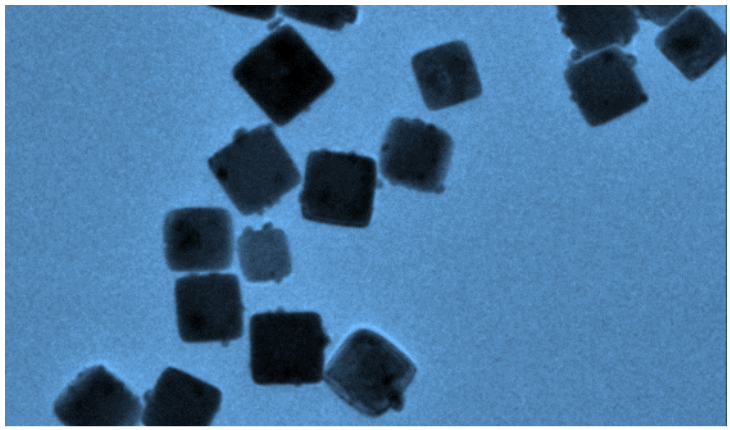


2
September
2016

Assessment and mitigation of nano-enabled product risks on human and environmental health

GUIDEnano

INSIDE THIS ISSUE

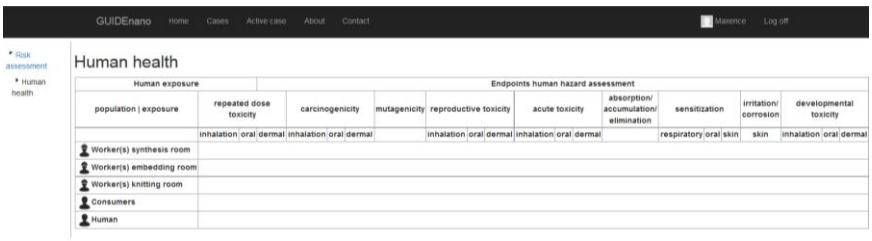
GUIDEnano develops innovative methodologies to evaluate and manage human and environmental health risks of nano-enabled products, considering the whole product life cycle.

MAIN ACHIEVEMENT: GUIDEnano Tool v2 RELEASED

GUIDEnano Tool v2 has been released on the 1st of May 2016! This is a major milestone in the project execution and shows that partners are working together with a clear common goal. In addition to the prediction modules on release, exposure, and environmental fate, this version features refined modules thanks to a strong expert feedback. Hypothesis-driven-experiments and new data from other projects were integrated in order to offer a Tool more adapted to the market needs expressed by the industrial partners.

Now, industrial partners from GUIDEnano will start the validation process of GUIDEnano Tool v2 with the GUIDEnano 8 case studies: Anti-fouling paints for ships, anti-slip ceramic tiles, coatings for food packaging, antimicrobial fabrics, hot bituminous mixtures, self cleaning agents, polymers for fuel system components, and ENM for soil remediation applications.

The goal now is to go towards the third version of the GUIDEnano Tool that will be released near the end of the project being April 2017. Stakeholders such as industries, regulators, insurance companies and consumers will be more deeply involved in the design of the tool and their opinion will be integrated in order to assure that the Tool meets the expected demands.



Socorro Vázquez-Campos
svazquez@leitat.org
Tel: (+34) 93 788 23 00

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DISSEMINATION

As the second version of the GUIDEnano online tool has been released, time has come now to present it to external stakeholders. This includes especially industries but also journalists, civil association, policy makers, researchers. For this purpose, different dissemination materials will be prepared such as a video for the presentation of the Tool (animation type) and a presentation highlighting the value, benefits, advantages and most important part of our Tool.

A widely distributed press release will be distributed to invite stakeholders to come and see the presentation of the Tool that will be made during Nanosafe 2016 conference in Grenoble. This session is crucial as stakeholders need a good guidance and explanation through the software to understand the advantages.

