ISSUE 4 | VOLUME 5 | AUGUST/SEPTEMBER 2010

A CONSTRUCTIVE CONTRIBUTION TO THE RESPONSIBLE DEVELOPMENT AND USE OF ENGINEERED NANOMATERIALS

nanoRISK

OPTIMIZING THE BENEFITS OF NANOTECHNOLOGY WHILE MINIMIZING AND CONTROLLING THE RISKS

Insider Report

Multicriteria Mapping *is used to study why some regulatory options – bans, moratoriums, voluntary measures, etc. – are deemed to be acceptable/unacceptable by various stakeholders in the U.S.*

STAKEHOLDER PREFERENCES IN REGULATING NANOTECHNOLOGY

How to regulate nanotechnology and the application of nanomaterials has been quite a controversial issue in recent years. A good example of opposing positions could be found in last year's comprehensive review of existing legislation on nanotechnology, conducted by the FramingNano project. This report documents variations in governance structures across the world and disagreement over whether voluntary codes of conduct will be enough to regulate nanomaterials.

While for instance non-governmental organizations (NGOs) like Greenpeace and Friends of the Earth consider the existing regulatory situation to be inadequate and are urging a strictly precautionary approach, industry representatives are instead seeking the development of specific guidance and standards to support implementation of existing regulations, which are generally seen as adequate.

Multicriteria Mapping

Steffen Foss Hansen, a postdoc at the Technical University of Denmark, Department of Environmental Engineering and NanoDTU Environment & Health, has now used *Multicriteria Mapping* (MCM) to study why some regulatory options – bans, moratoriums, voluntary measures, etc. – are deemed to be acceptable/unacceptable by various stakeholders in the U.S. and the criteria they use to evaluate the different regulatory options.

Multicriteria Mapping is a computer-based decision analysis technique that provides a way of appraising a series of different potential ways forward on a complex and controversial policy problem. Like other multicriteria approaches, it involves developing a set of criteria, evaluating the performance of each option under each criterion, and weighting each criterion according to its relative importance.

Hansen interviewed 26 stakeholders, including academics, public civil servants, corporate lawyers, and representatives from worker unions, industrial companies, and trade association. The MCM interviews were performed face-to-face and completed in a 3-month period between May and August 2007, prior to the U.S. Environmental Protection Agency's initiation of the it's voluntary Nanoscale Materials Stewardship Program.

His findings have been published in the June 30, 2010 online issue of *Journal of Nanoparticle Research* ("Multicriteria mapping of stakeholder preferences in regulating nanotechnology").

Incremental Approach a Favored Option

"Adopting an incremental approach and implementing a new regulatory framework have been evaluated as the best options whereas a complete ban and no additional regulation of nanotechnology were the least favorable" Hansen explains the key findings.

Participants described their idea of an 'incremental approach' as "...launching an incremental process using existing legislative structures—e.g., dangerous substances legislation, classification and labeling, cosmetic legislation, etc.—to the maximum, revisiting them, and, when appropriate only, amending them..." and a 'new regulatory framework' as "...launching a comprehensive, in-depth regulatory process specific to nanotechnologies that aims at developing an entirely

Continued on page 4

nanoRISK is published bimonthly by Nanowerk, LLC | Annual Subscription Rate US$49 | For subscription information e-mail subscriptions@nanorisk.org | Address all content-related inquiries to Editor, nanoRisk: editor@nanorisk.org | www.nanorisk.org

A new report lists current uses of nanomaterials in various building applications and also highlights potential and promising future uses.

