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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

UBIQUITOUS NATURAL NANOMATERIALS

Last month, when the European Commission offered its definition of "nanomaterial", it recommended to identify a nanomaterial only on the basis of its particle size: "The justification for this choice is that properties or risks posed by a nano-sized material are not determined by the intention of the manufacturer and do not differ depending on whether the nanomaterial is natural, produced incidentally, or the result of a manufacturing process with or without the explicit intention to produce a nanomaterial. There are many naturally occurring nanomaterials and they may exhibit similar properties to those that are manufactured. From a definition point of view it is therefore not logical to omit certain types of materials on the basis of their genesis." (Recommendation on the definition of nanomaterial; pdf)

"There is an inherent recognition in this definition that all sources of nanomaterials are important in evaluating the possible impact of nanoscale materials on human health and the environment; however, perhaps the greatest benefit to studying these materials will be in their ability to inform us about the manner in which nano-sized materials have been a part of our environment from the beginning." So argue Mark R. Wiesner and Michael F. Hochella, Jr. and their team in a thought piece published in the November 22, 2011 online edition of *ACS Nano* ("Meditations on the Ubiquity and Mutability of Nano-Sized Materials in the Environment").

Naturally occurring nanomaterials can be found everywhere in nature (fullerenes and graphene even have been discovered in space) and only with recent advances in instrumentation and metrology equipment are researchers beginning to locate, isolate, characterize and classify the vast range of their structural and chemical varieties.

"The closer we look, the more it appears that particles at the nanoscale are instrumental in important geochemical and biogeochemical reactions and kinetics such as the availability of elements in the oceans, the partitioning of metals in other aquatic systems, and the bioavailability and toxicity of many elements," the authors write. "An examination of the potential risks to human health and the environment posed by engineered nanoparticles and the ability to construct nanophases with great precision are leading to fundamental discoveries in the ecological and life sciences."

Recent findings by Hutchinson et. al. ("Generation of Metal Nanoparticles from Silver and Copper Objects: Nanoparticle Dynamics on Surfaces and Potential Sources of Nanoparticles in the Environment") for instance challenge conventional thinking about nanoparticle reactivity and imply that the production of new nanoparticles is an intrinsic property of the material that is not strongly size dependent. The discovery that silver and copper nanoparticles are generated spontaneously from man-made objects implies that humans have long been in direct contact with these nanomaterials and that macroscale objects represent a potential source of incidental nanoparticles in the environment.

This work also shows that in some cases, nanomaterials that are virtually identical to those engineered by researchers can form spontaneously in nature, either from ions in solution or from larger non nano-objects.

While almost all research on nanomaterial toxicity and the potential risks involved with nanomaterials has focused on engineered nanoparticles, the dynamic nature of nanoparticles in the environment adds another dimension to this field.

Naturally occurring nanomaterials are continuously forming within and distributed throughout continental soils, ground and surface waters, the oceans, and the atmosphere. According to Hochella, researchers estimate that soils are the

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Exposure Measurement And Assessment Of Nanoscale Aerosols

Various German leading institutions worked out a strategy paper ("Aerosols Released from Engineered Nanomaterials in Workplace Operations"; pdf) adressing the challenges of exposure measurement and assessment of nanoscale aerosols released from engineered nanomaterials (ENM) in the workplace. The working group aimed at a harmonized approach for exposure measurement and exposure assessment. The outcome is pragmatic and widely usable. This tiered approach can be widely used by small and medium sized enterprises as well as large chemical companies with global business operations. The main findings of the working group can be summarized as follows:

