

'Nanoparticles for European Industry II – Measurement, Characterisation and Standardisation; Manufacturing Scale-up and Processing; Regulations, Risks and Toxicology.'

24th – 25th October 2007 – The Olympia Conference Centre, London

24th October 2007: Day 1

08.30 - 09.10 Registration and Refreshments

09.10 - 09.20 Welcome and Introduction

Dr Mark Morrison, Institute of Nanotechnology

Session 1: Manufacturing Scale-up and Processing

(Chair- Dr Mark Morrison, IoN and Peter Hatto, Ionbond/ISO TC 229)

09.20 - 09.50 Keynote: **'Nanoparticle Applications in Food, Personal Care and Packaging'**

Dr Michael Butler, Unilever

- ❖ The presentation will discuss applications of nanoparticles in foods, personal care products and packaging.
- ❖ Emphasis will be on cost-effective, practical, safe, scalable processes and materials.
- ❖ The primary focus on the benefits of these materials will be on their impact on preventative health and the environment rather than cosmetic effects.

09.50 - 10.15 **'Manufacturing Routes for Nanoparticle Synthesis'** (Presentation not included on proceedings CD)

Dr Derek Graham, ICI

- ❖ Brief overview of printed electronics and the role of nanoparticulate materials.
- ❖ Novel manufacturing methods including cryochemical synthesis, hydrothermal processing and supercritical fluids.
- ❖ Illustrate the importance of nanostructure through applications.
- ❖ Screen printable indium tin oxide (ITO).
- ❖ Ink jet printable metallic nanoparticles including copper and silver.

10.15 - 10.40 **'Rapid Nanocomposite Prototyping'**

Dr Stephan Barcikowski, Laser Zentrum Hannover e.V.

- ❖ From bulk to nano: Pulsed laser ablation in liquids.
- ❖ From cores to functional shells: In-situ functionalisation of nanoparticles for bio imaging and drug delivery.
- ❖ From nanomaterial to prototypes: In-situ dispersion and embedding of nanoparticles in polymers.

10.40 - 11.10 **Refreshments**

11.10 - 11.35 **'Carbon Nanotubes: Synthesis, Processing and Composites'**

Dr Milo Shaffer, Imperial College

11.35 – 12.00 **'New Nanoparticle and Quantum Dot Hybrid Materials: Issues for Industry Scale Manufacturing and Applications'**

Professor Jim Johnston, Victoria University of Wellington

- ❖ Nanoparticles and quantum dots can impart interesting tuneable optical and chemical functionality to consumer products.
- ❖ Leaching of nanoparticles and quantum dots from consumer products can be overcome by first tethering them to host fibres.
- ❖ Maintaining the size and composition of nanoparticles and quantum dots is a challenge when scaling up a laboratory synthesis to industry production.
- ❖ These issues will be discussed using gold and silver nanoparticles and zinc sulfide quantum dots on wool and paper fibres.

12.00 - 12.25 **'Synthesis of Hydrophobized Inorganic Nanoparticles for the Homogeneous Incorporation in Nanocomposites'**

Dr Markus Klapper, Max-Planck-Institute for Polymer Research

12.30 - 13.40 **Lunch**

- 13.45 - 14.10 **'Pulsed Laser Ablation in Liquid for Generation of Copper and Titanium Oxide Nanoparticles'**
Professor Lin Li, University of Manchester
- Generation of nanoparticles by laser ablation in liquid.
 - Until now only 'pulse' laser ablation in liquid has been reported. We first demonstrated the successful generation of metal-oxide nanoparticles using 'continuous wave' laser ablation in liquid.
 - High power continuous wave ablation in liquid resulted in higher production rate compared to the pulse laser ablation.

- 14.10 - 14.35 **'Bottom Up Synthesis of Nanomaterial Building Blocks through the use of Metastabilization'**
Dr Nicos Angastiniotis, Higher Technical Institute, Cyprus
- Through the use of the metastability process an inhomogeneous particle can be converted into a building block.
 - The metastability process not only homogenizes the particle but also sizes its grain within a range where confinement effects take place.
 - The additional capability of the process to regulate the non-stoichiometric constituency within the frame of the aforementioned building block provides the flexibility to manipulate even further the material properties.

- 14.35 - 15.00 **'Scaling up of Formulated Nanomaterials using Hydrothermal Synthesis'**
Dr Ed Lester, University of Nottingham
- The problems associated with hydrothermal synthesis.
 - The design of a new continuous flow reactor.
 - The formulation of nanomaterials.
 - The design and build of a scale up reactor.
 - Future directions.