NANOMATERIALS IN THE CONSTRUCTION INDUSTRY AND RESULTING HEALTH AND SAFETY ISSUES

Tailing after emerging nanotechnology applications in biomedical and electronic industries, the construction industry recently started seeking out a way to advance conventional construction materials using a variety of manufactured nanomaterials. The use of nanotechnology materials and applications in the construction industry should be considered not only for enhancing material properties and functions but also in the context of energy conservation. This is a particularly important prospect since a high percentage of all energy used (e.g., 41% in the United States) is consumed by commercial buildings and residential houses by applications such as heating, lighting, and air conditioning. A recent review by scientists at Rice University has looked at the benefits of using nanomaterials in construction materials but also highlights the potentially harmful aspects of releasing nanomaterials into the environment.

Led by Pedro J. Alvarez, the the George R. Brown Professor of Engineering at Rice University, the team compiled a list of current use of nanomaterials in various building applications and also highlighted potential and promising future uses.

Use of nanomaterials in construction

Carbon nanotubes – Expected benefits are mechanical durability and crack prevention (in cement); enhanced mechanical and thermal properties (in ceramics); real-time structural health monitoring (NEMS/MEMS); and effective electron mediation (in solar cells).

Silicon dioxide nanoparticles (SiO_2) – Expected benefits are reinforcement in mechanical strength (in concrete); coolant, light transmission, and fire resistance (in ceramics); flame-proofing and anti-reflection (in windows).

Titanium dioxide nanoparticles (TiO_2) – Expected benefits are rapid hydration, increased degree of hydration, and self-cleaning (in concrete); superhydrophilicity, anti-fogging, and fouling-resistance (in windows); non-utility electricity generation (in solar cells).

Iron oxide nanoparticles (Fe_2O_3) – Expected benefits are increased compressive strength and abrasion-resistant in concrete.

Copper nanoparticles – Expected benefits are weld-ability, corrosion resistance, and formability in steel.

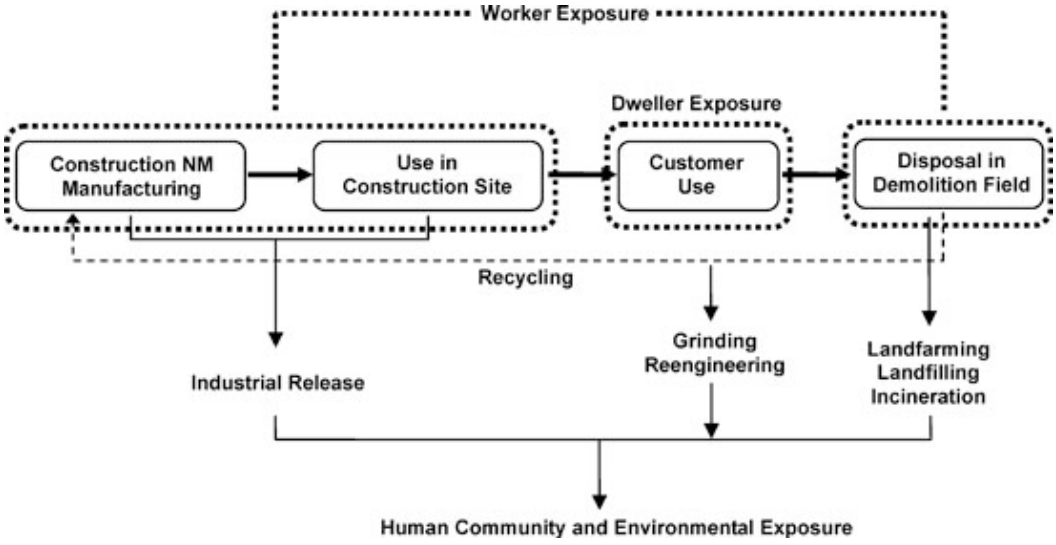
Silver nanoparticles – Expected benefits are biocidal activity in coatings and paints.

Quantum dots – Expected benefits are effective elect-ron mediation in solar cells.

Potential risks and concerns

The authors point out that manufactured nanomaterials, in particular synthesized nanoparticles and carbon nanotubes, may be accidentally or incidentally released to the environment at different stages of their life cycle.