- Safe work places where ENMs are produced or pro cessed can be achieved, using existing technology, and which conforms with best industrial hygiene practices. Existing substance-specific, binding, health based OELs must be complied with and are not subject of or overridden by the current approach.
- Exposure measurement of nanoscale aerosols released from ENMs in the workplace is possible and exposure assessment methodologies exist. However, methodologies are not yet standardized and more difficult to apply as in routine operations, e.g. gravimetric dust measurements according to DIN EN 481.
- Equipment required for measurement of exposure to nanoscale aerosols released from ENMs is sophisticated and the results produced, e.g., total particle number concentration, have no direct correlation to the chemical identity. Calibration of equipment is still a challenge and validation using round robin testing, which is typically correlated with SMPS results, is difficult as no commonly accepted reference method is available.
- At the moment, for a practitioner, a tiered approach to exposure assessment appears to be the most ap propriate strategy. This approach is split into 3 tiers. In the first step (Tier 1) information is gathered according to established industrial hygiene practices. In the next tier (Tier 2) a basic exposure assessment using a limited set of easy-to-use equipment is conducted, where as in the highest tier 6 (Tier 3) the latest state-of-the-art measurement technology is employed to assess the potential for workplace exposure to nanoscale aerosols released from ENMs if required.
- Existing legally binding OELs, e.g. synthetic amorphous silica [TRGS 900: EC No. 231-545-4], carbon black [ACGIH], etc., have to be complied with. Where no such substance-specific, binding, health-based OEL values for ENMs exist, the tiered approach is using 3 criteria for the assessment of the data: 1) Interference value exceeded for nanoscale aerosols released from ENMs. 2) Significant increase over aerosol background level in the workplace air. 3) Chemical identity of the nano-objects and their nanoscale aggregates and agglomerates detected in the aerosol.
- The application of the decision logic leads in total to 7 different cases (Case A – G), which may guide the risk management decisions of the practitioner.
- This step-by-step approach may need to be revisited as soon as new scientific findings are available (especially on binding, health-based occupational exposure limit values). The presented exposure assessment strategy of nanoscale aerosols released from ENMs in the workplace may serve as a starting point for further standardization.

Study Shows Nanoparticles Used As Additives In Diesel Fuels Can Travel From Lungs To Liver

Recent studies conducted at Marshall University have demonstrated that nanoparticles of cerium oxide -- common diesel fuel additives used to increase the fuel efficiency of automobile engines -- can travel from the lungs to the liver and that this process is associated with liver damage.

The data in the study by Dr. Eric R. Blough and his colleagues at Marshall's Center for Diagnostic Nanosystems indicate there is a dose-dependent increase in the concentration of cerium in the liver of animals that had been exposed to the nanoparticles, which are only about 1/40,000 times as large as the width of a human hair. These increases in cerium were associated with elevations of liver enzymes in the blood and histological evidence consistent with liver damage. The research was published in the Oct. 13 issue of the peer-reviewed research journal *International Journal of Nanomedicine* ("Intratracheal instillation of cerium oxide nanoparticles induces hepatic toxicity in male Sprague-Dawley rats").

Cerium oxide is widely used as a polishing agent for glass mirrors, television tubes and ophthalmic lenses. Cerium oxide nanoparticles are used in the automobile industry to increase fuel efficiency and reduce particulate emissions. Some studies have found that cerium oxide nanoparticles may also be capable of acting as antioxidants, leading researchers to suggest these particles may also be useful for the treatment of cardiovascular disease, neurodegenerative disease and radiation-induced tissue damage.

Dr. Siva K. Nalabotu, the study's lead author and a Ph.D. student in Blough's lab, says: "Our studies show that cerium oxide nanoparticles are capable of entering the liver from lungs through the circulation, where they show dose-dependent toxic effects on the liver. Our next step is to determine the mechanism of the toxicity."

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most prolific generators of Earth's nanomaterials, and that oceans provide the largest collective reservoir of these materials ("Naturally occurring inorganic nanoparticles: General assessment and a global budget for one of Earth's last unexplored geochemical components").

The authors write that all nanoparticles, once released into the environment, undergo dramatic and complex transformations through interactions with various chemicals and other factors – e.g., UV light, interaction with (in)organic ligands, redox reactions, biotransformations, aggregation. Such transformations will in turn affect the nanoparticles' toxicity.

They point out that "even without a unique mechanism of toxicity for nanoparticles, nanophases could contribute to greater-than-expected toxicity via additional routes of exposure or simply through a more efficient delivery system for toxic metal ions (e.g., a Trojan horse effect)."

