NanoFASE Deliverable D9.4

Parameter set on uptake and toxicokinetics of aged NMs in aquatic and terrestrial organisms and for biomagnification potential

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Research Report Summary

During their life cycle, nanomaterials (NMs) may be released to the environment and can undergo several changes. These physicochemical transformations will alter their environmental behaviour and their potential effects on biota. Some nanoparticles (NPs), like Ag NPs, are mainly converted to sulphides in wastewater treatment plants (WWTP) (Lowry et al. 2012), while in other compartments they may dissolve. It is known that sulphidation decreases NM toxicity (Levard et al. 2013) and persistence in ecosystems due to the low solubility of metal-sulphide forms (Suresh et al. 2011).

Time is also a crucial factor for the understanding of NP/NMs transformations in the environment. The contact time with soils, sediments or waters influences their behaviour and chemical form, e.g. by allowing for NP/NMs to form complexes with other molecules. In addition, the biota can also be seen as a reactor, changing NP/NM properties and interfering with how other organisms may uptake and accumulate them afterwards.

Regulation and legislation focus on the hazard assessment of pristine/as produced NP/NMs. However this assessment is not indicative of actual fate and potential effects after release to the environment. Therefore

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studying NPs with characteristics similar to those that may occur upon release to the environment can be a major asset for understanding NP/NM hazards and risks.

In NanoFASE Report D9.2, a set of parameters for the uptake and toxicokinetics of pristine NMs in aquatic and terrestrial organisms was established. In the present D9.4, uptake and toxicokinetics was assessed for NMs mimicking aged versions of pristine Ag NPs, i.e. sulphadised Ag-NPs (Ag_2S-NPs). With these model NPs uptake kinetic experiments were carried out, and kinetic rate constants derived. The Ag_2S NP were produced by Applied Nano, and used by all NanoFASE partners involved in this deliverable. In addition, an aquatic trophic chain model was used where AgNP (3-8 nm, AMEPOX, as manufactured) entered into several bio-reactors (algae and daphnids), to follow finally to a fish model.

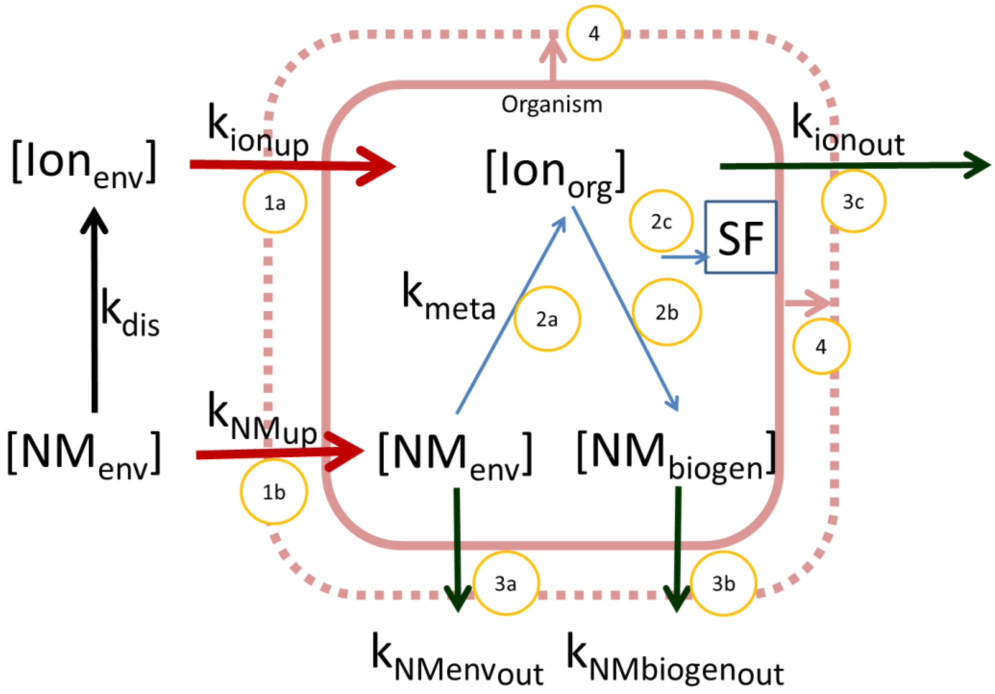

Fig. 1- Conceptual biokinetic one-compartment model describing the uptake, transformation and elimination of nanomaterials in organisms.

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