



## Welcome to the 4th NanoSustain Newsletter

Dear Reader,

It is summer time and this means for most of us a particular time of relaxing and refreshing, thinking about what has been done and achieved, and preparing for the tasks ahead. However, we would like to provide you with some news from our NanoSustain project and give you an update on new events and activities that may be of interest.

NanoSustain has restructured the project website ([www.nanosustain.eu](http://www.nanosustain.eu)) to make it easier for you to find the topics and information you are looking for. We invite you to register at our website and get in touch with our project and with the research we do on the impact and sustainability of selected engineered nanomaterials (nanocellulose, TiO<sub>2</sub>, ZnO and MWCNTs).

WP2 has further developed the structure and content of the project-specific material and literature database as a tool to support and guide the work going on in other Work Packages (WP). WP2 and WP3 have established an online available Material Data Sheet (MDS), which all partners can use to directly upload the analytical and experimental data produced. In addition to inter-laboratory comparison exercises that are run in parallel, this MDS will systematically collect all newly generated data and provide the template to evaluate their validity, before transferred into the central material database.

Also in WP3 interesting initial results have been achieved on the toxicology of selected nanomaterials, which have been characterized within the project, and further characterization and toxicological testing is planned on various life-cycle relevant samples. Weathering and abrasion tests are currently being implemented in close cooperation with the EU FP7 NanoHouse project and Flügger Denmark (*see p3 for further information*).

WP4 has further developed a specific model for the end-of-life and recycling phases (re-use, recycling and/or final treatment and disposal) and for the application and use phase, including all relevant material flows of selected nanomaterials and associated products. Together with WP6, WP4 will organize at the end of September 2011 in Bremen, Germany, a particular training workshop to introduce into the methodology of LCA of nanomaterials (*for more information please see announcement on p4*).

In WP5 preliminary melting experiments with glass samples coated with and without nano-ZnO have been carried out and the concentration, morphology and composition of the produced particles measured at the different stages of the heating/melting of the glass. These glass recycling experiments will be further developed to find out how nano-ZnO coated glass will behave during the established glass melting/recycling process (*see p2 for more information*).

Of course all results produced within NanoSustain will be soon published in peer-reviewed journals or technical reports, and presented at conferences, and so made available to the whole Nanosafety Community.

For now, I hope you still enjoy summer and wish you a pleasant reading of this 4<sup>th</sup> NanoSustain Newsletter!

Best wishes

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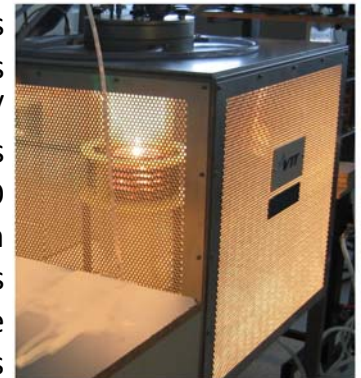


## WP5 Update



## Glass Melting Experiments

At VTT Technical Research Centre of Finland window glass coated with pro.Glass Barrier 401 provided by Nanogate was heated and melted in an induction furnace (PCT/FI2010/050906), (**Figure 1**). The pro.Glass Barrier 401 coating is based on a sol-gel hybrid matrix with incorporated ZnO nanoparticles. As a reference, window glass coated only with the sol-gel hybrid matrix without ZnO was used. The aim of this study was to find out the behaviour of ZnO nanoparticles in the established recycling process of melting. The glass sample was cut to approx. 3x4 mm rectangles, and the mass of the heated/melted sample was about 7g, fig. 2. The temperature range was 700-1500 °C.



**Figure 1:** Induction furnace used to heat and melt glass.



**Figure 2:** Induction crucible with the cut glass before melting.

To study the concentration, morphology and composition of the produced particles at the different stages of the heating/melting of the glass sample various measurement devices based on aerosol technology were applied. Particle mass concentration (MC) was measured online by Tapered Element Oscillating Microbalance (TEOM 1400A). Particle number concentration (NC) was measured online by Condensation Particle Counter TSI 3775 (CPC). Particle number concentration and size distribution (NSD) was measured by Scanning Mobility Particle Sizer (SMPS; TSI 3080 electrostatic classifier with 3081 DMA connected with TSI 3775 CPC). Samples for individual particle morphology and composition analysis were collected with an Aspiration Electron Microscopy grid sampler (AEM sampler).