The team concludes that "fundamental research is needed to adapt existing equilibrium models to account for the generation of nanomaterials from dissolved metals, the formation of nanoparticles from macroscopic objects, and to improve our understanding of how engineered nanomaterials may confound equilibrium modeling."

EUROPEAN COMMISSION ADOPTS COMMON "NANOMATERIAL" DEFINITION

"Nanomaterials" are materials whose main constituents have a dimension of between 1 and 100 billionth of a metre, according to a Recommendation on the definition of nanomaterial (pdf) adopted by the European Commission. The announcement marks an important step towards greater protection for citizens, clearly defining which materials need special treatment in specific legislation.

European Environment Commissioner Janez Potocnik said: "I am happy to say that the EU is the first to come forward with a cross-cutting designation of nanomaterials to be used for all regulatory purposes. We have come up with a solid definition based on scientific input and a broad consultation. Industry needs a clear coherent regulatory framework in this important economic sector, and consumers deserve accurate information about these substances. It is an important step towards addressing any possible risks for the environment and human health, while ensuring that this new technology can live up to its potential."

Nanomaterials are already being used in hundreds of applications and consumer products ranging from toothpaste to batteries, paints and clothing. Developing these innovative substances is an important driver for European competitiveness, and they have significant potential for progress in areas like medicine, environmental protection and energy efficiency. But as uncertainties remain about the risks they pose, a clear definition is needed to ensure that the appropriate chemical safety rules apply. The definition will help all stakeholders including industry associations, as it brings coherence to the variety of definitions that are currently in use in different sectors. The definition will be reviewed in 2014 in the light of technical and scientific progress.

The recommendation also delivers on a commitment made in 2009 to the European Parliament to issue a single definition that is broadly applicable to all EU legislation concerned by nanomaterials.

The definition adopted back in October is based on an approach considering the size of the constituent particles of a material, rather than hazard or risk. The wording describes a nanomaterial as "a natural, incidental or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50% or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm – 100 nm."

The definition is based on scientific advice from the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) and the Joint Research Centre (JRC). A draft version (pdf) of the definition was subject to a public consultation.

Detailed and technical information is available in the European Commission MEMO/11/704 - Questions and answers on the Commission Recommendation on the definition of nanomaterials.

Background

Nanomaterials are currently governed by a variety of legislative instruments at EU and national level. However, definitions have been developed on a case-by-case basis and vary across sectors, creating unnecessary burdens for industry and hampering public debate about risks and benefits of these substances. This recommendation gives EU legislators a legal reference for nanomaterials, when adopting new or implementing existing legislation.

The experience of the first registration deadline (30 November 2010) under REACH, the EU's overarching chemicals policy, showed that companies needed more clarity about their obligations with regard to nanomaterials. REACH has a key role to play in generating information about the properties of nanomaterials as chemical substances. With the adopted definition it will be easier for companies to assess their registration dossiers and determine exactly when they should consider their products as nanomaterials.

European Commission Requests Guidance On The Safety Assessment Of Nanomaterials In Cosmetics

The European Commission (EC) has asked the Scientific Committee on Consumer Safety (SCCS) to prepare a guidance document (pdf) on the safety assessment of nanomaterials in cosmetics. On the basis of the evolving knowledge based on the health risk assessment of specific manufactured nanomaterials, the Commission considers appropriate to request the SCCS to develop guidance on the essential elements that would be required in a manufactured nano-material safety dossier i.e. physicochemical characterization; toxicological evaluation, exposure assessment etc.

Terms of reference

On the basis of the present experience, the SCCS is requested to develop guidance on:

1. The essential elements that must form part of safety dossiers for the assessment of nanomaterials in cosmetic products, based on the data requirements for the pre-market notification listed in article 16 of Regulation (EC) No 1223/2009, i.e. taking into account points 3a to 3f of article 16 (identification of the nanomaterial; specification; quantity; toxicological profile; safety data and exposure).
2. The possibility to develop criteria and conditions that would allow the safety assessment of nanomaterials on a category based approach rather than on a case-by-case basis.
3. The suitability of alternative methods already validated for the assessment of conventional chemical substances for the assessment of nanomaterials in light of the current (as of 2009) ban on animal testing in the EU.
4. The set of attributes unique to manufactured nanomaterials that will need to be addressed by newly developed and/or newly validated alternative methods for the testing of toxicological end points for which there will be a ban on the testing on animals after March 2013.

