NanoFATE Deliverable 6.2

Report on predicted soil contamination levels; based on aerial or sludge deposition for each of the ENPs using the multi-media model.

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Research Report - Summary

This study report is a first step in the generation of environmentally-relevant exposure levels to be used in ecotoxicology tests in the NanoFATE project. The EUSES model is a first tier risk assessment used in the EU as a preliminary risk assessment tool. The model apportions the chemical/substance between different environmental compartments following its different loss routes. The EUSES model was used in a way which would estimate environmental concentrations of nanosilver and nano zinc oxide arising from the everyday use of products which contain these engineered nano particles (ENPs). Such uses include the release of nanosilver woven into the fabric of clothes which have antibacterial properties or the use of nano zinc oxide in sun screens. The loss of these ENPs during their manufacture or the manufacture of the products which contain them was not included. The predictions were based on a published estimate of production amounts that was consistent with this philosophy. The total amounts considered in the European Union were 33.4 tonnes/year for nanosilver and 542 tonnes per year for nano zinc oxide.

Values were predicted to be between 8 and 57 ng/L for nanosilver in river water and between 1 and 24 ng/kg dry weight in agricultural soils. The route for nanoparticles to soils is via sewage sludge application. EUSES makes the assumption that 60% of sludge production is spread onto agricultural land. The range comes from a combination of the scale of the scenario used in EUSES (regional versus continental) and the removal efficiency in sewage treatment works (49% and 98% in the case of nanosilver). The local values estimated by EUSES were not used because these relate to a high local release rate which is associated with a point source discharge (e.g. from a manufacturing process). For nano zinc oxide the range for river water was from 440 to 1390 ng/L and for soils from 59 to 570 ng/kg dry weight. Here the range is only determined by the EUSES spatial scale as only one sewage treatment removal efficiency value was used of 74%.

This report is to be published as a refereed journal paper.