

'Nanotechnology – Products and Processes for Environmental Benefit'
*Themes Include: Hazardous Chemical Substitution, Resource Minimisation, Reversing
Pollution and Carbon Emission Reduction*

16-17 May 2007 - The Royal Society, Carlton House Terrace, London

16th May 2007: Day 1

08.45 – 09.20 **Registration**

09.20 - 09.30 **Welcome and Introduction**

Session 1: Nanotechnology and Reducing Environmental Impact

Chair: Otilia Saxl, Institute of Nanotechnology

09.30 - 09.55 **'Reducing Our Carbon Footprint: Can Nanotechnology Provide Solutions?'**

Professor Peter Dobson, University of Oxford

- Solar cells and nanotechnology: can we design new types of cell that permit absorption of a wide range of wavelengths and arrange for effective charge separation?
- Can we design more effective solar thermal absorbers?
- Can combustion be made more efficient and less polluting using nanotechnology?
- New methods of storing energy using nanotechnology?
- Does nanotechnology hold the key to nuclear waste clean-up?

10.00 - 10.25 **'The Role of Nanotechnology in Chemical Substitution'**

Dr Ulrich Fiedeler, ITAS, Forschungszentrum Karlsruhe

- The results of a recent report commissioned by STOA are presented
- An assessment is made of benefits of substitute materials
- The implications for future products and processes are discussed

10.30 - 10.55 **'Nanotechnology - More Fashion, Less Waste'**

Professor Sandy Black, LCF

- 1m tonnes of textiles are discarded in the UK each year, mostly to landfill. Expansion in the growth of natural fibres is unsustainable from pressure on land.
- Waste is largely driven by fashion
- How can nanotechnology offer novelty to fashion aficionados, but reduce waste?

11.00 – 11.25 *Refreshments*

Session 2: Nanotechnology – Towards Reducing Pollution

Chair: Professor Peter Dobson, University of Oxford

11.30 – 11.55 **'PEM (Polymer Electrolyte Membrane) Fuel Cells - State of the Art and Technology Challenges'**

Dr Barry Murrer, Johnson Matthey Technology Centre

- PEM Fuel cells promise efficient energy generation
- How close are they to market?
- How can nanotechnology improve performance and reduce costs?

- 12.00 - 12.25 **'Nanotechnology with Respect to Protecting Surfaces'**
Professor Dr Michael Veith, Leibniz-Institute for New Materials (INM)
- New Films made of nano-particles for Corrosion Protection
 - New Structured Films for Light Management
 - Films of Hybrid Systems with Several Added Values
- 12.30 – 12.55 **'Fighting Climate Change through Plastic Electronics'**
Dr John de Mello, Imperial College and Molecular Vision Ltd
- An award-winning breakthrough in the manufacture of plastic electronics is described
 - Dramatic implications for sustainable energy production (organic solar cells) and energy consumption (organic solid-state lighting)
- 13.00 – 14.10 *Lunch*

Session 3: Nanotechnology and Environmental Monitoring

Chair: Dr Barry Murrer, Johnson Matthey Technology Centre

- 14.15 – 14.40 **'Making Sense of Water Pollution Monitoring'**
Professor Anthony Turner, Cranfield University
- Prolific amounts of chemical information are required to feed environmental models
 - Biosensors offer a replacement for bioassays - a kind of "electronic fish"
 - Nanomaterials coupled with molecular imprinting deliver "plastic antibodies"
 - Biosensors & biomimetic sensors can furnish both specific and high level information remotely
- 14.45 – 15.10 **'If You Can't Measure It, You Can't Control It: Advances In Nano-based Air Quality Sensing Techniques'**
Dr David Rickerby, JRC, Ispra
- What we want to measure, and why
 - New generation of low cost, miniaturised sensors
 - Integration of sensor networks with wireless telecommunications infrastructure for high spatial resolution monitoring