In elaborating this guidance, and taking into account the growing experience on the matter the SCCS is asked to consider all available documentation on the subject such as

- the SCCP scientific opinion on safety of nanomaterials in cosmetic products;
- the documents issued by the OECD Working Party on Manufactured Nanomaterials;
- the EFSA scientific opinion on guidance on risk assessment of the application of nanoscience and nanotechnologies in the food and feed chain.

The document should be finalized before the end of the current SCCS term (February 2012).

NanoCode MasterPlan For The EU-CoC For Nanotechnology And -Sciences Published

The international partners of the EU funded NanoCode project have elaborated strategies and options for the development and implementation of the "Code of Conduct for Responsible N&N Sciences and Research (EU-CoC)". The developed MaterPlan was recently published ("Issues and Options on the Path Forward With the European Commission Code of Conduct on Responsible N&N Research"; pdf).

The NanoCode Project

NanoCode is a European project funded under the Programme Capacities, in the area Science in Society, within the 7th Framework Program (FP7).

The aim of NanoCode is to develop a strategic framework (called MasterPlan) guiding the further development and implementation of the Code of Conduct for Responsible Nanosciences and Nanotechnologies (N&N) Research (EU-CoC).

The development of a practical tool (the CodeMeter; CodeMeter; xls) to help stakeholders assess their performance in complying with the CoC's principles form a key element of the framework.

The MasterPlan

This MasterPlan builds on the insights gained from encompassing stakeholder consultations in eight European countries as well as at international level, in particular in the associated project countries Argentina, South Korea and South Africa.

The consultations, made by an electronic survey, structured interviews and focus groups, involved more than 400 stakeholders worldwide, to assess attitudes, expectations, needs and objections regarding the EU-CoC.

The findings are summarized in separate reports1. The results of the survey, the first draft of this MasterPlan and the CodeMeter prototype were deliberated during the National Workshops with national stakeholders in all partner countries.

In this report, selected ideas, options and recommendations concerning revision and implementation of the EU-CoC will be presented and discussed with a focus on stakeholder preference, practicability, need for structural and substantial changes of the EU-CoC, and compatibility with the governance context of the existing EU-CoC.

Review Of 2007-09 Literature On Toxcological And Health-Effects Relating To Six Nanomaterials

NICNAS, the National Industrial Chemicals Notification and Assessment Scheme of the Australian Government regulator of industrial chemicals, commissioned a review and analysis available literature from 2007-2009 on six industrial nanomaterials, chosen as they were considered to already be in, or close to, commercial use in Australia ("Review of 2007-09 literature on toxcological and health-effects relating to six Nanomaterials"; pdf).

The aim of this review was to identify any available scientific evidence of important toxicological/health effects that had not been covered by the scope of previous reviews and therefore supplement currently available scientific information on these substances.

Scope of the review

The consultant was asked to draw out knowledge of toxicological/health information of: fullerenes, carbon nanotubes and nanoforms of zinc oxide, titanium dioxide, cerium oxide and silver. To build technical knowledge and avoid unnecessary duplication specific 'data gaps', not covered in previous reviews, were identified and addressed in the consultancy (depending on the availability of published papers).

In addition, any other toxicity/health related information on the six nanomaterials that were not captured in the previous reviews was also expected to be included in the report.

Conduct of the review

This consultancy was carried out in three phases, a comprehensive literature search to collect articles available on each data gap identified by NICNAS1, analysis of the literature on findings in relation to data gaps and compilation of the report based on these findings.

Use of the review

This review will be one source of information used by NICNAS in determining the risks posed by the use of these substances in Australia. NICNAS continues to monitor and keep up to date on scientific research papers on these nanomaterials as they are published, work that will provide the basis for future risk assessments on these materials, as new information arises, contributing to the key NICNAS strategic direction in relation to industrial nanomaterials - to protect human health and the environment through appropriate regulation.

