Information Booklet

Life cycle Assessment (LCA) & Risk Analysis in Nanomaterials-related NMP projects

Specialist Brainstorming and Coordination Meeting
March 2, 2011, Brussels (Belgium)

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Brussels/Stuttgart
March 2011
This booklet contains brief description of some of the projects presented at the meeting. The booklet will also be available on-line, together with the meeting presentations, at


User name and password will be communicated after the meeting by a separate e-mail.

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Life cycle Assessment (LCA) & Risk Analysis in Nanomaterials-related NMP projects

Specialist Brainstorming and Coordination Meeting

March 2, 2011, Brussels, Belgium

Venue: ENEA building (4th floor), Rue de Namur 72, 1000 Brussels, Belgium

NOTE: The meeting will take place in conjunction with the EuMaT Executive Board meeting of March 3, 2011 Brussels

Participating FP7 projects (see http://cordis.europa.eu for details)

iNTog-Risk: Early Recognition, Monitoring and Integrated Management of Emerging, New Technology Related Risks

MATTRANS: Micro and Nanocrystalline Functionally Graded Materials for Transport Applications

M-RECT: Multiscale reinforcement of semi-crystalline thermoplastic sheets and honeycombs

MUST: Multi-level protection of materials for vehicles by "smart" nanocontainers

Nanofate: Nanoparticle Fate Assessment and Toxicity in the Environment

NANOFOL: Folate-based nanobodies for integrated diagnosis/therapy targeting chronic inflammatory diseases

NanoGEM: Nanostructured Materials - health, exposure and material properties

NanoHex: Enhanced nano-fluid heat exchange

Nanohouse: Life Cycle of Nanoparticle-based Products used in House Coating

Nanoplytox: Toxicological impact of nanomaterials derived from processing, weathering and recycling of polymer nanocomposites used in various industrial applications

Nanosustain: Development of sustainable solutions for nanotechnology-based products based on hazard analysis

Basic idea and objectives

Analyzing life cycle behavior (i.e., performing a LCA – Life Cycle Analysis) and potential risks of new technologies and products are becoming an ever increasing factor of sustainable success of these technologies and products. This applies also to the technologies and innovation being developed in many EU FP7 NMP (Nanosciences, Nanotechnologies, Materials and New Production Technologies) projects. Main goal of the meeting is to explore the possibilities for coordination, alignment and liaison among the running projects, coordination between the EU and industry for future research, possibilities for cross-project activities, possibilities for data and tools sharing and horizon mapping – all for LCA and risk analysis related to nanomaterials. The idea was initiated in the MUST project ("let's discuss the issue with a couple of most adjacent NMP projects") and it was arising from the interest to achieve results which are:

- Comparable among different projects
- Providing a good basis for development of future common solutions in the area of LCA and risk analysis/ management.

Correspondingly, the most important expected outcomes are:

1. (1) coordination and alignment among solutions in different running projects;
2. (2) inputs for the priorities of future calls in the area LCA/risk such as self-healing materials;
3. (3) ensuring that the research and technology related interests of RTD projects are well matching the interest to ensure environmental and general sustainability of the results of this research.

Target participants / audience

Target number of participants is approx. 50; their expected profile ranges from material scientists, over LCA specialists and risk professionals, to legislators. In particular, are expected to take part:
- the project coordinators;
- the partners which are responsible for LCA and/or risk analysis in the respective projects.

Participation by invitation and public announcement.

Fees / Registration

No participation fees are foreseen, the meeting room is offered as a courtesy of ENEA, catering offered by Steinbeis Advanced Risk Technologies and MUST project. The participants will finance their own, travel and other costs e.g. as a part of their dissemination/liaison activities.
**Life cycle Assessment (LCA) & Risk Analysis in Nanomaterials-related NMP projects - Specialist Brainstorming and Coordination Meeting - March 2, 2011, Brussels, Belgium**

**Venue:** ENEA building (4th floor), Rue de Namur 72, 1000 Brussels

**Public transport:** Take the metro Line 1 direction STOCKEL - STOKKEL or Line 5 direction HERMANN-DEBROUX and get off at ARTS-LOI - KUNST-WET (two stops). Take the metro Line 2 direction SIMONES (LEOPOLD II) or Line 6 direction ROI BAUDOUIN - KONING BOUDEWIJN and get off at PORTE DE NAMUR - NAAMSE POORT (two stops). From there to the Office it’s only 50 mt.