The goal is to engage as many stakeholders as possible to present them the GUIDEnano Tool by an active promotion of all partners. This will be done also locally where organizations have a better network and will be able to contact directly interested bodies such as institutes or agencies. All dissemination activities will be reported and efforts will be concentrated on the publications of the work done so far. This includes not only the experimental but also the theoretical work for the Tool Knowledge.

EXPLOITATION

One of the main objectives of the consortium members is to make sure that the GUIDEnano Tool will continue to exist after the end of the project in April 2017. Therefore, the partners started discussions about the future exploitation of the results of GUIDEnano, especially the web-based tool. This has the most promising business development potential thanks to its user-centric approach. It offers a real added value to industries producing/ working with nano-enabled products thanks to an intensive user feedback since the beginning of the development.

The consortium has a very clear idea about how the tool should look like and what functions it should fulfill. In this regards, the industries have a positive feedback and would like to see this tool enter the market. The business plan is currently being developed based on the model of having the Tool as a software which industries are able to purchase and use independently. Additionally, consultancy and training services are also part of this business model.

Socorro Vázquez-Campos
svazquez@leitat.org
Tel: (+34) 93 788 23 00

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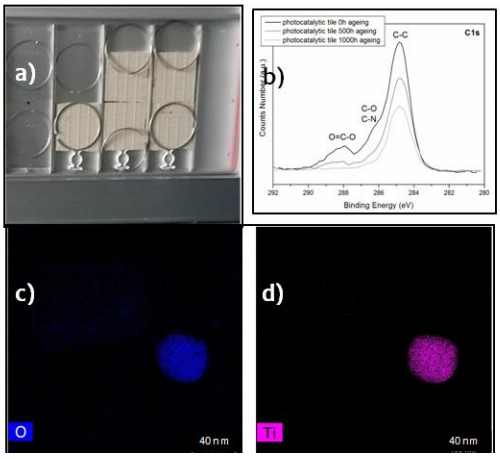
Our work progress

WP3

RELEASE ASSESSMENT

Objective: generate and validate strategies to identify and categorize the release processes that take place during the life cycle of a NM-enabled product, and assess potential release of NM during such processes

A list of scenarios/activities that could lead to NM release during any step of the life cycle of a nano-enabled product is being defined and is being incorporated in the GUIDEnano Tool. Currently, these activities define release factors, relevant exposure forms and receptor compartments and will be available for the user. In some cases release factors will be set as default values (e.g. % of NM that is removed from the reactor during the cleaning process) which could be overwritten by the user according to the specific conditions following in their industries. In other cases, when NM release is influenced by use conditions (e.g. outdoor) and by matrix-NM interaction (e.g. NM embedded or adsorbed on the surface) release will be defined according to the combination of several composition parameters of the product. If no information is available for the total life-span of the product, extrapolation from 1 to x cycles will be given, and read-across from similar nano-enabled products (e.g. coatings) will be performed when data is limited. The same would apply for nanomaterials, with comparable mode of action (i.e. dissociation and photocatalytic activity).



a) Tiles placed in a climatic chamber ready for accelerated aging; b) XPS spectra showing the reduction of the organic part fraction on the surface; c) and d) SEM-EDX images reveal the presence of TiO2 particles in collected waters.

WP4

EXPOSURE ASSESSMENT

Objective: development of models and guidance on (human) exposure assessment for the various stages of NM-enabled product value chains (life cycle)

Firstly, exposure scenario information from ongoing and finished FP7 projects has been collected using the MARINA exposure scenario library. A quality, similarity and relevance scoring system will be incorporated to rate the different information sources as to their analogy to the user's scenario.

Number count exposure data collected in standardized circumstances were converted to mass concentrations in order to be comparable to the model outputs. Statistical analyses were performed to examine correlation between model estimates and converted mass concentrations. Furthermore model performance was evaluated based on the uncertainty given by the developers of the ART model.