Initiation Of A Database Of Functional Micro- And Nanostructures

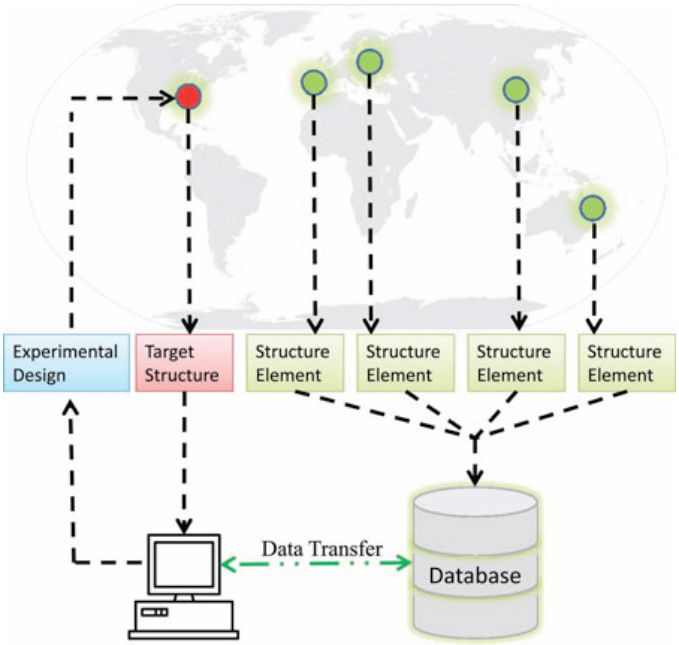
Writing in a recent issue of *Small*, Professor Ned Thomas, Dean of Engineering at Rice University, proposes the setup of a database of functional nanostructures ("Initiation of a Database of Functional Micro- and Nanostructures").

Periodic micro- and nanostructures are of importance in a variety of fields, including photonic crystals, phononic crystals, data storage devices, fuel cells, microfluidics, biosensors, tissue engineering, optical devices, impact absorption microtrusses, plasmonic metamaterials, and energy applications including solar photovoltaics.

Although there are extensive ongoing investigations on functional micro- and nanoperiodic structures, there is at present no system to comprehensively classify, store, process, and analyze the various functional structures that are continually emerging from these exciting research areas.

Structure database systems have been established for proteins, chemicals, crystal structures, minerals, biotechnology information, standard references, and drug designs. There has been an effort to design a unified nomenclature for engineered discrete nanoparticles, which includes the composition, size, shape, core, ligand chemistry, and solubility.

In his article, Thomas and first author Lin Jia propose a database system which connects the morphologies, fabrication technologies, and physical properties of various 2- and 3D periodic and quasiperiodic functional micro- and nanostructures. The advantages of the database system include: 1) enabling the design of lithographic procedures for fabricating a given target structure; 2) finding the structure with an extremized objective function; and 3) analyzing the impact of the morphology on various physical properties.



The schematic of the database system incorporating structures uploaded by researchers. A user can upload a target structure which will be compared with the database structures.

REACH Implementation Projects On Nanomaterials Publishes Final Reports

Final reports have been published from two REACH Implementation Projects on Nanomaterials (RIP-oN 2&3). The projects intended to develop specific advice on the implementation of REACH for nanomaterials. The reports have scoped the current state-of-the-science regarding assessment of nanomaterials in the context of REACH, and provide recommendations to the European Commission on how the REACH Guidance on Information Requirements and Chemical Safety Assessment could be further developed to better address nanomaterials.

The RIP-oN 2 project has addressed the REACH information requirements on intrinsic properties of nanomaterials, and the information needed for safety evaluation of nanomaterials. The RIP-oN 3 project has addressed exposure assessments and hazard and risk characterisation for nanomaterials within the REACH context.

The final reports can be downloaded from the DG Environment webpage.

Under a separate process, a third report from the RIPoN activity relating to Substance Identity (Rip-oN 1) has also been published. This report is also available online, however, according to the Commission it was not possible to reach consensus amongst the experts on the recommendations, therefore further work of the Commission, in collaboration with CARACAL, is required before recommendations can be forwarded to ECHA.

