deutscher
verband
nanotechnologie

Practical requirements of small and medium sized enterprises for working safely with nanoparticles

Nanotechnology is a cross-sectional technology of the classical science

deutscher verband nanotechnologie

Nanoparticles
→ production/application
→ big quantities, large scale industry

Chemistry

cross section

Material Sciences

Basic material for coatings and parts
→ SME are user of nanoparticles

cross section

Biochemistry

Nanoparticles used as drug carrier or medicine
→ Very small amount
→ SME are user of nanoparticles

Nanotechnology
Interdisciplinary field

Physics

- Coatings, layer, parts for electronics, optics etc.

normal case: **no nanoparticles**

Biology

Structure size on the area of nanometers

normal case: **no nanoparticles**

Big Issues in this context

deutscher verband nanotechnologie

- Nanoparticles are only a small part of the nanotechnology
- Production of nanoparticles is typically attached to the large scale industry (small amounts, universities)
- SME are user of nanoparticles, usually not the producer
- Nanoparticles always in combination with chemical application

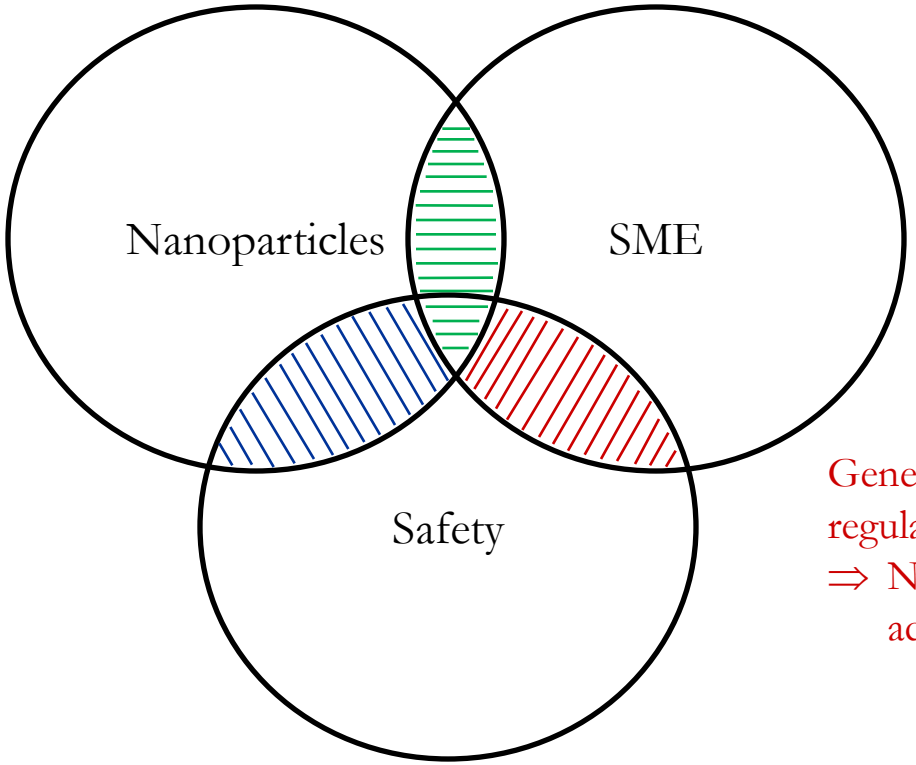
Nanoparticles in

deutscher verband nanotechnologie

Chemistry	Biochemistry	Material science
Production and application in large quantities - Filler in polymers (SiO_2, C) - CNT - … Chemical large scale industry - Bayer AG - BASF - Degussa - … ⇒ **NO SME**	Application: drug carrier, medicine, … - Purchase of suspensions and pastes - Complete deagglomeration is important and requires dispersed nanoparticles - Small quantities (gram range) ⇒ **Laws/regulations etc. are enough**	Use of nanoparticles - all quantities - after processing, you usually has a temperature step and the nanoparticles are no longer in existence (ceramics, glass) - without temperature step they are firmly embedded in a polymer

Use of nanoparticles by SME

deutscher verband nanotechnologie



Big issue:
REACH etc.

