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NEWS AND RECENT GOVERNMENT BRIEFS

NIOSH Draft Research Agenda for Manufacturing Includes Nanomaterials

On August 23, 2017, the National Institute for Occupational Safety and Health (NIOSH) published a *Federal Register* notice requesting comment on the draft "National Occupational Research Agenda for Manufacturing" document, which was written by the National Occupational Research Agenda (NORA) Manufacturing Sector Council. According to the *Federal Register* notice, the NORA for Manufacturing "is intended to identify the research, information, and actions most urgently needed to prevent occupational injuries and illnesses in the manufacturing sector," and "the Agenda identifies the most important occupational safety and health needs for the next decade, 2016-2026" (NIOSH, 2017). The draft Agenda addresses occupational health and safety issues generally and outlines six research objectives, two of which (Objectives 1 and 3) briefly address nanomaterials and nanotechnology (NORA, 2017).

- **Objective 1:** "Reduce the burden of acute and chronic occupational illnesses, injuries and fatalities in manufacturing by a) enhancing knowledge of occupational safety and health hazards and their effects, and b) developing effective interventions to reduce exposure to known occupational safety and health hazards." Regarding nanomaterials, Objective 1 also states, "Exposure to hazards associated with repetitive hand-intensive work, manual material assembling and handling, nanomaterials, excessive noise, and chemicals contribute greatly to debilitating acute and chronic conditions in the manufacturing industry." [emphasis added]
- **Objective 2:** "Improve surveillance of work-related hazards, exposures and illnesses in the manufacturing industry."
- **Objective 3:** "Examine emerging risks from new technologies and explore ways in which new technologies can advance occupational safety and health in manufacturing." Regarding nanotechnology, Objective 3 also states, "New technologies that are reshaping the manufacturing industry include: data processing capabilities, connectivity of devices and services, advanced robotics, nanotechnologies, a world of wearable devices, the Internet of Things, artificial intelligence, and virtual/augmented reality, etc." [emphasis added]
- **Objective 4:** "Improve occupational safety and health for workers in non-traditional employment arrangements."
- **Objective 5:** "Advance capacity-building and educational efforts in manufacturing."
- **Objective 6:** "Develop mechanisms for effective translation into practice in the manufacturing sector."

The deadline for submitting comments on the draft Agenda has already passed (October 23, 2017).

The *Federal Register* notice can be downloaded here:
https://www.gpo.gov/fdsys/pkg/FR-2017-08-23/pdf/2017-17786.pdf

The draft National Occupational Research Agenda for Manufacturing can be downloaded here:
https://www.regulations.gov/document?D=CDC-2017-0072-0002

US EPA Issues SNUR for Carbon Nanotube Substance

On June 8, 2017, the United States Environmental Protection Agency (US EPA) issued a Significant New Use Rule (SNUR) under the Toxic Substances Control Act (TSCA) for a carbon nanotube substance that was the subject of a Pre-manufacture Notice (PMN), initiating US EPA's evaluation of the intended use. Manufacturing and processing for the significant new use of the carbon nanotube substance cannot begin until US EPA has conducted its review of the PMN and made a determina-

tion. The carbon nanotube substance that is the subject of the SNUR is a bimodal mixture that consists of multi-walled carbon nanotubes and other classes of carbon nanotubes (generic) and is intended to be used as a specialty additive.

Based on test data of analogous respirable, poorly soluble particulates and nanocarbon materials, US EPA identified concerns for pulmonary toxicity and oncogenicity and imposed a Consent Order "based on a finding that the substance may present an unreasonable risk of injury to human health and the environment" (*Federal Register*, 2017). The current SNUR was issued to protect future users of the substance and, consistent with the Consent Order, requires the following protective measures:

- Use of certain personal protective equipment;
- Submission of a dustiness test within 6 months of the notice of commencement of manufacture;
- Submission of data on certain physical-chemical properties;
- Processing and using the substance only for the use specified in the Consent Order, including no application method that generates a vapor, mist, or aerosol (unless conducted in an enclosed process); and
- Releases to water beyond those described in the PMN.