5.15 – 15.40 *Refreshments*

Session 4: Nanotechnology and Decontamination

Chair: Dr David Rickerby, JRC, Ispra

- 15.45 - 16.10 **'Photocatalysis as Environmental Light Cleaning - Dreams and Reality'**
Dr František Peterka, NANOPIN (Czech National Center for Nanosurfaces Eng.), EU-COST540
- methods principles
 - limits
 - references
 - function testing
- 16.15 – 16.40 **'Novel Fibrous Catalyst for Treatment of Waste Waters'**
Dr Katherine D. Huddersman, School of Molecular Sciences, De Montfort University
- Heterogeneous Fentons Catalyst
 - Works at room temperature and pressure to decompose organics
 - Applications to wide range of effluents including endocrine disruptors
- 16.45 – 17.00 *Closing Remarks for end of day 1*
- 17.00 – 18.00 *Drinks Reception*

17th May 2007: Day 2

Session 5: Nanotechnology - Reducing Environmental Damage and Benefiting Health

Chair: Malcolm Harbour, MEP

- 09.30 - 09.40 **Welcome and Introduction to Day 2**
Malcolm Harbour, MEP
- 09.40 - 10.05 **'Nanotechnology for Stay-Clean Finishes for Industry'**
Del Stark, European Nanotechnology Trade Alliance
- Nano-based treatments - and how they work
 - Applications
 - Economic and environmental benefits
- 10.10 - 10.35 **'Environmentally-Compliant, Functional Sol Gel Coatings'**
Professor Robert Akid, Sheffield Hallam University
- The wide applications of organic inorganic hybrid coatings and their benefits are discussed
 - Applications include anti-corrosion coatings, Cr (IV) replacement, anti-bacterial coatings and prevention of biofilms
- 10.40 - 11.05 **'Nanotechnology in Photovoltaics'**
Professor Keith Barnham, Imperial College London
- quantum well solar cells for 3rd generation concentrator systems
 - the quantum dot luminescent concentrator
- 11.10 - 11.35 *Refreshments*

Session 6: Nanotechnology for Better Products

Chair: Del Stark, ENTA (European Nanotechnology Trade Alliance)

- 11.40 - 12.05 **'Nanotechnology for Reduced Toxicity Flame Retardants and Property Enhancement in Polymers'**
Professor Richard Pethrick, Strathclyde University
- What benefits can nano technology bring to polymer materials
 - Can nano materials be safer than current options for fire retardants
- 12.10 - 12.35 **'Novel Fibre Technology Tackles Global Warming'**
Dr Semali Perera, University of Bath
- An award-winning pollution control technology
 - Molecular sieving fibres for size selective separation
 - Energy efficient recovery and reuse of CO₂ and organic solvents (VOCs)
- 12.40 - 13.45 *Lunch*

Special Session: Nanotechnology Benefits and Risks

Chair: Ottilia Saxl, Institute of Nanotechnology

- 13.50 - 14.15 **'Nanotechnology: Environmental Protector - or Polluter?'**
Professor Dr Paul Borm, Centre of Expertise in Life Sciences (CEL), Zuyd University
- The good, the bad and the ugly are discussed, including:
 - Remediation using magnetic particles, catalytic degradation and absorption on high surfaces
 - Nanoparticle emissions of catalytic conversion, gasoline additives and nanosilver

14.20 - 14.45

'Nanotechnology – Controlling the Risks to Reap the Benefits'

*Christopher Bunting, General Secretary, IRGC
(International Risk Governance Council)*

- IRGC has developed an approach to nanotechnology risk governance
- This presentation will outline that approach and how it differs for different generations of technology applications

14.50 – 15.15

'Environmentally Beneficial Nanotechnologies: Barriers and Opportunities'

Professor Sir Howard Dalton FRS, Chief Scientific Adviser, DEFRA

- Howard Dalton will talk about the findings of a new study which looks at the current and potential environmental possibilities offered by nanoscience.
- The study - 'Environmentally Beneficial Nanotechnologies: Barriers and Opportunities' - examines both the benefits and the barriers to the adoption of a number of applications of nanotechnology.
- The study focuses in particular on those applications of nanotechnology which could help to reduce greenhouse gas emissions.

15.20 – 15.30

Final Remarks and Close