

Nanoparticles in the environment, is it a problem?

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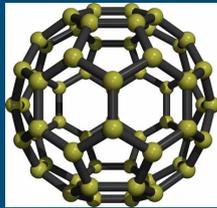


What are nanoparticles?

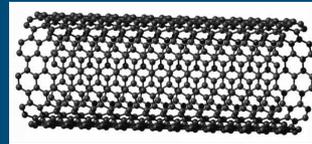
- All kinds of materials: metals, carbon, combinations
- Small size: 1-100 nm (0.000001-0.0001 mm)
- Large surface-to-volume ratio
- Different properties than bulk material of ionic form
surface charge, shape,
- Different fate and behavior in environment and organisms
- Specific effects?



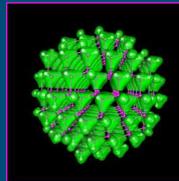
Examples



Fullerene (C60)



Nanotube



Quantum dot



Benefits?

Very wide range of applications

- Food: packaging, delivery systems, structure...
- Clothing: disinfection/odors, abrasion...
- Cars: construction, safety...
- Detection of pathogens or other small particles
- Health care: implants, delivery systems
- Agriculture: "encapsulated" pesticides
- Solar cell systems
-



Nano-socks



Sport materials



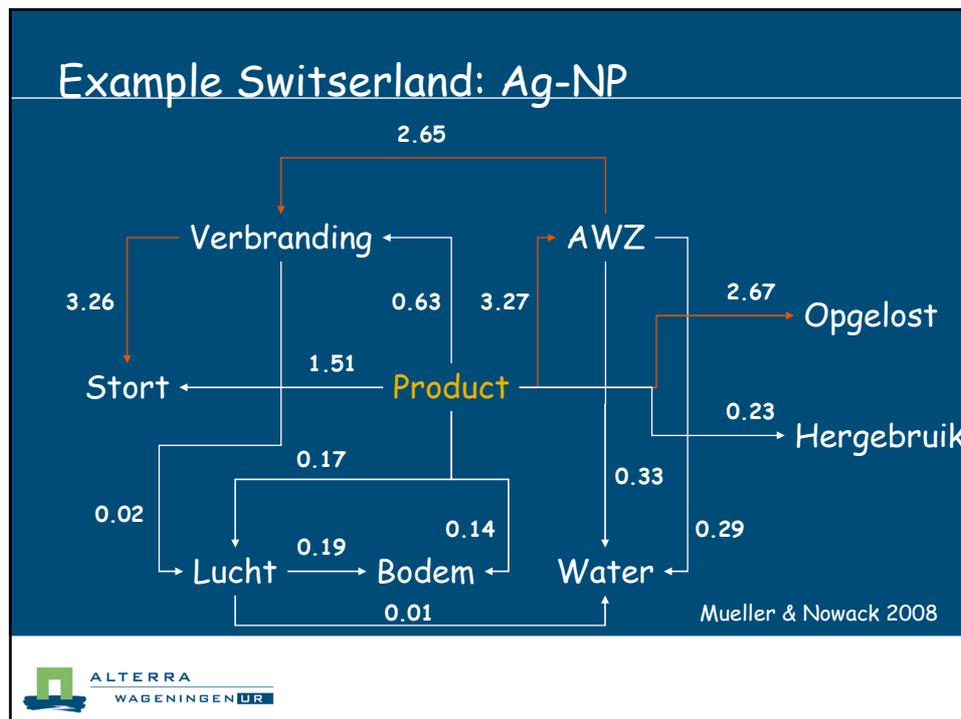
Nano-cop
Wiet-detection



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How do they end up in the environment?

- During production: 1 kg C60 → 10 kg disposal
- During use: abrasion sweaters met nanotubes of silver
- After use/disposal: furnace, tip, water treatment, other uncontrolled



Is it a problem?

Benefits versus risks

New technology: benefits usual first acknowledged,
before risks

"Real" risks versus risk-perception

Risk evaluation based on current methods ?

Probably not, because

- Effects are likely to be different
- Exposure of organisms different

Is it a problem?

We don't know, because.....

- What effects are to be expected?
- What is the behavior of nanoparticles in the environment?
 - o Solubility, stability, food web accumulation?
- What is the behavior in the organisms?
 - o Directly from nose to brains, without blood circulation
- How can we measure nanoparticles in for instance soil?



Is it a problem?

Whether nanoparticles are an environmental problem is not clear yet

The main problem is that we just know too little to say

Research needed!



Needed research on environmental risks of nanoparticles

Classification of particles → extrapolation between particles

Fate in environment → where do they end up, are they stable, agglomeration, availability for organisms.....

Effects in organisms → endpoints, test development.....



Effects van nanoparticles on soilorganisms

PhD-project: Merel van der Ploeg (IP/OP, WIMEK)

Alterra,
Wageningen Universiteit, Toxicologie
RIKILT



Why soil organisms?

Soil very important for human and nature
(societal impact)

< 1% van papers on environmental risks of
nanoparticles in soil, vast majority on aquatic
systems
(scientific impact)

Are effects also risks?

We assess effects → relevance and reproducibility
We have no environmental concentrations to relate
the effects to

Planning

Experiments further analysed

growth F2

population modelling

relation *in vivo* \leftrightarrow *in vitro*

Experiments with isopods

Experiments with other particles



Final Viewpoint

After assessment of risks (we need more than just the results of this project!), we need to:

Communicate with the general public!

Acceptance of new techniques should be done on real risks.

Risk perception of the general public should be point of attention (GMO-discussion)



Thanks!

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