They write that "some manufactured nanomaterials could be considered as potential emerging pollutants because their environmental release is currently not regulated despite growing concerns about the associated risks to public and environmental health. Once in the environment, manufactured nanomaterials may undergo diverse physical, chemical, and biological transformations that change their properties, impact, and fate. Thus, a holistic manufactured nanomaterials



Possible exposure scenarios during the lifecycle of manufactured nanomaterials used in construction.

Continued on page 3

NANOMATERIALS IN THE CONSTRUCTION INDUSTRY

Continued from page 2

lifecycle exposure profiling is essential to evaluate potential impacts to human and ecosystem health, as well as to mitigate unnecessary risks."

Risk factors range from occupational exposure of workers during during coating, molding, compounding, and incorporation of nanomaterials into the finished building materials or components to community exposure to community exposure during construction, repair, renovation, and (mainly) demolition activities. At the end of the lifecycle, there is a risk of environmental release from solid nanomaterial wastes as they get disposed of in landfills and incinerators.

Aerosolization of manufactured nanomaterials, wastewater effluents from manufacturing processes, and construction-related work, as well as adhesive wear, abrasion, and corrosion of buildings/civil infrastructures could also result in manufactured nanomaterials' release to the environment

Mitigation of public and environmental health impacts

"Whether nanoenabled construction materials could be designed to be "safe" and still display the properties that make them useful is an outstanding question" the authors state. Adopting principles of industrial ecology and pollution prevention (see: "The Twelve Principles of Green Engineering") should be a high priority to prevent environmental pollution and associated impacts by manufactured nanomaterials.

According to the authors, some substances can be re-engineered to create safer, greener, and yet effective products. Recent examples include the substitution of branched alkylbenzene sulfonate detergents, which caused excessive foaming in the environment, with biodegradable linear homologues, as well as the replacement of ozone-depleting chlorofluorocarbons by less harmful and less persistent hydrochlorofluorocarbons.

"Thus, it is important to discern the molecular structures and associated properties that make nanomaterials harmful and determine which receptors might be at higher risks. However, detoxification could result in loss of useful reactivity, and focusing on exposure control (e.g., by using appropriate durable coatings during manufacturing, improving matrix stability to minimize manufactured nanomaterials leaching, and adopting controlled construction and careful disposal practices) rather than suppressing intrinsic reactivity that contributes to toxicity might be appropriate in many cases."

In their concluding remarks, the authors emphasize the use of manufactured nanomaterials in the construction industry in the context of energy conservation.

"Opportunities for energy savings – other than using manufactured nanomaterials to harvest solar or other forms of renewable energy – include improved thermal management by using silica nanoparticles in insulating ceramics and paint/coating that enable energy conservation and solar-powered self-cleaning nano-TiO2-coated surfaces. Additional opportunities include the use of quantum dots and carbon nanotubes to improve the efficiency of energy transmission, lighting, and/or heating devices, as well as incorporation of fullerenes and graphene to enhance energy storage systems such as batteries and capacitors that harvest energy from intermittent, renewable sources (e.g., solar and wind)."

Furthermore, manufactured nanomaterials that extend the durability of structures (e.g., through enhanced resistance to corrosion, fatigue, wear, and abrasion) also contribute indirectly to saving energy that would otherwise be used to repair or replace deteriorated infrastructure.

As a final aspect, manufactured nanomaterials can also contribute to a greener construction industry when used as substitutes for materials that can become harmful environmental pollutants, such as lead and mercury (see EPA's brief on green nanotechnology manufacturing).

NEW EU PROJECT TO DEVELOP SUSTAINABLE NANO-SOLUTIONS

The Nanosustain FP7 project, started on May 1, 2010, is funded for three years and has the objective of developing innovative solutions for the sustainable design, use, recycling, and final treatment of nanotechnology-based products. Although production of nanomaterials is rapidly increasing, our knowledge about possible health and environmental effects associated with these materials is still rather poor. NanoSustain will therefore address the following questions:

1) How, and to what degree, will society and the environment will be exposed to nano-materials and associated products; and

2) Where do these particles end up? Expected results will improve our present knowledge on the impact and fate of these particles after entering economic and natural cycles.

