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PARTNERSHIP FOR EUROPEAN RESEARCH IN OCCUPATIONAL SAFETY AND HEALTH

Research project
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Exposure measurements and risk assessment of manufactured materials/nanoparticles (MMNPs)

Project A: Nanodustiness project

Project B: Nano Exposure & Contextual Information Database (NECID) project

Duration of the project

2010 - 2012

Background

Release of nanostructured particles from nanopowders into the air, present a potential source of exposure. Therefore, any handling of nanopowders including maintenance on production systems may result in unwanted worker exposure by inhalation. On a general point of view the propensity for a powder to form an aerosol when agitated is governed by many factors, and is currently not clearly understood. This propensity for a powdered material to emit airborne particles during handling under specific conditions is named "dustiness". Dustiness is an important exposure determinant; it provides a basis for estimating the potential for exposure by inhalation.

Research into the "dustiness" of powders with relevance to the occupational health context has led to test methods designed to evaluate the release of inhalable and respirable particles. Different dustiness test methods have been developed in which different test apparatus and particle measurement devices are used. Two methods have been taken as reference methods by the European standard EN 15051: rotating drum (RD) and continuous drop (CD) methods.

However, these methods are not applicable as such to nanostructured materials without further development. At this moment, there are four different methods that can be used to evaluate and categorize nanopowders. These methods are different in their concept of agitation (and energy input), their sampling train. Also, the results are expressed in different ways. There is clearly a need for developing a harmonized approach for evaluating the dustiness of nanopowders.

Objectives

The objectives of the project are to:
- **develop a harmonized approach** within the involved institutes **for evaluating dustiness of nanopowders** taking into account the different existing concepts and test apparatus
- **assess the comparability** between involved institutes **and the reproducibility** within one's institute **for a given test apparatus** using the developed approach
- **evaluate how the dustiness ranking of a selection of nanopowders is similar using the different test apparatus and approach** developed within the project

It is thought that this research **would constitute a preliminary work for standardization.** Also, such a harmonized approach would **stimulate new experimental studies investigating the relationship between inhalation exposure and measured dustiness** as, so far, only few attempts have been made in that area for classical powders and none for nanopowders.

Research methods

Based on the inventory of availability of the dustiness methods in the different involved institutes, design of a study using the same instruments together with the same methods in different institutes. The standard operation procedures (SOP) should be as much as possible similar for the different methods and institute.
SOP should include:
- The preparation of the nanopowder tested (sampling, moisture content, as is or dry?, …).
- The sampling train (tubing, splitting, dilution…) and measurement strategy.
- The preparation and check of the instruments (time interval, particle size range,…).
- The preparation and check (by measuring) of the test apparatus (clean air, controlled humidity and temperature,…).
- The incorporation of the nanopowder tested in the test apparatus.
- The test running (duration,…).
- The data (format for exportation,…).
- The data treatment.

Scientific relevance

High. To date, relatively few information is available on assessment of occupational exposure to MMNPs. Although new measurement techniques have been developed, quite some knowledge needs to be developed on their performances, and their applicability remains to be evaluated for exposure assessment. Measurement strategies have to be developed and tested in workplaces. In addition, relevance of dustiness to be used as one exposure determinant in control banding approach need to be examined.

Practical/societal relevance

High. Scientifically credible measurement methods are essential in order to control potential occupational health risk from current and emerging nanotechnologies. Given the fast pace of developments in applications of nanomaterials and the complex and multidisciplinary nature of this issue, there is an urgent need for more international cooperation to accelerate the process of risk assessment. Exposure assessment is a critical component of risk assessment, and improvements in this area will allow development in toxicology, epidemiology and evaluation of effectiveness of prevention measures. In addition this is pre-normative research to answer some aspects of the EC mandate M461.

Project leader

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Project participants

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