

Conclusions of EuroNanoForum 2009 conference

The EuroNanoForum 2009, a 4-day conference, was organized at the Prague Congress Centre from 2nd to 5th of June, as an event of the Czech Presidency, under the auspices of the Czech Ministry for Education Youth and Sports and with the support of the Industrial Technologies Directorate of the Directorate General for Research of the European Commission. The conference examined the nanotechnology contribution to the sustainable development of European industry and society while underlining the up-to-date industrial technologies and the role of products and services enabled by nanotechnologies in today's world.

- The Forum provided a communication platform between the main European and international stakeholders (industrialists, researchers, universities and policy makers) in nanotechnology research and development. The conference was attended by more than 700 participants from 36 countries.
- The conference highlighted spectrum of nanotechnologies, which could significantly contribute to the industries including aeronautics, automotive, chemicals, biotechnology and healthcare, construction electronic and electrical engineering, food, shipping, manufacturing, power generation and storage, remediation of the environment and textiles. Various **technical details e.g. technology readiness, end-user needs, benefits and risks, have been assessed at each of 33 conference sessions.** The detailed **summary of each session** will be used to guide **future political actions in research on nanosciences, nanotechnologies and converging sciences.**

Following the presentations and a panel discussion, the participants arrived at the conclusions listed below:

Eco- & energy- efficient industrial production:

- The interest in **nanomaterials and metal nanoparticles as catalysts** is increasing, for **energy-cost reduction, improvement of selectivity and minimisation of waste streams.** Among particular examples that were shown was the use of superparamagnetic nanoparticles as heterogeneous catalysts. Other promising concepts to improve energy efficiency are microreactors and novel reactive media - **ionic liquids.**
- Nanotechnologies could contribute to a significant decrease in energy demand during the construction of new buildings, and to lower green gas emissions from existing ones.
- **For new-generation cars, as well as ships and aircraft, nanotechnologies will impact on production and operating costs, and lower the environmental impact.**

Energy and environment

- Rapidly expanding fields of nanoscience and nanotechnology could contribute to a clean, energy-efficient society and to a plentiful supply of low-cost sustainable and renewable energy (photovoltaics, wind) and thermoelectric conversion systems. **Any new technologies should be suitable for large-scale application, and capable of providing reliable, stable solutions.** One of the highlighted research results fulfilling these criteria is dye-sensitised nanocrystalline titanium dioxide solar cells.

- The environmental benefits may in some cases be compromised by unintended consequences of using nanoscale materials, but **further data is needed to assess and mitigate possible risks**. The climate-forcing effects of natural and engineered nanoparticles in the atmosphere should also be investigated.

Nanotechnology for sustainable healthcare

- Despite the coordination effort and of funding increases to **nanomedicine**, **industrial concerns about the maturity of these technologies still exist**. However, nanotechnology is helping to bring about important advances in areas such as **regenerative medicine, drug delivery and diagnostics**. Presentations showed how in-vitro diagnostics is more and more connected to new drug propositions; in-vivo imaging is combining different reagents and biomarkers; and biodegradable nanofibre scaffolds are helping to treat previously incurable conditions. The conference calls for **better cooperation among researchers, hospitals (i.e. clinicians) and industries**.

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Prospects for industrial nanotechnologies

- Despite the advances in characterisation and analytical tools, some gaps remain. The incremental improvements in silicon-based electronics and improved design of devices are evidenced. Breakthroughs from bottom-up approaches (e.g. molecular electronics) are still in their infancy. The recommendation is to strengthen e public-private partnerships and improve education in Europe.

Governance of nanotechnology

- To respond to wider interdependent concerns expressed by industry, various ETPs and European policies (e.g. Research and Development, Health, Environment, Consumer protection, Competitiveness ...), the need for **more effective Europe-wide cooperation on horizontal nanotechnology issues** (Standardisation; Education; Ethical, Social and Legal Aspects; Communication and Outreach) was discussed.
- **Further dialogue and joint actions** between governments, funding agencies, industries and research entities are essential to achieve a prosperous sustainable economy **in Europe**. Only these interactions will overcome the infrastructural and knowledge barriers. They are vital to maximise the benefits of cooperative research in nanosciences and nanotechnologies. Also vital is a dialogue with society at large, in order to overcome misconceptions created by ill-informed media comment.
- In order to support the continuation of nanotechnology's industrialisation, encourage the development of new products and services, and to respond to broad public demand for **safe and responsible research, wider international cooperation and greater financial support is needed in the fields of safety, health and environmental protection**.
- Market success of nanotechnology applications depends very much on the establishment of **corresponding standards, and continuous development of measurement and testing methods**.