Abstract title: Multiwalled carbon nanotubes affect long term recolonization and structure of benthic communities

Abstract text:

Whereas for traditional pollutants knowledge evolved from studying effects in the laboratory to studying effects in situ, assessment of in situ effects for ENPs still is in its infancy. Most ecotoxicity studies focus on single species laboratory tests. This kind of tests is less realistic with respect to multiple exposure routes, dynamic particle mixing, 'fouling' and aging of ENPs, or ecological processes like community effects or recolonization. Consequently, assessment of in situ effects is urgently needed because laboratory studies can be expected to be poor predictors of effects under field conditions, especially for ENPs. Aim of this study was to assess long term community effects of macroinvertebrates exposed to sediment contaminated with multiwalled carbon nanotubes (MWCNTs). This study focussed on the influence of MWCNT contaminated sediment on the recolonization by benthic macroinvertebrates in a long term controlled and replicated field experiment (15 months). MWCNT treatment effects were assessed and quantitatively compared to community composition after 3 months and to similar treatment effects of another carbonaceous material (activated carbon; AC) which was applied simultaneously in parallel systems in the framework of another study. A remarkable finding of this recolonization study is that MWCNT contaminated sediment showed significant effects on the benthic community structure after 15 months. After 3 months, effects were not (yet) significant. A dose of 0.0002 – 0.2 % MWCNTs explained 9.9% of the community composition (biodiversity and species abundance, p=0.012). The field-relevant lowest dose tested also caused significant effects (p=0.020). For the first time this shows that despite aging and burial, MWCNTs affect the structure of natural communities. Exposure to AC showed a comparable impact at a 50x higher dose, which suggests that the MWCNTs were about 50 times more potent than AC.

Session: Environmental fate and effects of nanoparticles under realistic conditions

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