General laws and regulations
⇒ No need for additional laws

Nanoparticles used for coatings, parts etc., chemical processing. What can happen? - Occupational Safety -

Use of nanoparticles by SME

deutscher verband nanotechnologie

Absorption through the skin

Usually nanoparticles can`t penetrate healthy skin
→ gloves, lab coat

Possible problem:
Nanoparticles may have different properties than larger particles of the same substance

Inhalation of ultrafine dusts

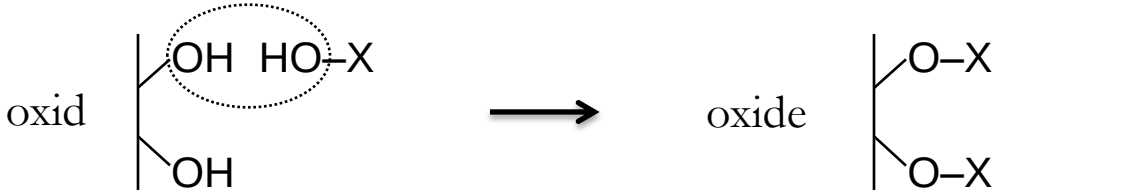
Problem! Based on the surface modification of nanoparticles in combination with the agglomeration status, nanoparticles are very mobile
⇒ Should be avoided!

Use of nanoparticles by SME

deutscher verband nanotechnologie

Risk = Hazard multiplied by Exposition no exposition = everything is well

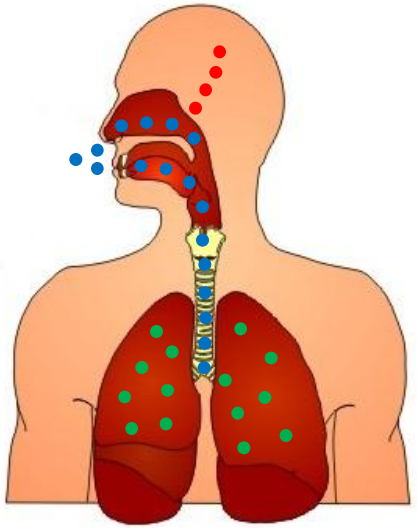
no Hazard = Is everything well? I don`t know it! This can depend from the surface chemistry, this depends from agglomeration status.



Al_2O, ZrO_2, TiO, SiO, usw.

X = $-CH_3$
X = $-NH_2$
X = $-CH=CH_2$
X = -CL
X = …

hydrophobically
hydrophilic
reactive
toxic



The difference between the colours can be the kind of surface modification.

SME don`t take a risk; simple solution: no working with isolated particles!!!

Use of Nanoparticles by SME

deutscher verband nanotechnologie

I can't talk for all SME, but for the SME who are member of the "German Nanotechnology Association"

- Processing of nanoparticles only in fume cupboards with adequate filters; personal protective measures, and a comprehensive information and training of employees.

- Nanoparticles are only used in formula, dispersions,…. directly made by the producer

- Synthesis of nanoparticles is always carried out in closed systems (autoclave etc.)

- After processing, the nanoparticles are embedded in an organic matrix or a part of a ceramic or a glass. In the last case no isolated nanoparticle are detectable.

Processing of nanoparticles by SME

deutscher verband nanotechnologie

Processing of nanoparticles includes always a wet chemical process step.

Nanoparticles in powder form are agglomerated. They can`t be used by the industry. Deagglomeration means stirring , surface modification, dispersing and leads to an organic or inorganic solvent/media.

SME buy suspensions for her applications or produce direct a suspension fron the nanoparticles.

No contact with nanoparticles.

SME of DV Nano

deutscher verband nanotechnologie

- nobody is using CNT (technology has not yet arrived in SME)
- nobody is using aerosols of nanoparticles
- nobody is working with Ag-nanoparticles for Socks and other needless things

Our SMEs committed to the principles of the "Nanokommision".
They are highlighted on our website.

⇒ Preventive protection used by SME

Thank you for your attention!