NanoSustain has mobilised a critical mass of expertise, resources and skills to tackle this complex issue and the consortium includes many leaders in the field of hazard characterisation and life cycle analysis. The IoN will be providing management support in addition to leading the dissemination activities of the project.

Expected results will improve our present knowledge on the impact and fate of these particles after entering economic and natural cycles. NanoSustain has mobilized the critical mass of expertise, resources and skills to tackle this complex issue.

Based on results from hazard characterization, impact assessment and LCA, we will explore on a lab-scale new solutions for the design of selected nano-materials and associated products and their sustainable use, recycling and final treatment. As the concerned nanotech industry will actively participate in the planned project, NanoSustain will set the ground for the development of new sustainable products and industrial applications, and hence help to strengthen competitiveness of the European nanotechnology industry.

Continued from page 1

new legislative framework that tries to take all the widely different nanomaterials and applications into consideration."

Hansen notes that comparing the ranking of the various options by the stakeholder groups reveals that an incremental approach was ranked highest by a majority of the various stakeholder groups e.g. civil servants, public interest groups, industrial company representatives and corporate lawyers.

The option of forming and implementing a new regulatory framework was ranked highest by the worker union representative, academics and environmental NGOs under whereas industrial company and trade association representatives evaluated it to be only the third/fourth best option.

The option of relying on voluntary measures generally ranked high as well and was ranked first by the trade association representative; second by the industrial company representatives and the corporate lawyers; and third by the civil servants. In contrast, academics and the environmental NGOs evaluated this option either worst or second to worst.

Environmental NGOs and Trade Associations Differ

"The largest difference in ranking of the policy options can be observed between environmental NGOs and the representatives from the industrial companies and the trade association," says Hansen. "The option of relying on voluntary measures and having no additional regulation are evaluated to be most favorable by the representative from the trade association, but the least favorable by the environmental NGOs whereas the three options ranked as most favorable by industrial company representatives were the options ranked the least favorable by the environmental NGOs."

He points out that the criteria used by NGOs and the trade association representative to evaluate the various policy options differed widely – which could help explain their dissimilar ranking of the options. Several NGOs put most weight on criteria that fell into the categories of health and environmental concerns and regulatory, legal, social and ethical issues, the trade association representative used criteria that fell into the categories of proportionality and benefits.

During the MCM exercise, a total of 97 different criteria were used by the interviewees with *Protection of human health and environment* being mentioned most often, followed by *Practicality* and *Transparency in the decision-making process*. Criteria predominately fall into health and environmental concerns (27%) followed by concerns about efficacy (14%) and criteria that could be classified as benefits, economical, social, regulatory, and legal issues (10–13%).

Hansen points out that the expressed opinions about future regulation appear far less polarized than originally expected. "We observed a high level of agreement among stakeholders on the most favorable policy options: the reliance on voluntary measures; an incremental approach; and forming and implementation of a new regulatory framework. Several stakeholders actually suggested the possibility of implementing a combination of these three options."

"This would also be a potential compromise between the two most extreme stakeholder positions, i.e., environmental NGOs versus the trade association representative" says Hansen. "The first step of such a potential future process, i.e., relying on voluntary measures, was evaluated highest by the trade association representative whereas combining this with an incremental approach was evaluated second overall. Environmental NGOs ranked relying on voluntary measures very low, but evaluated an incremental approach and forming and implementing a new regulatory framework highest."

Hansen notes that at the time of the interviews – in the summer of 2007 – there was a lot of discussion about the US EPA's voluntary Nanoscale Materials Stewardship Program (NMSP)and one might wonder if environmental NGOs might had been willing to accept relying on voluntary measures for a certain time-period while knowing that an incremental approach was being prepared.