**Tentative agenda**

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<td>1. Welcome from the EU DG RTD NMP (A. Stalios) &amp; EuMaT (M. Basista) &amp; MUST (Th. Hack, A. Jovanovic)</td>
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<td>10.15 – 10.35</td>
<td>2. EU DG ENV (M. Galatola): EU concepts and activities in the area of impact assessment, in particular LCA (ILCD handbook, ELCD database)</td>
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<td>10.35 – 10.55</td>
<td>3. Introduction to LCA (principles, ISO 14044, ...), extension of LCA to Risk Assessment, overview of projects and position of EuMaT (A. Jovanovic)</td>
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<td>10.55 – 11.15</td>
<td>4. Technology impact assessment (A. Ciroth, example from Prosuite project and openLCA Initiative)</td>
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<td>11.15 – 11.35</td>
<td>5. Possibilities and limits of conventional LCA methods and tools when applied to nanotechnologies (L. Breedveld, example of Plasmanice project)</td>
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<td>11.35 – 12.15</td>
<td>6. Precautionary principle in the development of new technologies – (Th. Hack &amp; M. Zheludkevich, example of MUST project) and need to develop new solutions for analyzing respective risks (A. Jovanovic, N. Filipovic, example from project MUST - Use of advanced modeling in impact assessment and risk analysis of nanosystems)</td>
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<td>12.15 – 12.45</td>
<td>7. Discussion</td>
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**Lunch break**

**13:45-15:00 Part II:** Running and future projects (Chair: F. Montemor)

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<td>8. Short presentations of relevant projects and role of LCA/RA in them:</td>
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**Coffee break**

**15:15-16:00 Part III:** Sample applications (Chair: A. Ciroth)

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<td>15.45 – 16.00</td>
<td>11. Applications: LCA of FGM and new coating materials (M. Cordella, R-Tech (Particoat and MATRANS))</td>
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**16:00-17:00 Part IV:** Conclusions & outlook (Chair: A. Jovanovic)

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<td>12. Conclusions related to applications:</td>
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<td>• Common issues to all projects, open issues &amp; possible remedies in the area of LCA (A. Ciroth)</td>
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<td>• Common issues to all projects, open issues &amp; possible remedies in the area of risk analysis (G. Klein)</td>
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<td>16.30 – 16.45</td>
<td>13. Possibilities of interaction: Current projects, future calls/projects (e.g. joint ENV-RTD calls, self-healing materials, mechanisms and effects of engineered nanomaterial interactions with living systems and/or the environment, ...) and other activities (A. Jovanovic)</td>
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<td>16.45 – 17.00</td>
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**Workshop material**

Workshop material will be made available (in protected mode) to workshop participants at: [http://www.eumat.eu/](http://www.eumat.eu/)
**Objective:**

The main objective of the project is the design, development, upscaling and application of novel multi-level protection systems like coatings and adhesives for future vehicles and their components to improve radically the long-term performance of metallic and polymeric substrates and structures. The utilisation of current well known polymer matrices will avoid extended development cycles; provide fast demonstration of emerging products, accelerating the replacement process of hazardous protective compounds currently in use.

**Multi-Level Approach:**

Nanotechnology application offers a large spectrum of possible improvements in a great number of applications and areas of industry. In the field of corrosion protection this can be the use of nanocontainers as carriers of polymerization agents to provide the self-healing effects in case of external damage. However the use of this technique may lead to various types of risks which broadly belong to two main categories: the risk of non-performance (e.g. the coating not providing the desired self-healing feature) and the risk of adverse or other possible undesirable impacts.

Steinbeis Advanced Risk Technologies considers risks associated to the project MUST. The risk management plan has been prepared in the beginning of the project containing a list of possible risks associated to the completion of MUST objectives, a critical analysis of the risks described and a strategy on how to keep the project on tracks.

The computational algorithm for the simulation of the self-healing action is based on the Monte-Carlo method. The boundary conditions for the modelling and simulations are set according to choice of matrix material, healing agent size and release properties of nanoreservoirs. The simulation algorithms determine the optimal size range of reservoirs and their spatial distribution in the coating.

The alternative innovative models of self-healing process is developed based on the Discrete Particle Deposition (DPD) model in order to allow for 2-level modelling: one for the rough estimation on the large component scales, and one for the local phenomena in the case of localized damage on the coating. The second model is the one based on “intelligent agents”, assuming that the additives in the surrounding fluid can act as the intelligent agents leading to the targeted deposition of the repair material on the damaged place.
1. R-Tech at a glance

Steinbals Advanced Risk Technologies Group (R-Tech) is the cluster of units belonging to and/or Steinbals (www.steinbals.eu). Over 700 Steinbals units present in 50+ countries worldwide act today as a global player in the area of innovation management and technology transfer. The group of Steinbals units working in the area of “Advanced Risk Technologies” deals with multiple aspects of risks, risk engineering and risk management, among others, including:

- Petrochemical and process plants
- Power plants and energy supply
- Material technologies, especially advanced material technologies
- New & alternative technologies (CO2, H2, nano, ...)