MARINA: MAnaging RIsks of NAnoparticles

SAFENANO & the Institute of Occupational Medicine (IOM) announced the official launch of European Research project MARINA (MAnaging RIsks of NAnoparticles).

Led by Dr. Lang Tran, IOM, MARINA aims within its 39 month timescale to develop specific reference methods for all the main steps in managing the potential risk of engineered nanomaterials (ENM). MARINA will address the four central themes in the risk management paradigm for ENM: Materials, Exposure, Hazard and Risk.

The methods developed by MARINA will be: (i) based on beyond-state-of-the-art understanding of the properties, interaction and fate of ENM in relation to human health and the quality of the environment and will either (ii) be newly developed or adapted from those existing but ultimately, they will be compared/validated and harmonised/standardised as reference methods for managing the risk of ENM.

MARINA will develop a strategy for Risk Management including monitoring systems and measures for minimising massive exposure via explosion or environmental spillage.

With a global consortium of 47 partners, the project is one of the largest in its area.

Upcoming Events
Looking At The Risky Side Of Nano

Nanomaterials: Characterisation, Simulation and Application
December 7, 2011, London (UK)
A one-day workshop of tutorial-type lectures targeted at new and current PhD students whose research falls within the areas of the characterisation, simulation and application of nanostructured materials and/or nanoscale devices.

International Workshop on Challenges to Increased Use of Nantechnology Standards
December 13-14, 2011, Washington, DC (USA)
Workshop goal: To develop a better understanding of issues and factors that are impacting the broad use and uptake of nanotechnology standards, and how development and deployment of nanotechnology can be catalyzed through more widespread acceptance and use of nanotechnology standards.

International Conference on Nanoscience and Technology 2012 (ICONSAT)
January 20-23, 2012, Hyderabad (India)
ICONSAT is primarily motivated by the desire to promote scientific exchange between experts in India and abroad in the area of nanoscience and technology. One theme of the event is nanotoxicology.

NanoImpactNet-QNano conference: "From theory to practice - development, training and enabling nanosafety and health research
February 27 - March 2, 2012, Dublin (Ireland)
The event consist of a three-day Integrating conference (including a special stakeholder session) and two one-day Training schools.

SENN2012 - International Congress on Safety of Engineered Nanoparticles and Nanotechnologies
October 28-31, 2012, Helsinki (Finland)
The goal is to summarize and share the latest knowledge on the safety of engineered nanomaterials and nano-related technologies. The emphasis is on producing solutions to the safety challenges related to engineered nanomaterials and nanotechnologies. Another aim is to enable commercial opportunities for the safe use of these materials and technologies.

NanoSAFE 2012
November 13-15, 2012, Grenoble (France)
Topics for the event are: Exposure assessment; Detection and identification; Toxicology; Environmental interactions; Nanomaterials release; Protection technology; Industrial production; Life Cycle Analysis; Ethics and societal issues; Commercial equipements; Risk management for OHS experts

IN SHORT – PAPERS, INITIATIVES & UPDATES

PAPER: Potential release pathways, environmental fate, and ecological risks of carbon nanotubes

The potential for negative effects caused by carbon nanotube release into the environment is a prominent concern and numerous research projects have investigated possible environmental release pathways, fate, and toxicity. However, this expanding body of literature has not yet been systematically reviewed. This paper critically reviews this literature to identify emerging trends as well as persistent knowledge gaps on these topics. doi: 10.1021/es201579y

REPORT: Joint EASAC-JRC present state-of-the-art report on safety of nanomaterials

The European Commission's Joint Research Centre (JRC) and the European Academies Science Advisory Council (EASAC) presented the findings of a joint report entitled "Impact of engineered nanomaterials on health: considerations for benefit-risk assessment" (pdf). The report summarizes the state-of-the-art knowledge on the safety of engineered nanomaterials and concludes that there is only limited scientific evidence to suggest that nanomaterials present a risk for human health.

