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Research unit INTERNANO: Mobility, aging and functioning of engineered inorganic nanoparticles at the aquatic-terrestrial interface

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Engineered inorganic nanoparticles (EINP) are expected to pass the wastewater-river-topsoil-groundwater pathway. Despite their increasing release, the processes governing the EINP aging and the changes in functionality in the environment are up to now largely unknown. The objective of the interdisciplinary research unit INTERNANO funded by the DFG is to identify the processes relevant for the fate of EINP and EINP-associated pollutants in the interfacial zone between aquatic and terrestrial ecosystems. The research unit consists of six subprojects and combines knowledge from aquatic and terrestrial sciences as well as from microbiology, ecotoxicology, physicochemistry, soil chemistry and soil physics.

For the identification of key processes we will consider compartment specific flow conditions, physicochemistry and biological activity. Situations representative for a floodplain system are simulated using micromodels (μm scale) as well as incubation, soil column and joint laboratory stream microcosm experiments. These results will be transferred to a joint aquatic-terrestrial model system on EINP aging, transport and functioning across the aquatic-terrestrial transition zone. EINP isolation and characterization will be carried out via a combination of chromatographic, light scattering and microscopic methods including dynamic light scattering, elemental analysis, hydrodynamic radius chromatography, field flow fractionation as well as atomic force microscopy, Raman microscopy and electron microscopy. INTERNANO generates fundamental aquatic-terrestrial process knowledge, which will help to evaluate the environmental significance of the EINP at aquatic-terrestrial interfaces. Thus, INTERNANO provides a scientific basis to assess and predict the environmental impact of EINP release into the environment.