EPA's Voluntary NSMP Widely Considered to Be a Failure

The U.S. EPA's voluntary NMSP was implemented despite numerous limitations (see "Implementing successful voluntary nanotechnology environmental programs appears to be a challenge" and "EPA Nanotechnology Voluntary Program risks becoming a 'black hole'") and is now generally believed to have been a failure (see "Too small to overlook").

Hansen concludes that the time seems ripe to move to a full implementation of an incremental approach and the initiation of discussions about the forming of a new regulatory framework. Attempts to address elements of an incremental approach already have been made such as for instance recommendation and guidelines published by the U.S. National Institute for Occupational Safety and Health ("Approaches to Safe Nanotechnology – Managing the Health and Safety Concerns Associated with Engineered Nanomaterials") but these efforts constitute merely a starting point.

"A critical review and adaptations of the existing legislation are fundamental elements of an incremental approach that still have to be seriously addressed by policy-makers and agencies involved in the administration of, for instance, the Toxic Substances Control Act (TSCA)" says Hansen.

He therefore believes that most stakeholders interviewed welcome the current movement in the U.S. towards reforms to the Toxic Substances Control Act. Recently, legislative reform proposals were proposed in both the U.S. House of Representatives ("Toxic Chemicals Safety Act of 2010"; pdf) and the U.S. Senate ("Safe Chemicals Act of 2010""; pdf) and both versions include revisions for nanomaterials.

The Federal Institute for Risk Assessment (BfR) in Germany currently advises against using nanoscale silver ions in consumer products.

German Federal Institute for Risk Assessment Advises Against Nanoscale Silver Ions In Consumer Products

The manufacturers of consumer products have made use of the antimicrobial properties of silver ions for some time now. Recently, silver particles in the nanorange have likewise been used. For instance, the surfaces in fridges coated with nanosilver are intended to inhibit the growth of germs and nanosilver aims to prevent odour formation in sports socks. It is not possible at the present time to determine in a definitive manner whether nanosilver constitutes a health risk for consumers.

"Until we are in a position to reliably rule out potential health risks, we recommend that manufacturers refrain from using nanosilver in consumer products", says Federal Institute for Risk Assessment (BfR) President Andreas Hensel.

Silver and silver compounds release silver ions that can inhibit the growth of germs. For that reason they are used for instance in cosmetics, textiles and household appliances. Furthermore, silver is approved as a dye for food (E174). Recently, the manufacturers of consumer products have been increasingly using silver in the form of nanoparticles, too. Nanoparticles are particles with a diameter of less than 100 nanometres. The properties of nanoparticles differ from those of larger particles of the same substance. It is these special properties that make them interesting for various applications. However, it has still to be ascertained whether their toxic properties change and they could become a health risk for consumers.

BfR feels there is a need for research to elucidate the fundamental issues in conjunction with the use of nanoscale silver as an antimicrobial material. On what scale do consumers come into contact with nanoscale particles? How big is the danger of resistance development?

BfR recommends refraining from using any nanoscale silver in consumer products until a definitive safety assessment becomes available. In any case nanoscale additives in food require approval. Nanosilver has not been approved for use in food. BfR welcomes this in the context of the yet to be answered questions about risk assessment.

BfR has published an Opinion on this subject which can be accessed on the website www.bfr.bund.de.

OECD Publishes Guidance Notes For The Safety Testing Of Manufactured Nanomaterials

This document aims to assist sponsors of the OECD Sponsorship Programme as well as others involved in the safety testing of manufactured nanomaterials, through providing general and common issues as well as specific considerations on sample preparation and dosimetry. The part of specific consideration includes: i) physical chemical properties; ii) ecotoxicity studies; iii) degradation, transformation and accumulation; and iv) health effects.