In order to provide the optimal service and results, the R-Tech group has dedicated units for specific areas of “advanced risk technologies” such as technology transfer, education, R&D, industrial services (business-oriented), and other EU-related issues.

The main competence of the center is in the area of assessment, analysis and management of business and technical risks. The center has large experience in co-ordination of European and national stakeholders, promotion of the transfer of technology, introduction of new approaches to the risk management. Participation in many EU and international collaborative and purely industrial projects, in both as a participant and as coordinator/project manager.

2. Background and introduction to “MUST”

The huge economic impact of environmental aggressiveness and corrosion of metallic structures is a very important issue for Europe, which lost more than 300 billion € for investments every year due to corrosion degradation. Transportation is one of the most important industries with high demand for corrosion protection. On this demand, application of organic coatings is introduced as a cost effective method of improving the corrosion protection and, therefore, the durability of metallic structures.

Since 2008, the EU project “MUST” is established with high European concerns to advance the protection against corrosion and similar defects is the design, development, upsizing and application of novel multi-level protection systems like coatings and adhesives. The strategy is to respond to destructive conditions with self-healing reactions. This ability is expected to be most effective if it is reacting at certain stages of degradation with different healing processes. A significant improvement of the durability of protective coatings is evident if early-stage degradation phenomena are recovered and, for example, decrease of the barrier proper ties of the coating is postponed to longer exposure times.

3. Advanced material protection

The idea in “MUST” is an extended multi-level protection approach combined within one system, where the protective systems not only react adequately to external impacts, but also respond to changes in their internal structure and are in the same system different damage prevention and repairation mechanisms, depending on the nature and the degree of impact from external environment. The multi-level self-healing concept is based on 4 levels of gradual active feedback to the environmental conditions:

- Incorporation of nanostructures and nanoparticles to absorb aggressive corrosive species
- Use of water-displacing compounds to be released from nanocoatings as soon as the first micro-defect appears the coating polymer matrix
- Release of polymerizing precursors entrapped in nanocoatings in order to form a new thin polymer film covering the damaged area and repair the layer by preventing crack propagation
- Encapsulation of organic and inorganic corrosion inhibitors acting on demand, suppressing corrosion and dehumidifying processes occurring in open defects

4. What do we do here?

R-Tech, as one of the main beneficiaries of “MUST”, manages the associated risks with the project services. Main aspects of risks dealt with are:

- Risks in its innovation (e.g., risks of unexpected side effects)
- Risks of non- or poor performance (e.g., risks of system or component failures)
- Risks of adverse/unexpected effects and impacts (e.g., public health and environment)
- Project risks, especially in innovation, R&D and new technologies oriented projects
- Risks due to the life cycle of products/technologies (e.g., unexpected problems in recycling)

5. “MUST” & future

The main specific target groups for the proposed solution are automotive, aerospace and maritime industries. A high industrial interest is well represented by the participation of main European industrial Endusers and suppliers of coatings and adhesives for vehicles. “MUST” will increase considerably the life cycle of materials and therefore boost the competitive strength of the European transport industry. The Multi-level protection approach will also open new opportunities for the application of modern light materials (magnesium and aluminum alloys) in transport industries.
iNTeg-Risk

Early Recognition, Monitoring and Integrated Management of Emerging, New Technology Related Risks

FP7/NMP – Nanosciences, Nanotechnologies, Materials and new Production Technologies: Grant no. CP-IP 213345-2

Coordination: European Virtual Institute for Integrated Risk Management (EUIERM), A. Jovanovic
Contact: iNTegrisk@eu-vri.eu / www.iNTeg-risk.eu
Budget: ~ 19.3 million €

Partners

Main Beneficiaries: (59, 60) indicates an EU-VRI member:

1. ENVIRO-EU-VR European Virtual Institute for Integrated Risk Management, Germany
2. EDF Electricité de France, France
3. GDF SUEZ France
4. Definisa AG Germany
5. MRL Materials Engineering Research Lab. Ltd, UK
6. TÜV SÜD Industrie Service GmbH, Germany
7. R-Tech Steinbeis Advanced Risk Technologies GmbH, Germany
8. Iberdrola S.A., Spain
9. Atos Origin Sociedad Anónima Española, Spain
10. Eni Norge Eni Group, Norway
11. D’Appolonia S.p.A., Italy
12. MIT Management Intelligence Technologier GmbH, Germany
13. DNV Det Norske Veritas AS, Norway
14. COWI A/S, Denmark
15. Piggy Forest Industry Oy, Finland
16. MOL Plc. MOL Hungarian Oil and Gas Public Company, Hungary
17. VSH Hagerbach Test Gallery Ltd, Switzerland
18. Swiss Re Swiss Reinsurance Company, Switzerland
19. NEIS Petroleum Industry of Serbia, Serbia
20. Saipem Energy Services S.p.A., Italy
21. Tecnologica Group - European Joint Venture cv, Belgium
22. Eurogas-GERG The European Association of the Natural Gas Industry, Belgium
23. Enagas S.A., Spain
24. INCDCM Alexandru Darabont, Nat onal Research and Development Institute on Occupational Safety, Romania
25. SWISSI Swiss Institute for the Promotion of Safety and Security, Switzerland
26. KMM-VIN European Virtual Institute on Knowledge-based Multifunctional Materials AISBL, Belgium
27. INERIS Institut National de l’Environnement Industriel et des Risques, France
28. CEA Commissariat à l’Energie Atomique, France
29. BAM Be. für Materialsforschung und –prüfung, Germany
30. USTUTT Universität Stuttgart (ZIRN), Germany
31. LEIA Fundación Centro de Desarrollo Tecnológico, Spain
32. TUCRE Technical University of Crete, Greece
33. SINTEF Stiftingen, Norway
34. DTU Technical University of Denmark, Denmark
35. VTT Technical Research Centre of Finland, Finland
36. BZF Bay Zoltan Foundation on For Applied Research, Institute tute for Logistics and Product on Systems, Hungary
37. Demokritos National Center for Scientific Research, Greece
38. IVF Swerea IVF AB, Sweden
39. VSB-TUO Sc. Technica Univerza v Ostrave , Czech Republic
40. JSI Jozef Stefan Inst tute, Slovenia

Basic idea and objectives

iNTeg-Risk is a large-scale integrating project aimed at improving the management of emerging risks, related to “new technologies” in European industry. This will be achieved by building new management paradigm for emerging risks as a set of principles supported by a common language, agreed tools & methods, and Key Performance Indicators, all integrated into a single framework. The project aim is to reduce time-to-market for the lead market EU technologies and promote safety, security, environmental friendliness and social responsibility as a trademark of the EU technologies. The project will improve early recognition and monitoring of emerging risks, seek to reduce accidents caused by them (estimated 75 B€/year EU27) and decrease reaction times if major accidents involving emerging risks happen.

Project structure and main planned achievements

The “EU response” proposed by the project will be based on 17 individual applications of new technologies like nano, H₂ technologies, underground storage of CO₂, new materials (ERRAs - Emerging Risk Representative Applications in EU Industry). The solutions will be generalized and used for the framework, which will be validated in a second application cycle. Overall solutions will be made available to the users in the form of the iNTeg-Risk “one-stop-shop” for EU solutions addressing emerging risks. The solution will include issues of early recognition and monitoring of emerging risks, communication, governance, pre-standardization, education & training, dissemination, as well as new tools such as Safetypedia, Atlas of Emerging Risks, Reference Library, etc. The project involves leading EU industries and renowned R&D institutions. It is coordinated by the European Virtual Institute for Integrated Risk Management, the dedicated EUIERM guaranteeing the sustainability of results after the project.

The project structure is a bottom-up one starting from the problems identified as representative (iNTeg-Risk ERRAs), over the development of the integrated/common approach and methods, towards the “one-stop-shop” containing solutions for different groups of stakeholders: from interested citizen, over students and concerned SMEs, to the scientists at academia or researchers in industry (each of them finding the information matching their respective interests). The subprojects in iNTeg-Risk, listed below, reflect the approach described above:

Subproject 1: Technology CASES: Identifying specific emerging risks and developing solutions to enter into the unifying framework, concept of ERRAs - Emerging Risk Representative industrial Applications

In SP2 the iNTeg-Risk work has fully integrated the results of some recent and/or still running activities and projects such as standardization work ISO related to integrated risk management (ISO 31000), the IRGC Risk Governance Framework, the risk management systems developed in the financial world, in particular Basel II and Solvency II, the work done in/for World Economic Forum, the EU directive INSPIRE and the EU projects in the area of LCA (Life cycle Assessment).

