



Sorption, dissolution and pH determine the long-term equilibration and toxicity of coated and uncoated ZnO nanoparticles in soil.

Pauline L. Waalewijn-Kool¹, Maria Diez Ortiz², Nico M. Van Straalen¹ & Cornelis A.M. van Gestel¹

¹ Department of Ecological Science, VU University; ² NERC Centre for Ecology and Hydrology.

Abstract

To assess the effect of long-term dissolution on bioavailability and toxicity, triethoxyoctylsilane coated and uncoated zinc oxide nanoparticles (ZnO-NP), non-nano ZnO and ZnCl₂ were equilibrated in natural soil for up to twelve months. Zn concentrations in pore water increased with time for all ZnO forms but peaked at intermediate concentrations of ZnO-NP and non-nano ZnO, while for coated ZnO-NP such a clear peak only was seen after 12 months. Dose-related increases in soil pH may explain decreased soluble Zn levels due to fixation of Zn released from ZnO at higher soil concentrations. At T ¼ 0 uncoated ZnO-NP and non-nano ZnO were equally toxic to the springtail *Folsomia candida*, but not as toxic as coated ZnO-NP, and ZnCl₂ being most toxic. After three months equilibration toxicity to *F. candida* was already reduced for all Zn forms, except for coated ZnO-NP which showed reduced toxicity only after 12 months equilibration.

Reference

Waalewijn-Kool, P.L., Diez Ortiz, M., van Straalen, N.M. & van Gestel, C.A.M. (2013). Sorption, dissolution and pH determine the long-term equilibration and toxicity of coated and uncoated ZnO nanoparticles in soil. *Environmental Pollution*, **178**, 59-64, doi: <http://dx.doi.org/10.1016/j.envpol.2013.03.003>.

For more information you can contact:

Project office: NanoFATE@ceh.ac.uk ; Project Coordinator: Claus Svendsen (csv@ceh.ac.uk)

ENP ecotoxicology work package leader: Susana Loureiro (sloureiro@ua.pt)

ENP bioavailability work package leader: Cornelis 'Kees' van Gerstel (kees.van.gestel@vu.nl)

Project Website: www.nanofate.eu