The total particle number concentration is in the order of  $5 \cdot 10^7$  particles/cm<sup>3</sup> when the temperature increases from 800 to 900 °C. The mass concentration is small, approximately 1-2 mg/m<sup>3</sup>. These particles are very small, approx. 5-15 nm in diameter and almost spherical as analysed by electron microscopy. The number concentration starts to increase almost steadily from 900 °C up to 1500 °C. The mass concentration has a similar trend reaching 90 mg/m<sup>3</sup> at 1500 °C. The count median diameter of the particles (CMD) varies between 15-40 nm within the temperature range of 900-1500 °C. At 1500 °C the CMD of the particles is approx. 30 nm. The evolution of the particle number size distribution (NSD) clearly indicates the increase of the particle diameter as the temperature of the furnace and the number concentration increases. At lower temperatures (900 °C) the NSD peaks at approx. 15 nm reaching up to 30 nm at 1500 °C.

In the next stage a more thorough analysis of the chemical composition of the particles released will be carried out and the results from ZnO containing coating and coating without ZnO will be compared. From these results we can make some conclusions on how ZnO coated glass will behave during the established recycling process by melting of glass. For further information please contact Ulrika Backman [Ulrika.backman@vtt.fi](mailto:Ulrika.backman@vtt.fi)



### NanoSustain Student: Mariaelena Pozzebon



Mariaelena received her degree in Molecular Biology from the University of Padua in 2006 with a research performed in Curie Institute in Orsay (France) during her Erasmus period. In January 2007 she started to work in the IFOM-IEO Campus in Milan. Here, she obtained her PhD degree in Molecular Oncology in January 2011 and she gained experience of several cellular and molecular biology techniques. In June 2011 Mariaelena moved to ECSIN in Rovigo and she joins the Nanosustain program to develop the functional genomics activities.

### Presentations by NanoSustain Partners

D.G. Rickerby, *"Strategies for Improving the Efficiency of Photocatalytic Water Treatment – a Brief Review"*, IWA Specialist Conference on Applications of Nanotechnology in the Water Sector - Nano and Water 2011 (Ascona, 15-18 May 2011)

N.C. Mueller, J. Braun, J. Bruns, M. Cernic, P. Rissing, D.G. Rickerby and B. Nowack, *"Application on Nano-scale Zero Valent Iron (NZVI) for Groundwater Remediation in Europe"*, IWA Specialist Conference on Applications of Nanotechnology in the Water Sector - Nano and Water 2011 (Ascona, 15-18 May 2011)

NanoSustain was introduced by means of a specific project poster by Eleanor O'Rourke and Mark Morrison, Institute of Nanotechnology (IoN) and leader of work package 6, at the EuroNanoForum 2011 conference in Budapest on the 31st May.

D.G. Rickerby, *"Increasing the Efficiency of Photocatalytic Water Treatment with Titanium Dioxide Nanoparticles by Control of Crystal Shape"*, Nanotech Conference & Expo 2011 (Boston, 13-16 June 2011)

The NanoSustain project was presented at a seminar on the 28th June 2011 at the National Research Centre for the Working Environment, Denmark (NRCWE) by Anne Thoustrup Saber (WP3 leader) to researchers at NRCWE and collaborators from the University of Copenhagen.



### Collaboration Update

**Flügger**

NanoSustain, NanoHouse and Flügger Denmark has agreed to test different NanoSustain materials for weathering and abrasion test. The following materials will be tested:

- Boards painted with paint containing different amounts of nanosized titanium dioxide; and
- Glass sheets coated with a matrix with and without nanosized zinc oxide

NanoHouse will test the samples from the NanoSustain project in terms of weathering and abrasion. In parallel, Flügger Denmark will test the same samples from the NanoSustain project in terms of weathering. These plates will be tested by abrasion test within the Nanosustain project. This set-up will enable a comparison between the methods used within the NanoHouse project with the methods used within NanoSustain/Flügger Denmark.



David Rickerby (JRC) was a member of the organising committee of the International Water Association Specialist Conference on Applications of Nanotechnology in the Water Sector - Nano and Water 2011, Ascona (15-18 May 2011) <http://www.iwanano2011.org/organizers.html>

David was also one of a panel of experts contributing to the ObservatoryNANO Technology BRIEFING "Nanostructured membranes for water treatment" and "Nano-enhanced membranes in water treatment".



## Training workshop on LCA of manufactured nanomaterials and nanotechnology based applications

University of Bremen, Germany, 26th & 27th September 2011

Life cycle assessment (LCA) is the most comprehensive and promising methodology today to evaluate the environmental impact associated with a product. LCA deals with the entire life cycle of a material or product in relation to possible environmental consequences caused by production or release.

In recent years, nanotechnology based materials and applications have been increasingly assessed by LCA-studies. However, a review of these studies indicates that a large number of uncertainties and data gaps remain to be addressed, in particular regarding the LCA of nanoproducts. Limited data is available today on material and energy input, and on environmental releases rates, derived from manufacture and transport, or on the ultimate fate of nanocomponents and nanoproducts.

The European FP7 project NanoSustain ([www.nanosustain.eu](http://www.nanosustain.eu)) is organising a 2-day workshop on life-cycle assessment (LCA) of manufactured nanomaterials and nanotechnology based applications, at the University of Bremen, Germany, on the 26th & 27th September 2011.