According to the plan, SP3 is scheduled to start in 2011. In SP4, the project has shown that already at this stage it can handle interesting issues like for instance:

- the volcanic ashes and
- Gulf of Mexico spill

in 2010. The volcanic ashes were dealt with primarily within the RiskEarS module of 1-Stop-Shop (the Emerging Risk Early Warning & Monitoring System – see left figure). The system allows to collect notions of emerging risks (currently almost 600) coming from different sources, usually persons and/or organizations "of confidence", registered as "post-sentinels", i.e. professionals rated as credible sources of notions about emerging risks. Apart from storing data in the system, RiskEarS allows monitoring of the evolution of risks (e.g. from early notion to a litigation case), e.g. in the form of the so-called RiskSparcs.
**LAMP**

**LASER INDUCED SYNTHESIS OF POLYMERIC NANOCOMPOSITE MATERIALS AND DEVELOPMENT OF MICRO-PATTERNED HYBRID LIGHT EMITTING DIODES (LED) AND TRANSISTORS (LET)**

**Project reference:** 247928  
**Instrument:** CP-STREP

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Via Ravegnana 186  
I-48018 Faenza (Ra)  
ITALY

**Web site**  
http://www.lamp-project.eu

**Timeline**  
Start Date: 01/06/2010  
End Date: 31/05/2013

**Budget**

**Project Partners**  
- University of Wuppertal (Institute for Polymer Technology), DE  
- Centro Ricerche Fiat, IT  
- Ekspla UAB, LT  
- National Research Council, IT  
- Organic Semiconductor Centre (School of Physics and Astronomy University of St. Andrews), UK  
- Joanneum Research Forschungsgesellschaft mbH, AT

**Vision & Aim**  
The overall goal of the LAMP project is to develop a new method for making light-emitting devices, using laser micro-patterning to generate quantum dots (QDs), giving new high performing materials for organic light-emitting transistors (OLET) and diodes (OLEDs).

The LAMP project proposes a new method to apply nanotechnologies in the field of low energy consumption light production. Currently OLEDs are made either by depositing small organic molecules by evaporation through a shadow mask, or by depositing polymers from solution by processes such as inkjet printing. However, these techniques have several drawbacks, e.g. material wasting (evaporation), expensive apparatus (vacuum chambers for evaporation), use of lithographic processes or masks for patterning (inkjet or evaporation). New methods avoiding or reducing all the aforementioned disadvantages will be of utmost importance for the LED industry.

The LAMP project will demonstrate how OLEDs containing QDs can be produced without the use of any shadow mask or inkjet methodology decreasing the industrial costs and improving the light-emitting efficiency. During the final phase of the project the laser system material processing demonstrator OLED vs OLET prototypes comparison and LCA evaluation will be carried out.

The potential impact of the project in scientific and industrial terms is based on the innovation for the production of QD-LEDs. QDs are already used mixed with polymer, but their selective direct formation on the polymer matrix can enhance the efficiency and lifetime of the device. In addition the use of the laser technology will be a real step ahead for industry because it applies laser technology, which is a well established technological platform in industry.

The LAMP consortium gathers 7 groups belonging to five different countries, and it has been built with the scope to cover not only the expertise needed for the project, namely materials synthesis, materials laser processing teams and device developers, but also to recruit research groups actively working in the field of LED research and manufacturing.
New Project

Nanoparticle Fate Assessment and Toxicity in the Environment

NanoFATE is a collaborative project with 12 partners from 9 European countries working together to investigate the fate and effects of engineered nanoparticles (ENPs) in the environment. This project is supported by the European Commission jointly under the Environment (including climate change) and NMP Themes of the 7th Framework Programme for Research and Technological Development.

The aim of NanoFATE is to examine post-production life cycles of key nanoparticles, from their entry into the environmental as ‘used products’, through the full range of waste treatment processes to their final fates (destinations in the environment or in organisms) and potential toxic effects.

The NanoFATE newsletter keeps stakeholders, scientific communities and the interested public up to date with aims and progress of the project. Furthermore, NanoFATE dissemination events will be announced.

Please visit our new project website: www.nanofate.eu where you will find a large store of information and links.

Our first Newsletter, published in Dec. 2010, focuses on the goals of the project and the partners involved. It can be downloaded from our website. I hope that you will subscribe to and enjoy the future issues of the NanoFATE newsletter.

Claus Svendsen
Coordinator
Centre for Ecology & Hydrology (Wallingford, UK)
It is estimated that inflammatory diseases affect more than 80 million people worldwide leading to untold suffering, economic loss and premature death. Considering life expectancy in Europe, these numbers are expected to increase in the next 20 years. Moreover, studies have shown that disorders such as rheumatoid arthritis (RA) can shorten life span by 10 years.