Secondly, exposure measurement data have been generated for the GUIDEnano case studies in order to refine the exposure scenarios mentioned above. Measurements were collected using the following direct-reading instruments: Condensation Particle Counter (CPC), NanoTracer, DiscMini (only Hempel and Servia Canto) and filter samples of airborne particles for SEM/EDX analysis. These measurement results give good insight in the exposure levels during several activities in the value chain of the GUIDEnano case studies and will be used to further validate the GUIDEnano model. Chamber experiments (under well controlled conditions) are planned to further study the relation between release and indoor air concentration and to fill data gaps.

Socorro Vázquez-Campos
svazquez@leitat.org
Tel: (+34) 93 788 23 00

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Our work progress

WP5

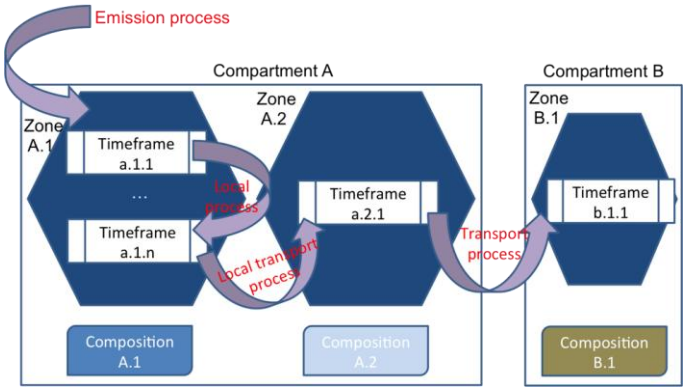
ENVIRONMENTAL FATE

Objective: generate strategies to understand how NMs behave in natural systems including the critical transformation reactions

The integrated exposure model that is proposed for the prediction of the environmental fate of NMs in the various natural and man-made compartments has the kinetic nature of the NM fate processes as a central endpoint. A semi-mechanistic approach is used, with a minimum number of fate descriptors for the NM. Environmental matrix interactions depend on NM properties and relevant environmental properties, such as organic and inorganic matter type and concentration, as well as ionic strength and the presence of mono- or divalent ions. The fate descriptors were already detailed for the following compartments: subsurface, soil, surface water, sediment and wastewater treatment plant (WWTP), and for the following transformations: homo- and heteroaggregation, sedimentation and sulfidation. The concept used for each kinetic transformation process is the same for all compartments, with some specificities arising depending on the compartment. However, an effort was made to use the same layout between compartments facilitating not only the tool makers but also the tool users.

The time-dependency of chemical species concentrations is an essential feature of this model, because it serves to link exposure scenarios with hazards that change over time. The model is prepared to link the existing hazard information with the exposure that is calculated on a temporal scale in each environmental compartment. However, since currently the hazard information is not time-dependent, a maximum concentration in a specific zone will be the output to be compared with the PNEC values.

The intention is to broaden the applicability of the model to most currently-produced and possible future NMs. Further, a compromise is sought between mechanistical accuracy and operational simplicity.



Schematic overview of the approach used in the model world that should take into account the following: compartments/ zones/timeframes/processes.

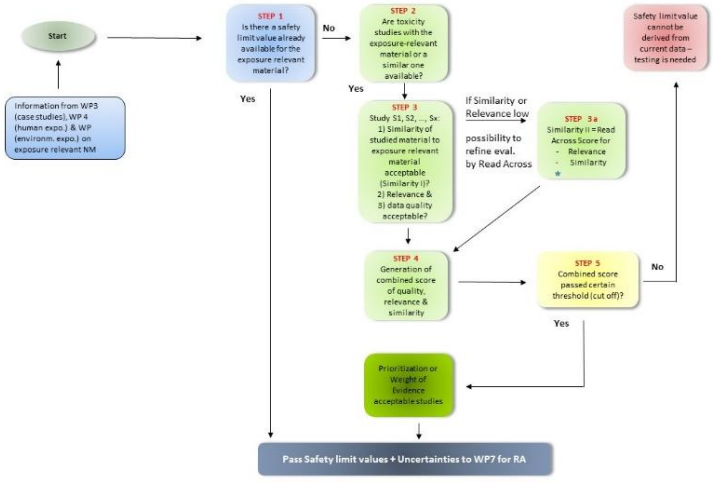
WP6

HAZARD ASSESSMENT

Objective: develop a strategy for predicting the ecotoxicological and human health hazard of the exposure-relevant NM forms throughout the lifecycle of NM-enabled products.

