NANEXO

Dissemination report

Development of Exposure Scenarios for Manufactured Nanomaterials

EXPOSURE NANOMATERIALS

NANEX brings together twelve partners from eight different countries. The project is supported through the 7th Framework Programme for Research and Technological Development and addresses the thematic priority: Exposure scenarios to nanoparticles. The project has started in December 2009 and will end in December 2010.
NANEX's main objective is to develop a ***catalogue of exposure scenarios for Manufactured Nanomaterials (MNM) taking account of the entire lifecycle of these materials****.*

Partners

Institute of Occupational Medicine – IOM	UK
Commissariat à l'énergie atomique et aux énergies alternatives - CEA	FR
Swiss Federal Laboratories for Materials Science and Technology - EMPA	CH
European Research Services GmbH – ERS	DE
Institut de Santé au Travail, Lausanne - IST	CH
Fundación LEIA CDT - LEIA	ES
Naneum Limited - Naneum	UK
Nanocyl S.A. -NANOCYL	BE
Nanotechnology Industries Association - NIA	BE
Netherlands Organisation for Applied Scientific Research TNO	NL
Joint Research Centre - JRC	Pan-EU
National Centre for Scientific Research DEMOKRITOS	GR

Project ID NMP-2009-1.3-2 Exposure scenarios to nanoparticles

The dissemination report from the NANEX project is designed to highlight and present in a simplified way the main results obtained during this project. This report mainly deals with one question which is of general concern for those who are interested in exposure scenarios for Manufactured Nanomaterials. The full results are summarized in the corresponding Technical reports. ***All Technical reports are publicly available from the NANEX project website****:*

http://www.nanex-project.eu

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Overall NANEX project objective

To develop a catalogue of exposure scenarios for manufactured nanomaterials (MNMs) taking into account the entire lifecycle of these materials.

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Objectives for occupational exposure work package

- To collect, collate, and review existing available information for developing occupational exposure scenarios.
- To develop occupational exposure scenarios for MNMs outlining operational conditions and risk management measures, and estimate associated exposure levels based on existing available information.
- To identify and review the applicability of available tools and models for predicting occupational exposure to MNMs.

Objectives for consumer exposure work package

- To collect, collate, and review existing available information for developing consumer exposure scenarios.
- To develop consumer exposure scenarios for MNMs outlining operational conditions and risk management measures and estimate associated exposure levels based on existing available information.
- To identify and review the applicability of available tools and models for predicting consumer exposure to MNM.s

Objectives for environmental release work package

To obtain knowledge on i) amount and ii) form of MNM release to the environment by considering the following:

- What is known, has been modeled or measured, which methods are available
- What can these models and measurement techniques deliver, what not,
- In what way is the REACH approach suited for MNMs, is it applicable or why not?

Objectives for case studies work package

- To obtain information on real-life exposure scenarios from three representative companies / products at different stages of the nanotechnologies value chains.
- To illustrate and test the applicability of a generic exposure scenarios format, by population of the matrix with real-life information (and possibly data) obtained from the representative companies / products.

Overall Conclusions

Development of exposure scenarios for MNMs is challenged by both limited availability of exposure information and lack of standardization for interpreting and reporting information relevant to exposure conditions and exposure levels.

1. Exposure to nanomaterials may never be fully described by a single number or metric. Thus, the aim of future research should be to determine which factors (e.g., activity, material characteristics, operational/use conditions and risk management measures) are the most important determinants of exposure and which types of information are critical for describing exposure levels.

2. The scope of current research on human exposure to MNMs is mostly limited to occupational exposure during laboratory-scale manufacturing processes.

- More detailed studies are needed at all stages of the life cycle of MNMs.
- In particular, studies of occupational exposure during full-scale and secondary manufacturing operations, as well as consumer and occupational exposure during use of products containing MNMs are essential.

3. Existing published studies on human exposure to MNMs generally contain little or no contextual information and can therefore not easily be interpreted, compared to other studies, or used for model development. Detailed description of context and sampling strategy, in addition to the measurements themselves, is essential.

- Contextual details: e.g. frequency and duration of activities, dimension of workplace, general and local ventilation, quantities used
- Sampling strategy: adjustment for background, sampling location in relation to sources and workers, data analysis methods
- Measurements: at the very least, size distribution and mass. Additionally, surface area, particle number, and morphology are needed
- Exposure assessment: number of activities with duration, exposure estimates for each activity, integration of measurements with contextual details.
- In occupational exposure studies, personal sampling is highly desirable.

4.

Considering a life cycle perspective is essential for environmental exposure assessment. However, life cycle information is scarce. More and better data are needed on:

- MNM production/application amounts (based on production or calculated by product use)
- Type of use in the life cycle stage (processing aid, inclusion into/onto matrix, reacting in use)
- Distribution of production and application volume in the market
- Distribution in time and space (local v. regional) of the emissions
- Emission pathways (sewage treatment, waste incineration, industrial point sources, wide dispersive use, intended and unintended release)
- Release factors in the life cycle (processes, products, service life, waste disposal)

5.

It is not feasible to measure exposure to MNMs in all exposure scenarios, and therefore, nano-specific exposure estimation models for occupational and consumer exposures are urgently needed.

- Existing models for conventional chemicals do not address nano-specific properties, such as size distribution, temporal changes, such as those caused by agglomeration, and the effect of size on exposure/dose relationships. They only provide exposure estimates that are in a mass-based metric, but there is currently no consensus on the most relevant metric for MNM risk assessment purposes.
- Existing models are not calibrated or validated for use with MNMs. Based on a theoretical evaluation, it was concluded that current models for estimating inhalation exposure are not applicable or at best inaccurate for MNMs. For dermal models the nano-specific properties are probably less critical for exposure and therefore these models could be used with care. Experimental data are needed to confirm/validate these conclusions.

6.

Given the current state of the exposure science for MNMs, no in-depth risk assessments can be conducted. In the short term, control of exposure to MNMs should be handled based on precautionary risk management approaches, such as control banding. This requires further research in effectiveness of risk management measures for MNMs. In the medium to long term, with additional and more harmonized research into exposure to MNMs, more detailed risk assessments will become feasible.

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Technical reports and detailed project conclusions available at:

www.nanex-project.eu

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