The treatment of chronic inflammatory disorders, including RA, remains a challenge for the medical and scientific community. The emergence of new drugs creates new options though it also entails high costs, complicated drug administration, allergic reactions and potentially fatal side effects. Therefore more efficient strategies have to be identified in order to improve inflammatory disease treatment while decreasing the side effects with an improved cost-benefit ratio.

Nano-enabled drug delivery systems will take therapy of chronic inflammatory disorders to a new level by creating a new, highly specific and efficient strategy, with reduced treatment costs.

**NANOFOL concept for nano drug delivery in activated macrophages promoting inflammatory disorders treatment**

- Nano drug delivery systems and design of stable nanobiodevices
  Nano drug delivery systems are promising tools to specifically deliver drug molecules to the inflammatory site.

- Selectively targeting activated macrophages in inflammatory diseases through Folate Receptors
  Recent studies have shown that the β is form of the Folate Receptor is highly expressed by activated macrophages and thus has become an interesting marker for inflammation diagnosis and therapy.

- Antibody based approaches to ensure high specificity
  With the aim of increasing therapeutic success without side effects, selective activated macrophage recognizing antibodies will be designed and used.

- Therapeutic agent for high treatment efficacy
  The ultimate goal of this project is to deliver specifically drugs (pharmacological compounds) or siRNA (small interfering RNA) to activated macrophages, inhibiting signalling pathways that are elicited in the continuous inflammatory process.
Description and complementarities of the consortium

The consortium formed to fulfil NANOFOH’s objectives is composed of 13 partners from 8 European countries.

Small and Medium size Enterprises: Suanfarma SA (ES), Synovo GmbH (DE), Extibio Praha AS (CZ), ALFAMA - Investigação e Desenvolvimento de Produtos Farmacêuticos, Lda (PT).

Research centers or universities: Universidade do Minho (PT), Technische Universitaet Graz (AT), Netherlands Organisation for Applied Scientific Research - TNO (NL), Instituto de Biologia Molecular e Celular - IBMC (PT), Institut National de la Santé et de la Recherche Médicale - INSERM (FR) / Institut Cochin – COCH (FR), Medizinische Universitaet Wien (AT), "Aurel Vlaicu" University of Arad (RO), Institut National de l’Environnement et des Risques - INERIS (FR).


Acknowledgement

The NANOFOH Project addresses the area “Development of nanotechnology-based systems for diagnosis and/or therapy for diabetes, musculo-skeletal or inflammatory diseases”, started on the 1st of December 2009 and will have a total duration of 48 months.

The research led in this project has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° NMP4-LA-2009-228827 NANOFOH.

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NANOFOH management is operated with MYNDSHIRE Internet Platform: www.mynisphere.com
NanoHex
Transforming the Future of Heat Management

The world’s largest collaborative nanofluids project, NanoHex is funded by an €8.3M Framework Programme Seven grant and involves 12 organisations from Europe and Israel.

NanoHex aims to develop and optimise safe processes for the production of an innovative nanofluid coolant for use in industrial heat management.

“Cooling is an issue facing many industries such as microelectronics, transportation, manufacturing and power generation,” Said David Mullen Project Director for NanoHex.

“Nanofluids have shown significantly enhanced thermal properties in comparison to traditional cooling fluids and the project hopes to develop a nanofluid that can be safely manufactured, applied and recycled.”

If successful such a nanofluid could help to extend product reliability, reduce energy consumption and enable the development of more sustainable products and processes within industry.

Partners will work together to produce large volumes of operational nanofluids for the industrial markets and develop working demonstrators of the nanofluids’ application in both power electronics and data centres.

The three year long project began in September 2009 and is lead by UK based company Thermacore Ltd.

Health, Safety and LCA by ENEA
Responsible for the project’s Health, Safety, LCA and Economics, ENEA will establish the life cycle assessment (LCA) for the use of nanofluid coolants in industrial applications, specifically for traction power electronics and data centres. They will also conduct a risk assessment (RA) to characterise any hazard and quantify potential exposure to nanofluids.

ENEA will also investigate the relevant aspects and impacts of the coolants on the environment, and health and safety across their entire life cycle, in order to develop and produce nanofluid using safe standards.