This documents will be updated/amended iteratively based upon knowledge accumulation in the future.

The document can be downloaded here (pdf) from the OECD website.

Background

The unique properties of manufactured nanomaterials raise the question of whether the current OECD Test Guidelines are adequate to appropriately address their characterisation and the assessment of their toxicological properties. Based on the discussion held in preparing the Preliminary Review of OECD Test Guidelines for their Applicability to Manufactured Nanomaterials [ENV/JM/MONO(2009)21], it was recognised that it is essential to develop a guidance document on sample preparation and dosimetry. It called special attention to this guidance as crucial in using test guidelines when considering the unique chemical and physical characteristics of nanomaterials.

The purpose of this document, Preliminary Guidance Notes on Sample Preparation and Dosimetry for the Safety Testing of Manufactured Nanomaterials, is primarily to assist sponsors as they conduct testing in support of the WPMN's exploratory testing programme (OECD Sponsorship Programme for the Testing of Manufactured Nanomaterials as well as other users involved in the testing of manufactured nanomaterials. This guidance includes general and common issues (Section I to Section IV) as well as specific consideration (Section V) on sample preparation and dosimetry for the safety testing of manufactured nanomaterials.

As a general point, dosimetry should always report mass concentration, but for nanomaterials, the results may be better expressed as a function of surface area or particle number because particle size and specific area may play a major role in determining the toxicity of nanomaterials. So any size distribution measurements and surface area measurements would need to be done for each dose. Also, the soluble nanomaterials are unlikely to need different sample preparation techniques, therefore these guidance notes refer and apply to water insoluble manufactured nanomaterials.

The section on specific considerations is composed of 4 parts: i) physical chemical properties (Section V;A); ii) ecotoxicity studies (Section V;B); iii) degradation, transformation and accumulation (Section V;C); and iv) health effects (Section V;D). These parts may give researchers specific orientation to those issues that, at present, seem most promising for yielding meaningful and reproducible test results.

EU-Chinese Collaboration On Consumer Protection

The Chinese Academy of Inspection and Quarantine and the European Commision Joint Research Centre (JRC) Institute for Health and Consumer Protection (IHCP) have kicked off collaboration to support risk management and improve consumer protection through new approaches in the areas of nanotechnology and alternative methods to animal testing.

Elke Anklam, Director of JRC-IHCP and Huailin Li, President of the Chinese Academy of Inspection and Quarantine, at the signing of the MoU on 6 June.

On 6 June, the organisations have signed a Memorandum of Understanding at the occasion of the EU-China Food Safety Scientific Seminar at the Shanghai World Expo. Both institutions provide technical support for policy makers and aim to reinforce their co-operation in scientific research for consumer products safety.

Nanotechnology is increasingly exploited in the development of novel and improved products and applications in areas as diverse as medicine, biotechnology, electronics, materials science, and energy technologies. The rapid increase in the utilisation of nanoparticles in industry and in consumer products is, however, causing concerns regarding the potential effects on health and on the environment. With today's globalisation of markets, food safety or consumer protection are no longer domestic issues, but need to be addressed in international collaboration.

The JRC-IHCP has several years of experience in the field of nanotechnology, in particular regarding research in the safety assessment of nanomaterials, where it assesses the potential risks of particulate nanomaterials due to uptake and subsequent potential adverse effects on living tissue. The institute develops and uses the state-of-the-art computational and in vitro techniques to analyse the interaction of nanoparticles with cells and proteins. The IHCP has also a long tradition and expertise in the field of alternative methods to animal testing. The institute carries out scientific validation of alternative methods to animal testing developed and submitted by research laboratories.

Upcoming Events
Looking At The Risky Side Of Nano

NanoImpactNet Workshop 2010
September 6-9, 2010, Dublin (Ireland)
This technical workshop will bring together experts with "hands on" bench experience with nanomaterials to discuss the recent advances in methodology, share our current experiences at the bench with nanomaterials, identify the problems and potential solutions for studying the biological effects of nanomaterials.

