



2011 International Colloquium on Nanotechnologies

This colloquium, organized in partnership by the European Society for Engineers and Industrialists (SEII) and the French Embassy to Belgium, benefits from the support of the German Embassy to Belgium.





Brussels
14th October 2011
Palace of the Academies



Why this colloquium about nanotechnologies?

Nanotechnologies open exciting areas of opportunities in new materials, electronics, energy, environment and medicine. They are considered as a top priority field of research in Europe. This is why SEII organized in 2008 a **first colloquium** that provided participants with an overview of the possibilities offered by nanotechnologies.

This **2011 colloquium**, aimed at engineers and scientists, addresses two very promising areas :



NanoEnergy Battery, FET Inc.

- > Nanotechnologies for sustainable energy, and
- > Nanotechnologies for future transport developments.



08 h 45 Registration of participants

09 h 30 Welcome addresses, by Philippe WAUTERS, President of SEII, and Jérémy DOMIS, Scientific Attaché of the French Embassy to Belgium

09 h 50 Keynote address: « Nanotechnologies: myth or reality? », by Léopold DEMIDDELEER

> We clearly master the necessary technologies to design and build any material at the nano-scale today, nearly 50 years after Richard FEYNMANN prophetically claimed that "there is plenty of room at the bottom!", giving the example of coding the Encyclopaedia Britannica on a pin head. What was stunning at that time is nearly common nowadays ...

> But, where are we today as regards the industrial developments of applications deriving from this captivating race for the infinitesimal? Do we derive the added value expected by the stock market? Is not the current wave of "Sustainable Development" going to swallow up the resources that are still needed to achieve the industrial development of nanotechnologies? Could it be that nanotechnologies are just luxury toys for developed countries? Let's have a close look at the visible part of it!



Dr Léopold DEMIDDELEER has a PhD in Physical Chemistry from the Free University of Brussels (ULB) and is currently executive Vice President and cochairman of the New Business Board of SOLVAY, a Belgian chemical group with global reach. He joined the company in 1981.

He is also President of the Board of EIRMA (European Industrial Research Management Association), Member of the Belgian Royal Academy and Vice President of SEII.

10 h 30 Coffee break

Morning session: Nanotechnologies for Sustainable Energy Developments

Chairman: Emeritus Professor Yvan BRUYNSERAEDE (K.U.Leuven)

11 h 00 « Potential benefits of nanotechnologies for sustainable energy », by Hélène BURLET

Nanomaterials exhibit specific properties that could be of great interest in the case of energy devices, but they are subjected to cost and safety constraints, which limit their use in applications where significant benefits are expected. The speaker will first provide an overview of the potential benefits of nanomaterials for electrochemical storage systems, harvesting devices, conversion and improved efficiency systems, including a comparison of theoretical performances with the results of practical applications, and then explain the main features of the "nanosafety approach", developed simultaneously to technological work at CEA in cooperation with European partners.



Dr Hélène BURLET is an international Expert in Materials at the French Atomic Energy Commission (CEA). After a PhD degree in Materials Sciences at the "École des Mines Paris", she joined the Laboratory of Innovation for New Energy Technologies and Nanomaterials (LITEN) of CEA, of which she is currently the CTO, more specially in charge of the evaluation of nanomaterials and nanotechnologies potential benefits for energy devices. She is a member of the material and of the nanoscience committees, and of the Scientific Council of CEA.

11 h 45 « Linking Nanoscale to Gigawatts: Nanotechnology in Photovoltaics », by Jef POORTMANS

The photovoltaic sector is one of the strongest growing industrial sectors and is considered by many as the next "holy grail" for the semiconductor industry. One of the key figures of photovoltaic devices is the energy conversion efficiency. Participants will first be provided with a short overview of the present

photovoltaic solar cell technologies and their typical efficiencies, thereby distinguishing between three so-called different generations of solar cell technologies. Several examples will be given of the use of nanotechnological features in those three different types of solar cells to improve their energy conversion efficiency. Many "third generation" solar cell technologies will in fact only work through the use of nanotechnology in different forms.