US EPA had previously issued the SNUR as a direct Final Rule on November 3, 2016, but withdrew it on January 19, 2017, after receiving a notice of intent to submit adverse comments. The commenter had noted a discrepancy between the direct final SNUR and the Consent Order that related to releases to surface water. The current SNUR has resolved this discrepancy.

The *Federal Register* notice can be accessed here:
https://www.gpo.gov/fdsys/pkg/FR-2017-06-08/pdf/2017-11695.pdf

Additional information is available here:
https://chemicalwatch.com/56773/us-epa-proposes-snur-for-carbon-nanotube-substance

US EPA Releases Final Guidance on New TSCA Rule

On August 14, 2017, US EPA released its "Working Guidance on EPA's Section 8(a) Information Gathering Rule on Nanomaterials in Commerce," which is organized as a frequently asked questions document. The Final Rule, which was published on January 12, 2017, and went into effect on August 14, 2017, requires manufacturers and companies that import or process nanomaterials to report certain information to US EPA, including specific chemical identity, production volume, methods of manufacture and processing, exposure and release information, and information on environmental and human health effects. While the final guidance was intended to address industry criticism of a Draft Rule that was released in May 2017, US EPA acknowledged that it was unable to address all the concerns that had been raised. Thus, US EPA will answer questions on a case-by-case basis and revise the guidance as needed. Contact information is provided in the guidance document.

US EPA's "Working Guidance on EPA's Section 8(a) Information Gathering Rule on Nanomaterials in Commerce" can be downloaded here:
https://insideepa.com/sites/insideepa.com/files/documents/aug2017/epa2017_1634.pdf

The Final Rule can be downloaded here:
https://www.gpo.gov/fdsys/pkg/FR-2017-01-12/pdf/2017-00052.pdf

Additional information can be found here:
https://insideepa.com/risk-policy-report/epa-declines-industry-call-delay-nano-reporting-rule-expands-guide
http://www.jdsupra.com/legalnews/epa-releases-final-guidance-on-tsca-84536

European Union Observatory for Nanomaterials Website Is Live

In the summer of 2017, the European Union Observatory for Nanomaterials (EUON) website went live, providing information on existing nanomaterials on the European Union (EU) market. EUON is a new initiative funded by the EU Commission and hosted and maintained by the European Chemicals Agency. In its first phase, the website provides general information on nanomaterials; how nanomaterials are used in products; safety information, such as how nanomaterials are characterized, nanomaterials in the environment, and exposure to nanomaterials; regulations; international organizations involved in nanomaterials and nanotechnology; research and innovation; and news. The second phase, starting in 2018, is intended to expand on the website's current content to target different audiences, possibly linking with or hosting databases on research and innovation. The third phase, slated for 2019, intends to bring the initiative into full operation, with additional content for different audiences.

The EUON website can be accessed here:
https://euon.echa.europa.eu

Additional information on EUON and its future plans can be found here:
https://euon.echa.europa.eu/documents/23168237/23372605/shd_dialoge_meeting_20170630_presentation_launch_en.pdf/41ea166c-b7f0-b673-0eba-425a82ea446d

European Commission Publishes Catalogue of Nanomaterials in Cosmetic Products

On June 15, 2017, the European Commission (EC) published its "Catalogue of Nanomaterials Used in Cosmetic Products Placed on the EU Market," as required under EC Regulation No. 1223/2009. The information provided in the catalogue is supplied by "responsible persons" (*i.e.,* designated as such within the EU) through the Cosmetic Products Notification Portal (EC, 2017). The release of the catalogue was delayed by over 3 years due to inconsistencies or inaccuracies in the data that were extracted from the portal.

