NanoFASE Deliverable D8.2

Report on Driving Forces of NM Behaviour in Natural Waters for Agglomeration and Transformation

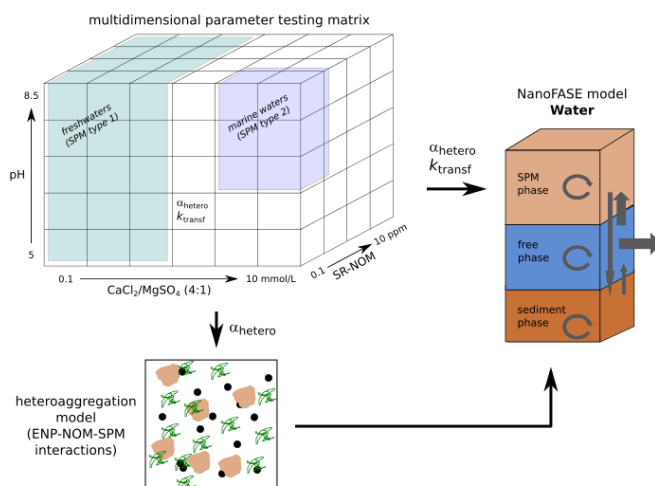| Contributors	Partner
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Research Report Summary

This report presents an overview of the main driving forces with respect to the behaviour of engineered nanomaterials (ENMs) in surface waters. A main goal is to identify and utilize existing knowledge from geochemistry, colloid science and previous investigations into ENM behaviour and fate to aid in the generation of quantitative data on ENM fate in surface waters as needed for the development and parameterization of the NanoFASE model (Fig. 1).

Figure 1 - Conceptual multidimensional parameter matrix designed to perform analytical studies in WP8. The terms ENP, SPM and NOM refer to engineered nanoparticles, suspended particulate matter and natural organic matter, respectively. SR-NOM is Suwannee River NOM, a standard NOM to be used in the experiments. The parameter α_{hetero} is the attachment efficiency for heteroagglomeration of ENP with SPM.

In a first step, relevant hydrochemical parameter ranges for European Surface waters and the Thames River as a case study are collected from available databases and literature. Further, an in-depth assessment of agglomeration processes, both from a practical and theoretical point of view is performed and recommendations for utilizing existing data on homoagglomeration of ENMs to predict their more complex heteroagglomeration behaviour are drafted. Finally, existing knowledge on geochemical transformations is presented and critically assessed with respect to the special requirements for ENMs (Fig. 2). Additionally, first approaches to study two of the most relevant ENM transformation reactions, namely dissolution and sulfidation, are presented together with first experimental results.
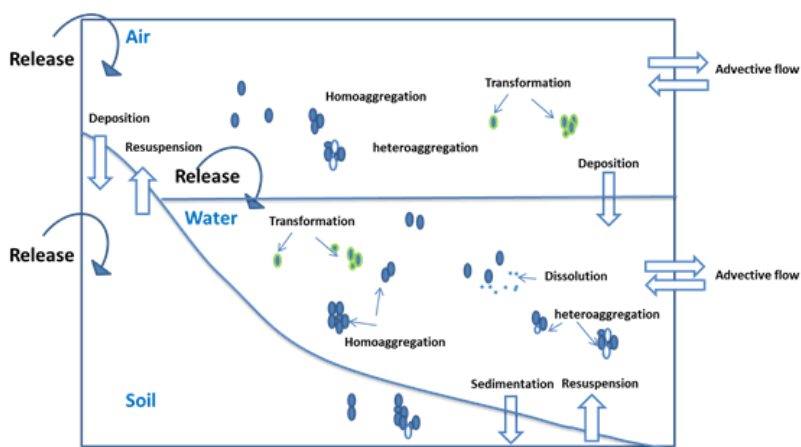

Figure 2 – Schematic overview of the various processes that jointly determine the fate of ENMs after their release to the environment, including the main geochemical transformation and (re)distribution processes.

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