August, 2016

NANOSAFE

AUSA NanoSafety Group Newsletter

Australasian University Safety Association Inc.

Welcome!

Dear AUSA NanoSafe Group members,

Welcome to the August NanoSafety newsletter! In this issue, we will be looking at nanosized metal oxides. Through this newsletter, we hope you will have a general idea about nano metal oxides, their hazards and possible controls. Hope you enjoy reading it!

If you develop new hazard management approaches towards these chemicals, we'd love to hear as well!

Xin, Julie and Maria

In this issue:

Group News

In August, we welcome two new members to the group. Please join us to welcome Martha CAVANAGH, Senior Project Advisor - RBHSC, Edith Cowan University and Ruhani Singh, Chemical Safety Advisor, The University of Western Australia

For group membership enquiry, please contact Xin directly.

Nanosized metal oxides - Appearance, size and hazards

Metal oxides are made of a cation and anion portion, normally in the form of X_nO_m. They are sphere shaped particles and are stable forms of metal. However, in its nanoform, due to the small size and hence large surface area, these chemicals varies in physical and chemical properties greatly from its macro-sized particles.

If one has not seen the chemicals in reality, they are extremely fine powders normally with white colors and are fluffy in texture. Inside a fume cupboard, these nanoparticles can normally fly around easily and it is observable by human naked eye for its suction into the fume cupboard. Even wearing gloves and handle the chemicals in fume cupboard, people can see white dots appearing on the gloves due to the environment of nano metal oxides.

Another special possibility with nano metal oxides accumulation is that those that are unstable by their parent particles, are likely to combine to become nanotubes and exhibit high stability properties. This property has been observed for titanium dioxide, aluminium oxide and molybdenum oxygen species.

In term of hazards, most nano metal oxides exhibit three major health hazards including cytotoxicity (causing cancer), genotoxicity (DNA damage) and oxidative stress to cells (generate reactive oxygen species and hence free radicals). Although there are other hazards associated with nanosized metal oxides, these three are quite common across many nanosized metal oxides. Some nano metal oxides that are used in medical research for drug delivery, eg. TiO_2, are also found capable of combine to toxic organic chemicals and deliver to the target receptors.

NOTE: The above mentioned hazards of nanosized metal oxides are on human cells only, ie no human testing. The nanopowders can enter both nucleus and cytoplasm to affect the cells.

Figure 1. Nanosilica (50nm)

Labelling of Nanomaterials

Labelling of nanomaterials can be quite challenging as the unknown hazard on human and the environment. With Globally Harmonised System (GHS) labelling transition period ending soon, it can be an opportunity for Australian institutes to learn from suggestions by the nanorama laboratory. A screenshot is shown below.

Labelling and packaging of nanomaterials

The full labelling and packaging scheme (classification, labelling and packaging, or CLP) of containers of hazardous substances is of great importance. In the EU, CLP has been defined since 2008 in the Regulation 1272/2008, which has been adapted in accordance with the Globally Harmonized System (GHS) for CLP. For storage bottles in laboratories, the "Laboratories" expert committee developed a simplified labelling system (on the left in the picture) taking into account the labelling system according to the CLP regulation. It explains the pictograms with short phrases so that the main risks can be identified at a glance. This labelling system can be downloaded here, and ready-to-use labels can also be obtained.

Please note There are no legislative requirements of what label/pictogram should be used for nanomaterials. European Union is in the process to develop a labelling system. Read more ...

For the interest of technical knowledge, nanorama laboratory also offers a great resource on most aspects of nanomaterials safety management. You may access the laboratory's website via this link. There are 58 questions to complete.

Frequently Asked Questions?

1. **Are current fume cupboard sufficient in nano metal oxides safety management?**

Laboratory fume cupboard are efficient in extracting most nanosized metal oxides. However, taking into consideration of environmental hazards, fume cupboards may not be efficient to capture the extracted nano metal oxides. As this article suggests, only specially fabricated HEPA filters are capable for picking up most of the nanosized particles. Hence, from the environmental perspective, fume cupboards may not be useful unless appropriate filters are used. It is even more hazardous for maintenance workers to work around the roof or outlet of the fume cupboard vent.

2. **What are some common PPE used of managing nano metal oxides?**

Common PPE used in laboratories are safety googles & half face respirators OR full face respirators with P3 particulate filters (P100 or N100 equivalence in the US), as recommended by NOISH but this test is based on the traditional 300 nm particles so the effectiveness of the PPE is in doubt. Other PPE includes double gloves (same materials or two different materials), disposable coveralls or lab coats.

It is important to note that The American Industrial Hygiene Association (AIHA) in 2015 has published a fact sheet on the effectiveness of personal protective equipment with nanoparticles. The factsheet can be accessed via this link. It may be useful when determining what PPE to use, although engineering control including isolation is more effective.

Suggestions

Our next newsletter will focus on metal oxides nanoparticles. Please email your suggestion/contribution to Xin, Maria or Julie by August 25, 2016 for inclusion.