The strategy mostly relies on information from studies following harmonized testing guidelines such as OECD and/or ISO, but is designed to also make use of 'other non-standard' studies and toxicity information. Scores will be used to select studies that can be included in the process to derive safety limit values. The strengths and limitations of using read-across and other options for filling identified gaps are currently being discussed and evaluated and will be incorporated into the tool.

Hypotheses-driven experiments to evaluate the assumptions identified as most critical to reduce the most prominent uncertainties in the process are for most cases finished or will be finished soon. To test the influence of the core material and the different coatings a base set of three different core materials (TiO2, CeO and Ag) each with three different coatings (citrate, PEG and the hydrophobic coating DDPA) was selected for testing in a wide range of in vivo and in vitro test systems.



Hazard assessment strategy for a human and environmental risk assessment.
Note: a safety limit value could be threshold, for example a PNEC-, DNEL-, or OEL-like value; or a statement, for example mutagenic/non-mutagenic

Socorro Vázquez-Campos
svazquez@leitat.org
Tel: (+34) 93 788 23 00

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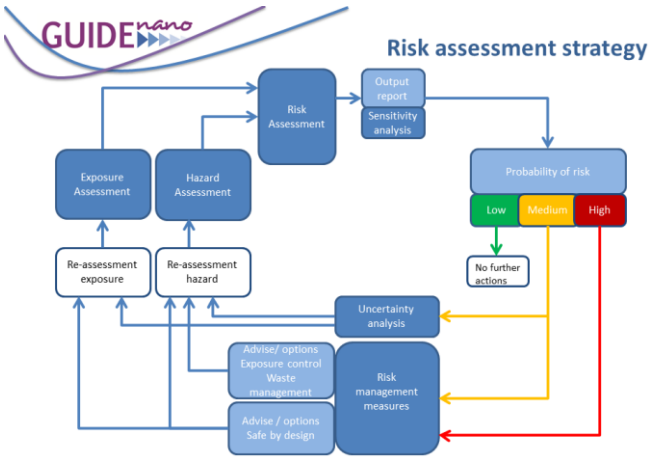
Our work progress

WP7

RISK ASSESSMENT

Objective: develop a strategy for risk assessment of release- and exposure-relevant NMs in NM-enabled products throughout the various product life-cycle stages



For the intermediate version of the tool, it has been decided that the risk assessment will be performed in a deterministic manner; the feasibility of probabilistic risk assessment in the tool will be investigated in the near future (v3 of the Tool).

A first draft approach to evaluate the acceptability of the risk assessment process by insurance communities and other relevant stakeholders has been developed. The purpose of the exercise of obtaining feedback from industry stakeholders in relation to the GUIDEnano Tool is to seek views, which will help to shape the output of the Tool dependent upon the needs of its target market.

Updated GUIDEnano risk assessment decision flow

WP8

RISK MANAGEMENT

Objective: propose, develop and validate risks mitigation measures (RMM) to reduce the potential risks identified through the risk assessment provided by the web-based tool

The investigation of occupational exposure control measure was focused on the measurement of the effectiveness of the personal protective equipment (PPEs) commonly employed by the industrial partners, with the objective to obtain for each of them a nominal protection factor (NPF) against NMs. The NPF of different PPEs have been determined, modified and validated using standard protocols available for bulk materials. Depending on the nature of the NM tested, two test protocols were adopted:

- a static test protocol was used to evaluate the NPF of PPEs against metal oxide NMs, which are not yet classified as safe materials. These tests were performed under simulated conditions and using mannequins in substitution to individuals
- a dynamic tests protocol was designed to evaluate the NPF of PPEs against NaCl nanoparticles, that being not considered hazardous materials, allowed that PPEs were worn by different individual, thus conducting the test under the more realistic dynamic conditions.