According to the catalogue, it "has an informative value only and is not in any case a list of authorised nanomaterials" (EC, 2017). The 43 nanomaterials listed in the catalogue are categorized as colorants, ultraviolet (UV) filters, preservatives, or "[o]ther functions than colorant, preservative and UV-filter" (EC, 2017). The catalogue provides information on the category of cosmetics each substance is used in, exposure route (dermal, oral, inhalation), and whether the product is intended to be rinsed off and/or left on. However, the catalogue does not specify which brands of products contain nanomaterials.

ClientEarth, a non-governmental organization, filed a complaint with the EU ombudsman on July 31, 2017, regarding "the European Commission's unlawful handling of a long-delayed list of nano-materials in cosmetics" (ClientEarth, 2017). In addition, ClientEarth lawyer Anne Friel stated that "the Commission's list does not contain the necessary information on nanos in the beauty products people use every day, further delaying consumers' ability to make informed decisions" (ClientEarth, 2017).

The catalogue can be downloaded here:
http://www.safenano.org/media/127231/nanocatalogue_06_2017_en.pdf

Additional information is available here:
http://www.safenano.org/news/news-articles/ec-publishes-catalogue-of-nanomaterials-used-in-cosmetic-products-placed-in-the-eu-market
https://chemicalwatch.com/58020/clientearth-files-complaint-over-eu-cosmetics-nano-inventory
https://www.clientearth.org/commission-facing-eu-legal-watchdog-nano-chemicals-cosmetics

Nanomaterials Fact Sheet Published by Massachusetts Toxic Use Reduction Institute

In August 2017, the Toxics Use Reduction Institute (TURI) of Massachusetts published a fact sheet on engineered nanomaterials. TURI was established by the Massachusetts Toxics Use Reduction Act in 1989 and is part of the University of Massachusetts-Lowell. According to its website, "TURI collaborates with businesses, community organizations and government agencies to reduce the use of toxic chemicals, protect human health and the environment, and increase competitiveness of Massachusetts businesses" (TURI, 2017). The engineered nanomaterials fact sheet is one of a series of chemical and material fact sheets "intended to help Massachusetts companies, community organizations, and residents understand the use of hazardous substances and their effects on human health and the environment" (Bergeson & Campbell, PC, 2017). The fact sheet defines engineered nanomaterials; discusses human health and environmental concerns about nanotechnology; provides case studies of four engineered nanomaterials (carbon nanotubes, quantum dots, nano titanium dioxide, and nanosilver); provides safer alternatives to some nanomaterials; discusses considerations for the safer development and use of engineered nanomaterials; and summarizes the federal regulatory context, as there are no Massachusetts regulations specifically governing the use or release of nanomaterials.

The TURI fact sheet can be downloaded here:
http://www.turi.org/content/download/11060/180362/file/Fact%20Sheet.%20Nanomaterials.%20August%202017.pdf

Additional information can be found here:
https://nanotech.lawbc.com/2017/09/turi-publishes-nanomaterials-fact-sheet/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+NanoAndOtherEmergingChemicalTechnologiesBlog+%28Nano+and+Other+Emerging+Chemical+Technologies+Blog%29

Information on TURI can be found here:
http://www.turi.org

Toxicity

Bishop, L; Cena, L; Orandle, M; Yanamala, N; Dahm, MM; Birch, ME; Evans, DE; Kodali, VK; Eye, T; Battelli, L; Zeidler-Erdely, PC; Casuccio, G; Bunker, K; Lupoi, JS; Lersch, TL; Stefaniak, AB; Sager, T; Afshari, A; Schwegler-Berry, D; Friend, S; Kang, J; Siegrist, KJ; Mitchell, CA; Lowry, DT; Kashon, ML; Mercer, RR; Geraci, CL; Schubauer-Berigan, MK; Sargent, LM; Erdely, A. 2017. "In vivo toxicity assessment of occupational components of the carbon nanotube life cycle to provide context to potential health effects." *ACS Nano* doi: 10.1021/acsnano.7b03038.