NanoImpactNet Training School
September 6-10, 2010, Bratislava (Slovakia)
This raining school will provide an update on the present state of knowledge in environmental fate and behaviour of engineered nanomaterials and enable the participants to actively contribute to the ongoing scientific discussions currently taking place in this area.

Second Nanosafety Autumn School
October 4-8, 2010, Venice (Italy)
The school will focus on emerging nanosafety aspects, concerning human and environmental exposure to engineered nanoparticles. The second cycle of the Nanosafety Autumn School will provide the update of the state-of-the-art on scientific knowledge and technical tools available for an integrated assessment of nanotechnology products.

The Wider Context of Nanotechnology
October 11-December 3, 2010, online
This course module will give an overview of the current state of the technology as well as sketching out the implications of these new technologies for safety, regulation, innovation and will give an overview of the societal and environmental implications.

Nordic Tour 2010: Health Effects and Risks of Nanoparticles
October 27 – November 16, 2010, various locations
The goal of this seminar series is to introduce the latest in nanotechnology to a wider audience and to discuss the possible health risks. Specialists in the area will gain from attending and hearing of the latest developments in the area. Each one-day seminar is comprised of morning sessions, which will be similar in each Nordic country.

Benefits and Risk Communication for Nanomaterials
November 16, 2010, webinar
Learn about the most current approaches to MSDS writing, control banding, and related business communication strategies to assist the occupational safety and health professional.

NanoSafe 2010
November 16-18, 2010, Grenoble (France)
The objectives of the conference will be to make available the major progresses and future trends in the domain of the safe production and use of nanomaterials.

IN SHORT – PAPERS, INITIATIVES & UPDATES

REPORT: New Insight Into Nanoparticle Dispersal in the Environment and the Body

Using a chemical trick that allows them to change the acidity of a solution almost instantly, a team at the National Institute of Standards and Technology (NIST) has demonstrated a simple and effective technique for quantifying how the stability of nanoparticle solutions change when the acidity of their environment suddenly changes ("Dynamic light scattering investigations of nanoparticle aggregation following a light-induced pH jump"). Using their "instant acid" technique and light scattering instruments to monitor the aggregation of nanoparticles, the NIST team followed the growth of clusters of chemically stabilized latex nanoparticles for the first few seconds after inducing the pH transition with light. Their results demonstrate that under certain conditions, the stability of the nanoparticles—their tendency to resist clumping—becomes very sensitive to pH.

PAPER: Testing Metal-Oxide Nanomaterials for Human Safety

The physico-chemical characterization of nanomaterials and their interaction with biological media are essential for reliable studies and are reviewed here with a focus on widely used metal oxide and carbon nanomaterials. Available rat inhalation and cell culture studies compared to original results suggest that hazard potential is not determined by a single physico-chemical property but instead depends on a combination of material properties. Reactive oxygen species generation, fiber shape, size, solubility and crystalline phase are known indicators of nanomaterials biological impact. Enhanced under-standing of biophysical properties and cellular effects results in improved testing strategies and enables the selection and production of safe materials.
Doi: 10.1002/adma.200902658

PAPER: Exploring Primary Liver Macrophages for Studying Quantum Dot Interactions with Biological Systems

Researchers demonstrate the use of Kupffer cells (KCs) to study quantum dot uptake, and show that it mimics that *of in vivo* studies, suggesting the KCs could be used for the initial screening of nanomaterial behavior *in vivo*. As nanomedicine and nanotoxicology research continues,, the number of nano-materials parameters to be examined remains prohibit-ively large. Thus, the development of novel high-throughput technologies is required to assess and evaluate nanomaterial cell interactions which can serve as screening tools to narrow down the nanomaterial parameters for more focused traditional *in vivo* investigations.
Doi: 10.1002/adma.200904231

TIMELINE: Nanotechnology Policy and Regulation in Canada, Australia, the European Union, the UK, and the USA

This timeline outlines important events related to nanotech-nology policy and regulation with an emphasis on developments since 2000.