Dr Jef POORTMANS is currently Director of the Strategic Programme and the « Solar and Organic Technologies Department » at IMEC in Leuven. He is also part-time Professor at the Katholieke Universiteit of Leuven, where he received his Master degree in electronic engineering in 1985. He started working at IMEC and, in parallel, went on studying and received his PhD in 1993. He then joined the photovoltaics group, being responsible for advanced solar cells, particularly thin-film crystalline Si solar cells, an activity for which he became cluster coordinator of European projects.

12 h 30 Walking lunch

<u>Afternoon session</u>: Nanotechnologies for Future Transport Developments

Chairman: Mr Michel VAN HECKE, Founding President of SEII

14 h 00 « Nanotechnology for Future Mobility », by Wolfgang A. KAYSSER

The outstanding potential of nanomaterials provides one of the answers to the challenge of future environmentally friendly and sustainable mobility. Nanomaterials and nanotechnologies are already implemented to recent major transportation vehicles as light duty passenger cars and commercial passenger aircraft. Lightweight car bodies consisting of metallic and non-metallic materials or composites will require further research and development of nanomaterials with respect to properties, processing, availability and price. Impressive weight reduction of light-metal airframes by new joining techniques using nanoscale microstructure control and aero-engines using nanotechnology for an improved weight to thrust ratio are options for the near future. Examples of recent developments will be described and long-term options will be discussed.



Dr Wolfgang A. KAYSSER is currently Scientific Director of the Helmholtz-Zentrum Geesthacht (Germany), specializing in research on leading-edge materials, and Full Professor for Applied Metals Science of Non-ferrous Metals at RWTH Aachen. He received a PhD degree on metal Science at the University of Stuttgart and then worked for nearly 20 years at the "Max-Planck-Institut für Metallforschung". He also was for 12 months visiting scientist at the Massachussets Institute of Technology. Before holding his present functions, he has been Director of the Institute for Materials Research of the German Aerospace Research Establishment in Cologne.

14 h 40 « Contribution of Fuel Cells to Sustainable Transport », by Laurent ANTONI

Sustainable drive systems and innovative safety technologies are the mainstays of CEA's vision of future mobility. Vehicles with hydrogen-powered fuel cells and battery-powered drive trains provide ideal conditions for environment friendly mobility, which saves natural resources. An overview of the potential benefits of these technologies and the current achievements, with the deployment of many systems operating in real conditions, will be presented. In the same way, the production method of hydrogen should be implemented using renewable energies, and hydrogen distribution must be executed with the best possible cost and carbon efficiency.



Dr Laurent ANTONI is a Laboratory Manager at the LITEN Institute of CEA (French "Commisariat à l'Énergie Atomique et aux Énergies Alternatives" in Grenoble. He received his PhD in Materials Sciences from the "Institut National Polytechnique" of Grenoble in 1996. After 7 years working in industry in the area of aqueous and high temperature corrosion of stainless steels and alloys, he has worked on fuel cell technology, in the areas of SOFC and PEM fuel stack components and systems. His current main research area is related to PEMFC stack testing and system development, and in the development of power Li batteries for transportation applications.

Round Table

16 h 00 Round Table discussion, moderated by **Philippe BUSQUIN**



Philippe BUSQUIN is a Belgian politician, Minister of State and presently Mayor of Seneffe. He received a degree in nuclear physics from the University of Brussels (ULB) in 1962 and received later a postgraduate certificate in environmental studies and a first degree in philosophy. He has been holding many positions in the Belgian political landscape, both at the national and at the regional levels, but also at European level, as he was the European Commissioner for Research from 1999 to 2004 and a member of the European Parliament from 2004 to 2009. He is also a Member of the Belgian Royal Academy.

Acknowledgments

The co-organizers:



Société Européenne des Ingénieurs et des Industriels (SEII) European Society for Engineers and Industrialists Europäische Gesellschaft der Ingenieure und Industriellen Europese Vennootschap van Ingenieurs en van Industriëlen Rue d'Egmontstraat, 11 – BRUSSELS – Belgium www.seii.org

and:



Ambassade de France en Belgique Boulevard du Régent, 42 1000 BRUXELLES (Belgique) www.ambafrance-be.org

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(Rue Jacques de Lalaingstraat, 8-14 – 1010 BRUSSELS – <u>www.bruessel.diplo.de</u>)



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Michel VAN HECKE, Founding President of SEII





Albert STRUB, Vice President of SEII, President of EIIL



Marc GOOSSENS, Director & member of the Executive Committee of SEII



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