A further goal of WP8 will be to build up an information hub platform to collect all the RMM investigated within GUIDEnano and to assign them a quantitative effectiveness. The information hub platform as well as the more effective RMM evaluated within the project will be feed into the GUIDEnano Tool as a way to manage and decrease the risk identified in the risk assessment process.

Socorro Vázquez-Campos
svazquez@leitat.org
Tel: (+34) 93 788 23 00

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Our work progress

WP9

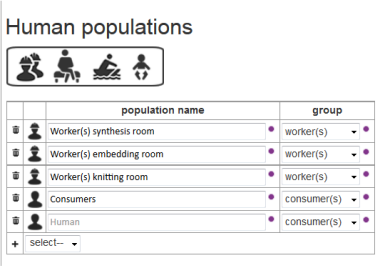
TOOL DEVELOPMENT

Objective: develop a web-based tool that guides end-users step by step to the relevant information for their product/ material risk assessment and for defining, in case it is needed, risk mitigation plans

GUIDEnano Tool v2 has been release and is now being evaluated by industrial partners. They work with the different experts in each part of the Tool to evaluate the risks for their case study. The main additions to the v1 are: Incorporation of the hazard endpoints (those not included already in v1) and studies (over hundred study classes covering both human and eco hazard) (WP6), decision trees and the risk assessment framework (WP7).

Furthermore, the Tool is built on a modular basis which will be easy to update in the future. Version 3 will focus on the incorporation of the fate model: kinetics, chemical speciation and transport deliver from WP5 and a decision module to support the user in selection of appropriate risk refinement and risk mitigation activities (WP8).

The Tool is constructed in a way that will allow the incorporation of the concept similarity/ read across being developed in the different WPs of GUIDEnano to be able to come up with a quantitative risk assessment for nanomaterials/ nano-enabled products.



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svazquez@leitat.org
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Joint Workshop on Risk Assessment & Management Strategies Applied to Nanomaterials (02/12/2015)

The technological center ITENE in Valencia (Spain) organised on the 2nd of December a joint workshop on risk assessment and risk management strategies applied to nanomaterials. The workshop included results from the projects on nanomaterials and nanosafety such as SIRENA, REACHnano, ECOTEXnano and GUIDEnano. Socorro Vázquez-Campos made a presentation about the web-based tool.

GUIDEnano Tool presentation

Integration of Databases into Risk Assessment Tools: Collaboration Meeting of Nanosafety Cluster Projects in Leiden (16/09/2015)

The Integration of Databases into Risk Assessment Tools is essential. Software Tools are under development in several Nanosafety projects for the risk/ hazard/ exposure assessment of nano-enabled products. Tools are mainly focused on guiding the user (nanomaterial producers, manufacturers, consumers, workers, insurance companies, regulators, policy makers) to assess the risks associated with nano-enabled products at all the stages of their life cycle, including recommendations to implement the most appropriate risk mitigation strategies ensuring human health and environmental safety.

Several European research projects in the field of nanosafety put together some efforts to harmonise nanosafety-related Tools (RA Tools, Nanodefinition Tool, Hazard Tools, Exposure Tools). The first meeting to initiate discussions was organised in Leiden (16/09/2015) between GUIDEnano, SUN, NANoREG and NANODEFINE, with the intention to extend to other projects in the next meeting.

The common issue shared by all the aforementioned projects was ontology issues and different needs on accessibility to harmonised databases; therefore eNanoMapper was invited to join the meeting to share their approach towards the identified needs.