REPORT: U.S. Government Accountability Office (GAO) Releases Report Regarding EPA's Challenges in Regulating Nanomaterial Risks

The U.S. Government Accountability Office (GAO) has released a report "Nanotechnology: Nanomaterials Are Widely Used in Commerce, but EPA Faces Challenges in Regulating Risk" in which it recommends that EPA complete its plans to modify its regulatory framework for nanomaterials as needed. GAO (1) identified examples of current and potential uses of nanomaterials, (2) determined what is known about the potential human health and environmental risks from nanomaterials, (3) assessed actions EPA has taken to better understand and regulate the risks posed by nanomaterials as well as its authorities to do so, and (4) identified approaches that other selected national authorities and actions U.S. states have taken to address the potential risks associated with nanomaterials. GAO analyzed selected laws and regulations, reviewed information on EPA's Nanoscale Materials Stewardship Program, and consulted with EPA officials and legal experts to obtain their perspectives on EPA's authorities to regulate nanomaterials.

GUIDELINE: German Paint and Printing Ink Association Publishes Guidance for Workplace Handling of Nanomaterials

The German Paint and Printing Ink Association has published a guideline document to inform its members on the responsible handling of nanoscale materials at the workplace. The document can be downloaded in either English or German language from the association's website.

REPORT: Nanotechnology-based Personal Care Products and Brands on the Rise

Small particles are becoming a big business for the world's personal care products manufacturers according to an analysis of world patent activity published today by the IP Solutions business of Thomson Reuters. The new report, Can Nanotech Unlock the Fountain of Youth?, finds that the beauty industry has begun to make an aggressive foray into nanotechnology, using tiny molecular compounds to improve the performance of creams, sunscreens, shampoos and other personal-care products.

PAPER: Infiltration of Outdoor Ultrafine Particles Into a Test House

The objective of this study is to investigate the transport of ultrafine particles (<100nm) into a residential building and to determine the functional dependence of infiltration on particle size and air change rate. Using continuous measurements of indoor and outdoor concentrations of size-resolved particles ranging from 5 to 100nmin a manufactured test house, particle penetration through the building, composite deposition, and the resulting value of the infiltration factor were calculated for two cases: closed windows and one window open.
Doi: 10.1021/es101202a

IN THIS ISSUE

Subscription

6 PDF issues per year (ISSN: 1931-6941)

1-year subscription (6 issues): ❒ US$49

Payment:

❒ US$ check enclosed payable to Nanowerk LLC

❒ Credit Card (please order online at www.nanorisk.org)

❒ Please send me a receipt

Subscriber Information

Name: ……

Organization/Company: ……

……

Position/Title: ……

Address: ……

……

City: ……

State/Province: ……

Postal Code: ……

Country: ……

E-mail: ……

Signature: ……

nano*RISK*

Nanowerk LLC
700 Bishop Street, Suite 1700
Honolulu, HI 96813, USA
Tel: +1 408 540-6512
Fax: +1 808 524-8081
E-mail: editor@nanorisk.org
Web: www.nanorisk.org

OPTIMIZING THE BENEFITS OF NANOTECHNOLOGY WHILE MINIMIZING AND CONTROLLING THE RISKS

The nano*RISK* newsletter is dedicated to providing objective and accurate information about critical issues and developments related to the risks arising from engineered nanomaterials. nano*RISK* appears bi-monthly (ISSN 1931-6941). For a complete list of all published nano*RISK* newsletters please go to www.nanorisk.org.

nano*RISK* is published by Nanowerk LLC, a publisher and information provider in the area of nanoscience and nanotechnology. Editor: Michael Berger. For further information about Nanowerk visit www.nanowerk.com.