matter were identified as two main factors affecting ENP fate in both soils and water. These factors therefore also may be the major ones affecting ENP bioavailability. Research within NanoFATE WP4 therefore has been focusing on assessing the influence of these factors on the toxicity of ENPs, especially ZnO ENPs and mainly in soils. This is appropriate as soils will be a sink for many types of ENPs released during production and from products. Work on the influence of media properties on ENP bioavailability in water has more focused on Ag ENPs. This deliverable includes four manuscripts dealing with the influence of soil properties on the toxicity ZnO ENPs to earthworms, isopods and Collembolans. In addition, it includes work on relationships between toxicity to the marine mussel Mytilus galloprovincialis and Ag ENP stability in seawater (manuscript in preparation). As a follow up of the work described in this deliverable, two review papers will be written, describing and applying a modelling framework for predicting metal-based ENP bioavailability in soils and waters. To that end, a workshop was held in Wallingford on 26th September 2013, where an inventory was made of all data on the influence of media properties on ENP bioavailability generated within NanoFATE. The workshop identified some data gaps and resulted in agreements on a limited number of further measurements to obtain all data needed for the development of such modelling framework. Together with the outcome of the workshop and the results of the additional measurements, the work described in this Deliverable will be the starting point for the review papers.

The first three papers (Heggelund et al., 2013; Waalewijn-Kool et al., 2013; Tourinho et al., 2013) focus on the effect of soil pH on ZnO ENP toxicity for earthworms, springtails and isopods, respectively. These three studies used the same soils, so enabling a comparison across species of the way soil pH is affecting ZnO ENP bioavailability and toxicity. The fourth paper (Waalewijn-Kool et al., submitted) describes the effect of soil properties on ZnO ENP toxicity to springtails. In the latter study, starting point was focusing on differences in soil organic matter content, but in the end soil pH turned out to be a major factor in affecting the

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bioavailability and toxicity of ZnO ENPs in soil. The final study is on the effect of particle size and exposure concentration on Ag ENP stability in seawater and the resulting bioavailability and toxicity to marine mussels. This study concluded that correction of Ag availability for the concentration-dependent aggregation and agglomeration in seawater gives a much better estimate of their toxicity.

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