**Destination and transport of engineered nanoparticles along the process wastewater – sludge – plant**

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The presence of engineered nanomaterials in various consumer products leads to a significant load of nanoparticles (NP) also in urban and industrial wastewater. Consequently, wastewater treatment plants (WWTP) play a key role in managing these NP-loaded wastewaters considering that the purified WWTP effluent must be harmless when entering the recipient and the (aquatic) environment. Up to now, there is little information or practical guidelines available to safeguard these ambitious provisions. As another product of wastewater treatment (WWT), sewage sludge is considered to act as a sink for NPs during WWT process. Quite often, sewage sludge is used as an organic fertilizer in the agriculture and horticulture. Under these purposes, it cannot be excluded that a significant amount of engineered NPs might find their way into the treated soil and finally into plants and the way back in the human food chain.

Within the project “nanoSuppe” (sludge uptake particle plant environment) guidelines for WWTP and for the usage of sewage sludge as fertilizer will be created based on laboratory studies to support WWTP companies and authorities in terms of this difficile problem. To reach this goal a strong consortium from WWTPs, related companies and a research centre is formed. The project is focused on the usage of engineered NPs like TiO2, CeO2 multiwalled carbon nanotubes (MWCNT) and quantum dots. These NPs are representatives for nanomaterials that are used in many consumer products like sunscreens, paints and also in the industry.

The process of characterization of NP from the lab into the scale of a field is one of the important focuses. It includes the radio labelling of NP as a strong detection tool, the characterization of these NP in liquid phase and sewage sludge and the uptake of NP into plants. The use of radiolabeled NPs guarantee a highly sensitive identification, localisation and quantification of NPs even at the low environmentally concentrations. It is independent of the used matrices (sewage, sludge, soil, plant) and background levels of natural NPs, colloids or substances of the same elemental composition.

Within this presentation, latest results on translocation of NPs from different matrices like tap water, sewage and sewage sludge into the plant will be shown and discussed. Furthermore the chemical and physical interactions of these matrices might have a huge impact on the destination of the NP in the different media. So the uptake of NP into the plants is limited to their availability in the media. Different approaches with four plant species such as lamb’s lettuce, sunflowers, ryegrass and red radish are under investigation. These test plants cover a wide spectrum of agricultural and horticultural interest. Lamb’s lettuce and red radish end up directly in the human food chain. Besides that ryegrass functioned as animal food for cows, goats and other animals which can end up in the food chain as well.