15.00 - 15.30 **Refreshments**

Session 2: Measurement, Characterisation and Standardisation
(Chair- **Dr James Johnston, NPL**)

- 15.30 - 16.00 **Keynote: International Standardization in support of Nanoparticle Measurement, Characterization and Impact Assessment.**
Dr Peter Hatto, Chairman ISO/TC 229 – Nanotechnologies; Director of Research, IonBond
- Highlight the most important, and frequently misunderstood, elements of international standards and standardization.
 - Review existing standards relevant to the field.
 - Discuss how current and future developments within ISO/TC 229 will contribute to the safe, responsible and commercially successful development of nanotechnologies.

- 16.00 - 16.25 **'Relevance of the Physico-chemical Characterization of Nanoparticles for Toxicity Testing'**
Dr Hermann Stamm, JRC ISPRA

- 16.25 – 16.50 **'Nanoparticle Detection and Analysis – Tracking Nanoparticles in a Sample, Directly and Individually, to Give High Resolution Particle Size Distributions'**
Dr Bob Carr, Nanosight
- The NanoSight technology for direct and real-time nanoparticle visualisation and analysis will be described.
 - Examples from a wide range of samples from the chemical, pharmaceutical and clinical sectors will be shown.
 - Latest developments in the evolution of the technique will be discussed.

- 16.50 – 17.15 **'A Spectroscopic Particle Sizing Instrument'**
Dr Rick Trutna, Agilent Technologies
- Agilent has developed a particle-sizing instrument that uses Mie scattering theory to deduce the particle size distribution from a measurement of the transmission spectrum of a colloid.
 - We shall describe how the instrument works and show measurement results for a variety of materials.

- 17.15 – 17.40 **'Overview of UK National Measurement system activities in nanoparticle metrology'**
Dr Alexandre Cuenat, NPL (Presentation not included on proceedings CD)

17.40 - 19.00 Drinks reception and poster viewing

25th October 2007: Day 2

08.45 - 09.15 Refreshments

09.15 – 09.20 Introduction and Welcome to Day 2

Session 3: Panel discussion - The Big Issue(s) (Chair- Dr Mark Morrison, Institute of Nanotechnology)

09.20 - 09.35 Introduction from chair, summary of conference so far

09.35 – 11.15 General discussion, with questions from audience
Panel members: James Johnstone, NPL; Del Stark, ENTA; Dr John Garrod, DEFRA;
Lynn Bergeson, Esquire, Bergeson & Campbell, P.C; Dr Derek Graham, ICI;
Trudy Phelps, ABHI and chair of CEN TC 352

11.15 – 11.45 **Refreshments**

Session 4: Regulations, Risks and Toxicology (Chair- Trudy Phelps, ABHI and chair of CEN TC 352)

11.45 - 12.15 Keynote: **'An Update on the Government's EHS Research Programme on Nanomaterials'**
Dr John Garrod, Defra

- ❖ Review of the current programme.
- ❖ Some recent results - reference materials, environmental exposure, environmental testing methods.
- ❖ International perspective.

12.15 - 12.40 **'A Qualitative Risk Assessment Framework Model for Nanomaterials Resulting from Environmental Applications'**

Niall O'Brien, University College Dublin

- ❖ Current procedures for risk assessment of nanoparticles, problems with current approaches.
- ❖ A proposed qualitative model: Risk = hazard x exposure, weaknesses/strengths of proposed model.
- ❖ Conclusions: Risk management – limiting hazard, exposure limits.

12.40 - 13.05 **'From NANOSAFE to SAPHIR, a Responsible Approach for Safe Industrial Nanomanufacturing'**

Dr Frederic Schuster, Nanosafe2

13.05 – 14.10 **Lunch**

14.10 - 14.35 **'Regulating Nanomaterials: 'Mind the Gap''**

Professor Robert Lee, BRASS

- ❖ Where the gaps are in the regulation of Nanotechnology

14.35 - 15.00 **'Emerging Global Governance Strategies: A Summary Overview'**

Lynn Bergeson, Esquire, Bergeson & Campbell, P.C

- ❖ Review range of emerging global governance strategies being used to manage nanotechnology risk issues.
- ❖ Assess the utility of various governance mechanisms to manage these issues.
- ❖ Forecast what governance mechanisms may be most useful, and why.

15.00 - 15.25 **'Toxic Effects of Nanomaterials to Trout: Implications for Fish Toxicity Testing & Regulation'**

Dr Richard Handy, University of Plymouth

- ❖ This work reports some of the first detailed toxicological effects on the body systems of fish.
- ❖ The data is discussed in the context of both characterisation and the practical issues of setting up fish toxicity tests
- ❖ Pragmatic solutions to the emerging problems are suggested.

15.25 - 15.40 Closing Remarks

Conference Close