RESEARCH: Semiconductor material gallium nitride is non-toxic and is compatible with human cells

Researchers have shown that the semiconductor material gallium nitride (GaN) is non-toxic and is compatible with human cells – opening the door to the material's use in a variety of biomedical implant technologies. GaN is currently used in a host of technologies, from LED lighting to optic sensors, but it is not in widespread use in biomedical implants. However, the new findings mean that GaN holds promise for an array of implantable technologies – from electrodes used in neurostimulation therapies for Alzheimer's to transistors used to monitor blood chemistry. doi: 10.1016/j.actbio.2011.09.038

RESEARCH: Nanotubes 'rob' green algae of space and light

A study ("Are Carbon Nanotube Effects on Green Algae Caused by Shading and Agglomeration?") shows that while CNTs do not have toxic effects on green algae they do inhibit its growth by depriving the plant of light and space. The researchers further developed a standard chemical method in order to measure the growth and photosynthetic activity of green algae exposed to CNTs. They found that even in the presence of high concentrations of CNTs the algae retain normal levels of photosynthesis, although growth rates are reduced.

REPORT: Dispersion and retention of dusts consisting of nanoparticles in lungs

This project aimed at studying the dispersion and retention behavior of dusts consisting of nanoparticles. Based on the results in various approaches, a tendency of nanoscaled particles to form larger size agglomerates following deposition and interaction with cells (in vitro) or the respiratory tract (in vivo) is predominant. The contrary trend, i.e. the increase of particle number due to a disintegration of agglo-merates seems not to be of high relevance ("Dispersion and retention of dusts consisting of ultrafine primary particles in lungs").

PAPER: Commercial titanium dioxide nanoparticles in both natural and synthetic water

This paper presents results from extensive colloidal stability tests on commercially relevant titaniumdioxide nanoparticles (Evonik P25) in well-controlled synthetic waters covering a wide range of pH values and water chemistries, and also in standard synthetic (EPA) waters and natural waters. The results demonstrate in detail the dependency of TiO2 aggregation on the ionic strength of the solution, the presence of relevant monovalent and divalent ions, the presence and copresence of natural organic matter (NOM), and of course the pH of the solution. doi: 10.1021/es2023225

PAPER: A strategy for assessing workplace exposures to nanomaterials

This article describes a highly tailorable exposure assessment strategy for nanomaterials that enables effective and efficient exposure management (i.e., a strategy that can identify jobs or tasks that have clearly unacceptable exposures), while simultaneously requiring only a modest level of resources to conduct. The strategy is based on strategy general framework from AIHA® that is adapted for nanomaterials and seeks to ensure that the risks to workers handling nanomaterials are being managed properly. doi: 10.1080/15459624.2011.623223

PAPER: Screening the cytotoxicity of single-walled carbon nanotubes using novel 3D tissue-mimetic models

In this work, researchers integrate for the first time 3D tissue-mimetic models in the cytotoxicity assessment of purified (p-) and oxidized (o-) SWNTs. An established ultrasound standing wave trap was used to generate the 3D cell aggregates, and results were compared with traditional 2D cell culture models. The results indicated that p- and o-SWNTs were not toxic in the 3D cellular model following a 24 h exposure. In contrast, 2D cell cultures were significantly affected by exposure to p- and o-SWNTs after 24 h, as assessed by high-content screening and analysis (HCSA). doi: 10.1021/nn203659m

RESEARCH: Nanoparticles and their size may not be big issues

If you've ever eaten from silverware or worn copper jewelry, you've been in a perfect storm in which nanoparticles were dropped into the environment. Since the emergence of nanotechnology, researchers, regulators and the public have been concerned that the potential toxicity of nano-sized products might threaten human health by way of environmental exposure. Now, chemists captured never-before-seen views of miniscule metal nanoparticles naturally being created by silver articles such as wire, jewelry and eating utensils in contact with other surfaces. It turns out, nanoparticles have been in contact with humans for a long, long time. The research ("Generation of Metal Nanoparticles from Silver and Copper Objects: Nanoparticle Dynamics on Surfaces and Potential Sources of Nanoparticles in the Environment") – focused on understanding the dynamic behavior of silver nanoparticles on surfaces when exposed to a variety of environmental conditions.

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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

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