Multi-walled carbon nanotubes (MWCNTs), which have the potential to elicit pulmonary toxicity, are frequently incorporated into composite materials in end-use products. Manufacturers of nano-enabled products are exploring the use of polymer coatings to add stability and increase end-product performance, while also reducing the percentage of MWCNTs required for the end-product, and in some cases enabling easier handling of the MWCNTs. The aim of this study was to evaluate the effect of polymer coating on MWCNT toxicity and to evaluate the toxicity of particles generated from composite materials embedded with polymer-coated MWCNTs.

Bishop *et al.* evaluated two different commercially available MWCNTs, using as-produced MWCNTs (AP-MW), polymer-coated MWCNTs (PC-MW), and particles generated *via* sanding from composite material incorporating the PC-MW particles (Comp-MW). The AP-MW and PC-MW particles were evaluated *in vitro* for genotoxicity. These particles were also evaluated *in vivo* in mice exposed *via* oropharyngeal aspiration to a single dose of either 4 µg (representative of approximately 8 years of exposure at average workplace exposure levels), or 40 µg (a dose known to induce pulmonary toxicity). The Comp-MW particles were evaluated *in vivo* in mice exposed to a single dose of 40 µg.

The AP-MW particles from Company 1 (AP-MW_1) were highly entangled, synthesized to form large agglomerates, with only 10% of the inhalable particles in the respirable fraction. The agglomerates formed by AP-MW_2 particles were smaller, with 40-50% of the inhalable particles in the respirable fraction. The AP-MW from both companies were genotoxic *in vitro* and produced comparable lung toxicity and inflammation *in vivo* at the low dose. At the high dose, toxicity was greater for the AP-MW_2 particles. The effect of the polymer coating differed between the two MWCNTs. For Company 1, the polymer coating reduced the dustiness (*e.g.*, the ratio of respirable/total particles), but had no significant effect on genotoxicity *in vitro* or lung toxicity or inflammation *in vivo*. For Company 2, the polymer coating increased the dustiness, had no effect on genotoxicity *in vitro*, and attenuated the effects on lung toxicity and inflammation *in vivo* at the high dose, making them comparable to the effects observed for the PC-MW_1 particles. Toxicity and expression of inflammatory genes in the lung were comparable for sanding-derived particles from the MWCNT-free composites of both companies. The Comp-MW_1 particles were smaller than particles from the corresponding MWCNT-free composite and also produced significantly more lung toxicity and expression of inflammatory genes. The size distribution of Comp-MW_2 particles was comparable to that of sanding-derived particles from MWCNT-free composite material from Company 2. Although the Comp-MW_2 particles were more toxic than the MWCNT-free composite particles, the difference was not significant, and there was no difference in expression of inflammatory genes between Comp-MW_2 particles and sanding-derived particles from MWCNT-free composite material from Company 2.

Overall, the results from the study by Bishop *et al*. highlight the importance of evaluating exposures that are representative of end-use conditions, rather than the as-produced nanoparticles, because the results for AP-MW_2 would have predicted these particles to be more toxic than the AP-MW_1 particles, whereas the Comp-MW_2 particles were comparably toxic to the Comp-MW_1 particles. Furthermore, in contrast to the Comp-MW_1 particles, Comp-MW_2 particles did not increase expression of inflammatory genes (relative to MWCNT-free composite particles).

Exposure

Jørgensen, RB; Hveding, IG; Solheim, K. 2017. "Nano-sized emission from commercially available paints used for indoor surfaces during drying." *Chemosphere* 189:153-160. doi: 10.1016/j.chemosphere.2017.09.028.

Nanostructured materials such as titanium dioxide (TiO_2) and carbon black have been used in paints for decades as white and black pigments, respectively. More recently, nanotechnology has been applied to paints for the development of antifungal additives for indoor waterborne paints and new paint binders. Given the increasing application of nanotechnology in paints, concerns have been raised regarding airborne emissions of nano-sized particles to indoor and outdoor air during both paint application and drying. This study claims to be the first experimental study to investigate emissions of nano-sized particles to indoor air during the paint-drying period.

