nanoGEM-Nanostrukturierte Materialien: Gesundheit, Exposition, Materialeigenschaften

Hazard assessment of selected nanomaterials and approaches for risk assessment at the workplace

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Tasks of Work Package 6

Assessment of the potential health risks of nanomaterials using exposure and risk assessments with regard to
- Chemical safety
- Occupational health and safety
- Consumer protection

Indicators for risk estimation are volatility/dustiness, exposure level, absorption rate, internal dose and mobility as well as toxicological relevance of *in vitro* and *in vivo* data.

Hazard assessment – Procedure

- Systematic literature search / literature observation:
  Literature databases (e.g. TOXCENTER, EMBASE), disseminated REACH dossiers (ECHA website), popular scientific journals
- Evaluation:
  Selection of relevant publications, NanoGEM data, identification of regulatory relevant „key studies“
- Documentation:
  Compilation of basic data sets → Hazard assessment

Risk assessment of nanomaterials at the workplace

Example: GBP* nanomaterials

Nanomaterials as „inert“ respirable dusts:
A common mode of action (inflammatory response)

→ **Group Assessment**

* Granular biopersistant particles with no or little additional chemical toxicity

Hazard profiles of nanomaterials

Case studies silver, SiO_2 and ZrO_2

Endpoint	Nano-Silver	Nano-SiO_2	Nano-ZrO_2
Acute Toxicity	not toxic	not toxic	not toxic
Irritation (skin & eye)	not irritating	not irritating	not irritating
Sensitization	not sensitizing to the skin	no suspicion	not sensitizing to the skin
Repeated Dose Toxicity (oral / inhalation)	Target organ(s) / distribution and dose-response relationship are known	Oral: no substance related effects Inhalation: local effects (lung inflammation)	no adverse effects
Genotoxicity	ambiguous	negative	negative
Carcinogenicity		Oral: no evidence	
Reproductive Toxicity (Fertility)	Oral: no evidence		
Developmental Toxicity	Oral: no evidence	Oral: no evidence	

Data available (nanomaterial)	Data available (nanomaterial ? / screening)	No (valid) data available

Risk assessment according to the Easy-to-use Control Scheme for Hazardous Substances at the Workplace (EMKG) by the Federal Institute for Occupational Safety and Health (BAuA)

Assumptions:
1) common mode of action – additive effect
2) ‚real‘ dust mixture at the work place (e.g. 50% nano-GBP / 50% micro-GBP)

Band	Concentration in air
	Solid substances [mg/m³]
A	1 < c ≤ 10
B	0.1 < c ≤ 1
C	0.01 < c ≤ 0.1
D	0.001 < c ≤ 0.01
E	c ≤ 0.0001

← Hazard band **B**

Derivation of the control approach

Hazard band	Quantity of use	Volatility/dustiness: low	medium	high
B (0.1-1 mg/m³)	low (g)	1	1	1
	medium (kg)	1	2	2
	high (t)	1	liquid: 2 solid: 3	3

Control approach 1: General safety measures and duties
Control approach 2: Technical protection measures
Control approach 3: Closed system

Discussion

Hazard assessments of nanosilver and selected nano metal oxides have been carried out within the framework of chemicals' legislation on the basis of published data and in the light of nanoGEM-internal results. An exemplary risk assessment for GBP nanomaterials at the workplace has been performed using a control banding approach.

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