The aim of this specific LCA workshop is to provide an overview on current R&D activities in Europe in this particular field, to present and discuss the LCA work carried out within the NanoSustain project in the light of the latest findings, and to introduce relevant tools to assess the life-cycle impact of nanomaterials. Current methods used for LCA, LCIA and the available software for LCA modelling will be demonstrated. The main focus will be on individual manufacturing processes and other life cycle phases (such as recycling or disposal) including the total life cycle of nanomaterials.

The Workshop is addressing post-graduate students, young, and experienced researchers, in particular from projects within the EU Nanosafety cluster, but also LCA specialists in relevant industries, governments and NGOs.

The University of Bremen, Department of 'Technology Design and Development', one of the leading experts on the LCA and prospective technological assessment of nanomaterials and related applications, and the LCA specialist within NanoSustain, will implement the workshop.

Participation is free of charge and the outcome and proceedings of the meeting will be published at the NanoSustain website and as a suitable paper document. The programme for the event can be found at the following link; [www.nanosustain.eu/events/LCA\\_Training\\_Workshop.pdf](http://www.nanosustain.eu/events/LCA_Training_Workshop.pdf)

*For registration and information on the venue, travelling and booking, please contact:*

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**or Eleanor O'Rourke email [eleanor.orourke@nano.org.uk](mailto:eleanor.orourke@nano.org.uk) or phone: +44 141 303 8444**



Source: [www.bremen-tourismus.de](http://www.bremen-tourismus.de)



### Cluster meeting on linking Environmental related projects, London, 22 September 2011

This workshop will be organized in conjunction with the 6th International Conference on the Environmental Effects of Nanoparticles and Nanomaterials, London, 19-21st September 2011, to bring together researchers from EU projects that have a large true environmental / ecotoxicology component. NanoSustain will help to organise and implement this meeting to discuss potential areas of cooperation. Further information from Claus Svendsen, [csv@ceh.ac.uk](mailto:csv@ceh.ac.uk)

### OECD WGMN SG9 Workshop, Rome, September 2011

The OECD SG9 on Environmentally Sustainable Use of Manufactured Nanomaterials is planning to organise a workshop to be held in Rome in September 2011. The workshop is planned to become a public and international event dealing with issues from the field of life-cycle aspects of manufactured nanomaterials, potential positive and negative impact on the environment and health of certain nano-enabled applications at different stages of development. One main goal is to bring together the members of the OECD Working Party on Manufactured Nanomaterials (WPMN) as well as participants from national governments, European Community, institutes working on life-cycle assessments, industries and the scientific community. The results of the workshop will be documented and will be made publicly available. NanoSustain was asked to present a case study on one of the thirteen nanomaterials in the OECD sponsorship programme.



### Nanochallenge & Polymerchallenge 2011 is back!

Padua, 10th-11th November

The competition offering the highest price reward worldwide, based on the best ideas and revolutionary projects in nanotechnology and in the polymer based material field is running again! There is again a new opportunity available for anyone with a good idea, to win the 2 prizes of 300.000 euro each to start up a new-co. Veneto Nanotech and Imast, the two Italian high tech clusters, confirmed their engagement in supporting the creation of new start-ups through Nanochallenge&Polymerchallenge while Intesa San Paolo Bank assured again its support for the contacts with investors and VCs interested in new business opportunities. The Final Contest will take place at the University of Padua, November 10<sup>th</sup>-11<sup>th</sup>. Deadline for the online registration is 2nd September.

**NanotechItaly 2011** is the fourth International Conference edition jointly organised by AIRI/Nanotec IT, the National Research Council (CNR), Veneto Nanotech and the Italian Institute of Technology (IIT). The aim of the conference is to highlight, with the contribution of the most important Italian players in the field and renowned experts from abroad, situation and perspectives of nanotechnology.



The event will take place at the Laguna Palace Hotel in Venice from 23rd-25th November 2011 and will offer:

- A comprehensive picture of nanotechnology activities, perspectives and needs in Italy
- The latest developments and trends of nanotech
- Innovation and business practices to bring nanotechnologies to the market place
- Governance and policy actions to promote nanotech development
- Matchmaking and networking opportunities

The three days agenda will focus on following themes: New materials, Processes and Manufacturing;; Health and life sciences - Nanomedicine; Smart transportation; Safe living; ICT & Nanoelectronics; and Responsible development - Nanotoxicology.

There is a call for contribution focused on relevant case of nanotechnology commercialisation, technology transfer, research activities at advanced stage of development with an high potential of application active. Those interested in presenting a poster are invited to send an abstract of their contribution via the official website of the event [www.nanotechitaly.it](http://www.nanotechitaly.it) by 12th September.

**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.