FIOH, RIVM and LEITAT participate in the International Toxicology Conference in Boston, USA (1-4/06/2016): Presentation and posters to disseminate GUIDEnano research activities

The International Nanotoxicology Conference is one of the most important at global level in the field of nanotoxicology. The 2016 edition was the 8th in a continuing series of international meetings and was held in Boston, USA from June 1-4 2016. The title of this edition was *A Decade of Nanotoxicology: Impact on Human Health and Environment*.

Julia Catalán from FIOH, Margriet Park from RIVM, and Joan Cabellos from LEITAT attended the meeting and presented scientific results resulting from the research made in the framework of the GUIDEnano project. Julia Catalán gave a talk about *Genotoxicity of Metal Nanoparticles – possible Nanoespecific Effects*, Margriet Park presented one poster entitled *Hazard evaluation in GUIDEnano: a web-based guidance tool for risk assessment and mitigation of nano-enabled products*, and Joan Cabellos presented two posters with the titles *Coating hydrophobicity modulates the intestinal absorption of nanomaterials* and *Influence of different experimental variables in the prediction of nanomaterial intestinal absorption*.

The objective of this conference is to bring together scientists from academia, industry, government agencies, and non-governmental organizations to present current research findings, focus their respective talents and expertise, and initiate new collaborations in an effort to ensure the safe implementation of nanotechnology.

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svazquez@leitat.org
Tel: (+34) 93 788 23 00

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30M Consortium Meeting in Barcelona: Preparing the 3rd version of GUIDEnano Tool (14-15/06/2016)

The GUIDEnano consortium met on the 14th and 15th of June in Barcelona for its 30M meeting. All partners gathered together to present their latest contributions and how these are included into the web-based tool. The second version of the tool was released and now partners are preparing for the third version that would be delivered at the end of the project within less than a year.

The web-based Tool will guide the nano-enabled product developers such as industries into the design and application of the most appropriate risk assessment & mitigation strategy for a specific product. The correct implementation of this guidance will ensure that the risks associated to a nano-enabled product, throughout its whole life cycle, have been appropriately evaluated and mitigated to an acceptable level.

Participation in the CALIBRATE Project Kick-Off Meeting in Copenhagen (May 2016)

GUIDEnano partners participated in the kick-off meeting of caLIBRAte project, a Horizon 2020 research and innovation action led by Det Nationale Forskningscenter Forarbejdsmiljo based in Denmark.

The objective of the caLIBRAte project is to establish a state-of-the-art versatile Risk Governance framework for assessment and management of human and environmental risks of ENM and NM-enabled products. The framework will be a web-based “system-of-systems” linking different models and methods.

The input of GUIDEnano was important in order to learn from experience and apply best practices.

Socorro Vázquez-Campos
svazquez@leitat.org
Tel: (+34) 93 788 23 00

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2nd Nanosafety Forum for Young Scientist in Visby, Sweden (15-16/09/2016)

The EU Nanosafety Cluster and the FP7-eNanoMapper project jointly organize a scientific conference which focuses on oral presentations by young scientists working in EU-funded and national nanosafety projects. The event is an open forum for young and senior scientists working in the nanosafety research field, where they can have the opportunity to network and exchange scientific information and learn from each other**. Dr. Socorro Vázquez-Campos is part of the scientific committee and Jose Muñoz Gomez will hold a presentation about GUIDEnano and release of nanomaterials from nano-enabled products** during the training school.

Venue: A former Viking settlement on the island of Gotland, about 100 km from the coast of Sweden, the Hanseatic city of Visby is arguably the best-preserved Medieval city in Scandinavia and since 1995, it is on the list of UNESCO World Heritage Sites. As the ancient city walls still stand and surround the old part f the city, Visby gives a taste of what living in Medieval times must have been like.

Click here to download the flyer.