Experiments were conducted for three water-borne acrylic paints and one solvent-borne alkyd paint in a stainless steel test chamber under standardized conditions (~23°C, 50% relative humidity, 0.5 $hour^{-1}$ air exchange rate). Following the application of the paint to aluminum plates, the number and size distribution of particles with diameters between 5.6 and ~560 nm were measured using a TSI Fast Mobility Particle Sizer (FMPS) over a 7-day period. Duplicate experiments were conducted for the four different paints, with and without tinting color.

The highest particle number concentrations were measured for the single solvent-borne alkyd paint that was tested, with a mean particle number concentration of 3.2×10^5 particles/cm^3 and a peak concentration of 1.4×10^6 particles/cm^3. These emissions were found to have a dominant particle size of 9.31 nm, demonstrating that small nano-sized particles were major contributors to the particle emissions. These particle number concentrations were about three orders of magnitude higher than those for the other water-borne acrylic paints. Particle emissions from the water-borne acrylic paints, both with and without tinting color, occurred only during the first 24 hours of drying and overall were very low and often not discernible from background particle number concentrations. One of the pigmented water-borne acrylic paints was found to have a smaller dominant particle size (6.04 nm) than the solvent-borne alkyd paint, due to a brief episodic emission event that occurred about 7 hours after application.

While significantly higher than for the water-borne acrylic paints, particle emissions for the solvent-borne alkyd paint occurred primarily over the first 48 hours following application and the study authors did not consider this to represent an important source of exposure to nano-sized particles, given the short duration of the emissions. Based on the lack of any systematic differences in particle emissions between the pigmented and base versions of the paints, the study authors also concluded that their findings suggested that carbon black, which was a paint pigment in the tested paints, was not a significant source of nano-sized particle emissions. As part of future work, the study authors proposed using methods that would allow them to determine the composition of the particle emissions and to investigate their sources, including whether they consist of volatile, semi-volatile, or solid particles.

5th Nano Today Conference

December 6-10, 2017
Waikoloa Beach, Hawaii
https://www.elsevier.com/events/conferences/nano-today-conference

The *Nano Today* journal, the Institute of Bioengineering and Nanotechnology (IBN), and Elsevier invite researchers with an interest in nanoscience and nanotechnology to attend the 5th Nano Today Conference in early December. The program includes oral presentations, an award ceremony, and a luau gala dinner. This international conference will focus on the latest research for topics such as nanosystems for biological and medical applications, processing and templating of nanotubes and nanoporous materials, nanomaterials for energy and environmental applications, and more.

4th International Conference on Nanoscience and Nanotechnology

December 14-15, 2017
Sri Lanka
http://nanoconference.co

The International Institute of Knowledge Management invites chemists, physicists, materials scientists, biomedical researchers, engineers, and other researchers to attend the 4th International Conference on Nanoscience and Nanotechnology (ICNSNT) in mid-December. The theme of this year's international conference is "Emerging Nanotechnologies for Sustainable Development." ICNSNT will explore this theme through the execution of roundtable discussions, an exhibition, technical sessions, a networking dinner, a cultural show, and an op-

tional post-conference tour. Conference tracks will highlight the synthesis and characterization techniques of nanomaterials; nanomaterials in food, agriculture, and water purification; smart textiles and apparels; and more.

6th International Conference on Nano and Materials Science

January 15-17, 2018
Lakeland, Florida
http://www.icnms.org/index.html
The South Asia Institute of Science and Engineering (SAISE) invites you to attend the 6th International Conference on Nano and Materials Science (ICNMS 2018) held at the Florida Polytechnic University in Lakeland, Florida, in mid-January. ICNMS 2018 aims to cover nano and materials science in the context of the latest scientific research results. Potential topics for presentations include nanomaterials and nanomanufacturing, nanofabrication, semiconductor materials manufacturing, and more.

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