Visit [www.nanohex.eu](http://www.nanohex.eu) for more information
The main goal of NANOPOLYTOX is to improve the understanding of the potential environmental & health impact of nanotechnology-based products (polymer nanocomposites) during their life cycle: use, re-use, recycling and/or final treatment and disposal of products containing engineered nanomaterials (NM). Carbon nanotubes, nanoclays and metal oxide nanoparticles will be studied as fillers in polymeric matrices (PP, EVA, PA6) that have a wide range of applications in the plastic industry.

The project addresses the following issues:

- Physical and chemical characterization of NM at different stages of their life cycle
- Toxicological characterization (human toxicity and ecotoxicity) of nanomaterials at different stages of their life cycle
- Transformation, migration and release of NM when included in polymer nanocomposites
- Environmental and biological fate of released nanomaterials
- Life Cycle Impact Assessment (LCIA) analysis of NM as fillers in polymer products
- Technological solutions for recycling and final treatment of NM included in polymeric matrices

visit: [www.nanopolytox.eu](http://www.nanopolytox.eu)
Developing innovative solutions for the sustainable design, use, recycling and final treatment of nanotechnology based products

The production of nanomaterials is increasing rapidly; however, our knowledge concerning the possible health & environmental effects associated with these materials remains poor.

The objective of the EU FP7 funded NanoSustain project (247939) is to develop innovative solutions for the sustainable design, use, recycling and final treatment of nanotechnology-based products by addressing the following two questions:

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

**The NanoSustain Workplan (2010-2013)**

WP1
Project Management and scientific and technical coordination
*Leader: Nordmiljo*

WP2
Data gathering, generation, evaluation and validation
*Leader: Veneto Nanotech*

WP3
Hazard characterisation and human health & environmental impact assessment
*Leader: NCRWE*

WP4
Life Cycle Assessment
*Leader: University of Bremen*

WP5
Development of technical solutions for use, recycling & final treatment
*Leader: VTT*

WP6
Dissemination & exploitation of project outcomes
*Leader: Institute of Nanotechnology*

**The NanoSustain Consortium**
NanoSustain has mobilised the critical mass of expertise, resources and skills needed to tackle the complex nature of the various project tasks. The consortium includes many leaders in the field of hazard characterisation, exposure analysis, and life cycle assessment from across Europe.

For further information on the project go to [www.nanosustain.eu](http://www.nanosustain.eu) or contact Rudolf Reuther: rudolf.reuther@nordmiljo.se
NordMiljö AB (NOMI) is the project coordinator and mainly responsible for the operational management, administration and S/T coordination of the planned work, including progress control and reporting to the Commission.

The Institute of Nanotechnology (IoN) will be responsible as WP6 leader for the dissemination and exploitation of the project results through a regular newsletter, training workshops, and dissemination events. In addition, the IoN will also be providing coordination support. Veneto Nanotech (VN) will lead WP2, build up the necessary project-specific database and ensure validation and access of already existing relevant data, and of newly generated data, to all project partners. The National Research Centre for the Working Environment (NCRWE) is responsible as WP3 leader for the production of after-production materials for further testing, for producing human exposure data and for the toxicological testing of the materials in animals. Universität Bremen (UniHB) is the leader of WP4 and responsible for the Life Cycle Assessment on selected nanomaterials and nanoproducts and the development and operationalization of criteria and guiding principles for precautionary design of engineered nanomaterials. The Technical Research Centre of Finland (VTT) will develop as WP5 leader innovative solutions for recycling, final treatment and disposal of selected nanotechnology-based materials and products, and carry out appropriate ecotoxicology studies. The Joint Research Centre (JRC) will help to fill knowledge gaps related to the behaviour of the selected manufactured nanomaterials in ecosystems. This will contribute to the development and implementation of testing methods and assessment of the distribution, transport, transformation and fate of selected nanomaterials, and their effects on human health and the environment. Kaunas University of Technology (KTU) will participate in the physico-chemical characterization and analysis of the selected test nanomaterials and products, and will develop and test an analytical method appropriate to detect and quantify engineered nanoparticles in various environmental matrices. National Institute for Research & Development in Microtechnologies (IMT) will participate in the physico-chemical characterization and analysis of the selected test materials and products, and in the development and design of new material & product properties and applications, or in new material synthesis for novel applications. Nanologica AB (NLAB) will provide the CNT-composite materials and associated materials data, contribute to their physical-chemical characterization, and support the exploration of treatment and disposal technologies. Nanogate (NGAG) will provide a ready-to-use nano-ZnO based test material and associated product data and contribute to the technical exploration and design of new solutions for sustainable use, recycling and final treatment of the provided test material. UPM-Kymmene (UPM) will supply nano-fibres (nanocellulose) and associated product data, and contribute to the design and exploration of technical solutions for their recycling and final treatment.
NanoValid at a Glance