2016 Annual ISES Meeting in Utrecht, The Netherlands (9-13/10/2016)

Globally, Exposure Science is now recognized as a critical component for assessing and protecting human, environmental and ecological health. Scientists from more than 40 countries on six continents will come together at the ISES 2016 meeting in the Netherlands to exchange knowledge and information, to enhance the development of Exposure Sciences globally, to discuss, learn, network and above all have lots of fun. Register now and plan to join us in Utrecht.

Dr. Socorro Vázquez-Campos will have hold a presentation during the ISES 2016 conference on Wednesday 12th of October in the morning about the safe-by-design approaches developed and validated within GUIDEnano project.

Fifth International Conference NANOSAFE 2016 (Grenoble, 7-10/11/2016)

The Fifth International Conference NANOSAFE 2016 will be held from 7th to 10th November 2016 in Minatec in Grenoble, France. The Conference is about the safe production and use of nanomaterials and is one of the most important in the field of nanosafety. Speakers from Europe, America and Asia will attend the meeting to exchange about recent research developments in the field.

In parallel to this meeting, **GUIDEnano will have its stakeholder workshop** on the 10th of November in the morning as a satellite event. This event is crucial in the development process of the GUIDEnano Tool as it will be presented to industries and other interested stakeholders to receive external feedback. If you would like to attend the meeting, click here to register.

More information about this event: on www.nanosafe.org

Socorro Vázquez-Campos
svazquez@leitat.org
Tel: (+34) 93 788 23 00

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Presentation of GUIDEnano Tool at OECD in Paris (29/11-01/12/2016)

On the 29th of November 2016 in the OECD headquarters in Paris, **Dr. Socorro Vázquez-Campos will present the GUIDEnano Tool to various stakeholders**. This will take place in the framework of a joint scientific conference of ProSafe project & NanoREG (Science based support for regulation of Manufactured Nanomaterials).

ProSafe aims to coordinate and strengthen existing and new initiatives in the field of nanosafety with emphasis on the regulatory context.

OECD's Programme on Manufactured Nanomaterials (MNM) is focused on policy and regulatory aspects related to human health and environmental safety, which amongst other things means the development of instruments for safety assessment.

The ProSafe-NanoREG conference will discuss the results from European funded projects on nanosafety, as well as the results from the OECD's activities on nanosafety and their regulatory relevance.

NMSA Conference - New Tools and Approaches for Nanomaterial Safety Assessment (7-9/02/2017)

A joint conference organized by NANOSOLUTIONS, SUN, NanoMILE, GUIDEnano and eNanoMapper (Malaga, 7-9 February 2017).

Jointly organized by five major FP7 projects NANOSOLUTIONS, SUN, NanoMILE, GUIDEnano and eNanoMapper, the conference aims at presenting the main results achieved in the course of the projects fostering a discussion about their impact in the nano safety field and possibilities future research programmes. Also, it will bring together international stakeholders such as regulators, industries, policy makers, and scientists. Keynote speakers from the different projects will present their research results and experts will discuss and exchange with the attendees the current challenges in the field of nanosafety. The call for abstracts is open!

It will be held at the Hotel Barcelò in Malaga from the 7-9 of February 2017. For more information and registration, visit: www.nmsaconference.eu

SRA Policy Forum: Risk Governance for Key Enabling Technologies (1-3/03/2017)

The continued development and growing opportunities for commercialization of key enabling technologies (e.g., nanotechnology, synthetic biology, biomaterials) raises fundamental environmental health and safety (EHS) challenges for regulators in various governments. **GUIDE will submit abstracts and aims to present the latest results on the development towards GUIDEnano Tool v3.**

The discussion topics for the SRA Forum will center on emerging risk issues of key enabling technologies such as traditional risk assessment (detection, toxicology, fate, and material exposure), risk communication (stakeholder engagement), and more novel approaches (risk governance under uncertainty).

The SRA Forum is targeted for personnel from research and academic institutions as well as from industry, governmental agencies, and other relevant organizations.

More information here.

Socorro Vázquez-Campos
svazquez@leitat.org
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