Project acronym: NanoValid

Project title: Development of reference methods for hazard identification, risk assessment and LCA of engineered nanomaterials

Project number: 263147

Instrument: EU FP7 Large-scale integrating collaborative project

Total budget: 13.9 mio. €

EC financial contribution: 9.6 mio. €

Duration: May 2011 – April 2015

Consortium: 33 partners from 19 countries

Coordinator: Rudolf Reuther, NordMiljö AB (NOMI), Sweden, rudolf.reuther@nordmiljo.se

Project Web Site: http://www.nanovalid.eu

Key Words: nanomaterials, toxicology, reference methods, reference materials, exposure assessment, risk management, hazard identification, monitoring, LCA

The growing development, production and use of engineered nanomaterials and associated products will increase exposure of men and ecosystems to these new materials. However, current knowledge is still incomplete and established test methods inappropriate to reliably assess exposure and risk of materials at the nano-scale. As a result, there is an urgent need to further develop these methods to overcome limitations of current hazard and risk assessment schemes and to generate the data needed for regulative requirements and for safeguarding production, application and disposal of nanomaterials along their life cycle.

NanoValid has mobilized the critical mass of international scientific knowledge and technical expertise required to address these questions. Current analytical and toxicity test methods and models will be put to test and subjected to rigorous intercalibration and validation. Where necessary, methods and materials will be modified, adapted and validated, and new reliable reference methods developed, in cooperation with relevant standardization bodies and the concerned industry, to support pre and co-normative activities and to make existing risk and life cycle assessment schemes applicable to ENPs.

The feasibility of validated measurement, characterization and test methods will be assessed by selected case studies to help to improve performance of existing exposure monitoring systems as well as risk reduction and life cycle management strategies.
## Project Acronym: NEPHH

**Project Reference:** 228536-2  
**Start Date:** 01/09/2009  
**Duration:** 36 Months  
**Contract Type:** Small or medium scale collaborative Project  
**Project Funding:** 2,496,277€

**Subject Index:** Nanosciences, nanotechnologies, materials & new production technologies

### Project Members

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www.nephh-fp7.eu
NEPHH - NANOMATERIALS RELATED ENVIRONMENTAL POLLUTION AND HEALTH HAZARDS THROUGHOUT THEIR LIFE-CYCLE is a medium scale collaborative Project partially funded by the European Commission under Cooperation Theme 4; Nanosciences, Nanotechnologies, Materials & New Production Technologies (NMP), in the specific Area 4.1.3: Health, Safety and Environmental Impacts, under Call Identifier NMP-2008-1.3.2: Impact of Engineered Nanoparticles on Health and the Environment.

Why NEPHH?

Engineered nanoparticles with unique, size-dependant physicochemical properties, constitute a new basis for a number of technologies. In fact, an increasing number of industrial and commercial consumer applications incorporate engineered nanoparticles which improve the technical and economic performance of those.

However, despite great benefits, initial research has indicated that engineered nanoparticles can have a negative impact on human health and environment, being currently available knowhow on the environmental and human health hazards associated with the manufacture, use, distribution and disposal of certain manufactured nanomaterials still limited.

For the acceptance of this emerging technology, the perceived safety of nanotechnology by the public is fundamental. As activity shifts from research to the development of applications, there exists an urgent need to understanding and managing the associated risks.

Where do we go to?

NEPHH Project aims to identify and rate important forms of nanotechnology-related environmental pollution and health hazards that could result from activities involved throughout the life cycle of Silicon-based polymer nanocomposites and to suggest means that might reduce or eliminate these impacts.

How will we get there?

⇒ Silicon based nanoparticles including nanosilica, layered silicates, glass nanofibres and foam-glass crystal materials will be used in combination with three engineering matrices: polyamide-6, polypropylene and polyurethane. 12 different nanocomposites will be produced.
⇒ From these nanocomposites macro-scale structures will be fabricated and physically processed in order to replicate different stages of product’s Life-Cycle.
⇒ Human health and environmental impact of samples obtained will be evaluated under a holistic and integrated approach.
⇒ Guidelines for the minimisation of occupational risks and for the responsible management of nano-waste in nanotechnology related facilities will be developed and disseminated.

Main Innovations

NEPHH accounts that nanoparticles can be surface modified and are generally embedded in currently commercialized nanomaterials -nanocomposites- going well beyond current research as it focuses on human health and environmental implications of nanotechnology-based materials and products under a holistic Life-Cycle perspective.