Session Preview and Challenge of Measurement and Characterization of Nano-objects

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Nano-materials

Paints

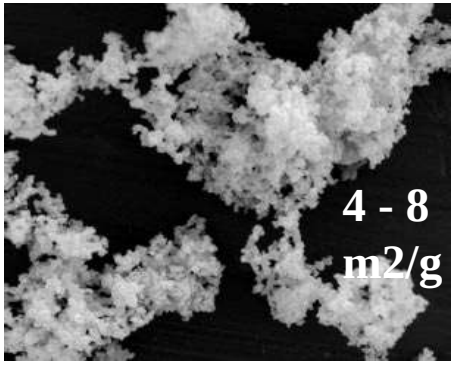
TiO_2

Courtesy of Dupont

Tires (~30 wt%)

Carbon Black

Inks



Courtesy of Inco

Ni for batteries

Optical fibers

ZnO as vulcanizing agent

Courtesy of Umicore

Flowing aid

Courtesy of Cabot

SiO_2

Summary and Classification

- There are a total of 16 oral and 12 poster presentations regarding to the measurement and characterization of nano- objects in this conference

- Classification:
  - Nano-object in gases
  - Nano-object in liquids
  - Nano- object in food, consumer products and medicine
  - Nanopowder characterization and synthesis
  - Bio- nano-object/Nano- object with bio-testing

Nano- object in Gases

- **Oral Presentation:**
  - Micro sensor for the capacitive detection of airborne nanoparticles fabricated by combining 3D printing and lithography (SCHMITT Jean)
  - Detection of nano-aerosols using ionized air (JAKUBIAK Szymon)
  - Aerosol sampling techniques using TEM grids (Xiang Maiqi)
  - Nanoparticle formation and emission during laser ablation of ceramic tiles (SALMATONIDIS Apostolos)
  - Real-time monitoring, sampling and microscopic analysis of nano-objects suspended in the air at workplaces (OBERBEK Przemyslaw)
  - Experimental investigation on impact of fine particle less than 10nm on filtering efficiency of particulate respirators (KOMAMIYA Toshinori)

Nano-object in Gases (Conti.)

- **Poster Presentation:**
  - Inter-comparison in the laboratory of various CPCs challenged by nanoparticles in the range of 6 – 460 nm (BAU Sébastien)
  - Improved light scattering measurement with microscopy data for nanoparticle number-based size distribution (CAEBERGS Thierry)
  - Design and evaluation of an airborne fiber selection module (CLAVAGUERA Simon)
  - Single Particle ICP-MS: metrological needs for detecting, counting and sizing nanoparticles (NOIREAUX Johanna)
  - Measurement and observation of particles generated during abrasion of CNT composite resin (MATSUI Yasuto)
  - Renovation and other sources of indoor 1.1-4.0 nm and ultrafine particles (MIETTINEN Elina)

Nano-object in Liquids

- **Oral Presentation**
  - Characterization of dispersibility and stability of TiO_2 nanoparticles in cell culture media with static multiple light scattering (SENTIS Matthias)
  - A novel chemical approach to region control synthesis of gold-BINOL hybrid nanostructures (PATLOLLA Shashank Reddy)

Nano-object in Food, Consumer product and Medicine

- Metrology of Nanoparticles with Small Angles X-Ray Scattering (SAXS) : from simple cases to nanoparticles in food additives (Tache Olivier)
- Optimization of AF4-ICP-MS and Sp-ICP-MS methods for titanium dioxide nanoparticles characterization in food product (GIVELET Lucas)
- Characterization of nanomaterials in consumer products and medicinal samples: from routine analysis to advanced methodologies (MENTA Mathieu)

Nanopowder Characterization

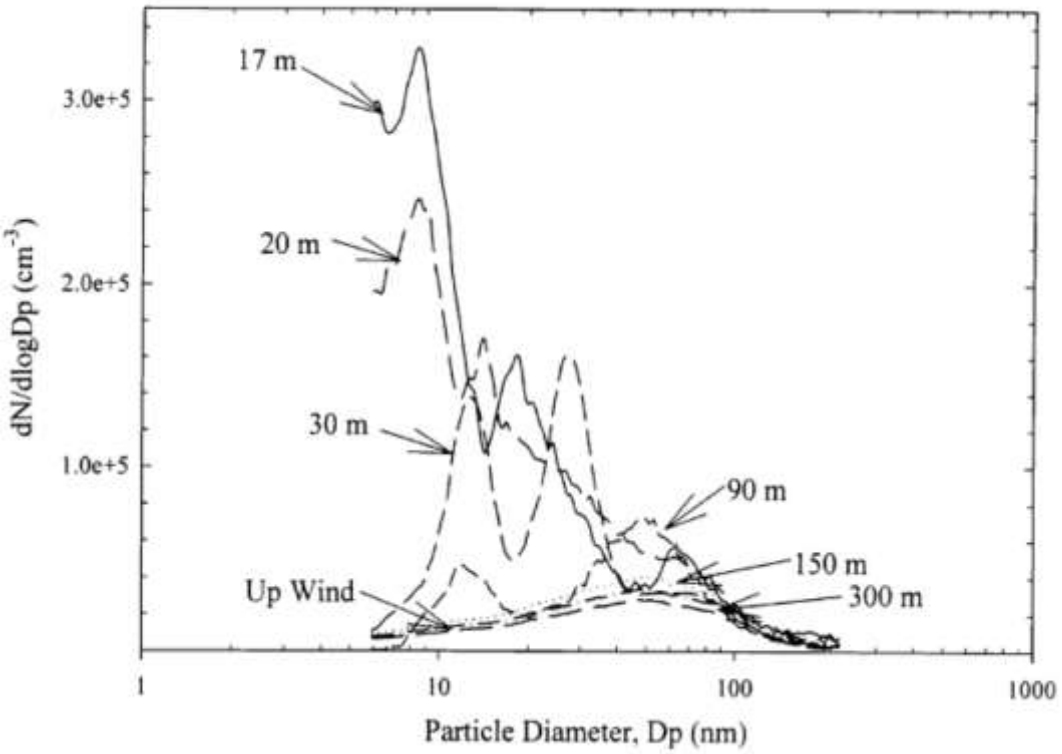
- **Oral Presentation:**
  - An operation methodology to characterize nanomaterial powders for risk assessment (DAZON Claire)
  - Purchasing metal oxide nanopowders for research: Buyer Beware! (RASMUSSEN Pat)

- **Poster Presenation:**
  - Comparison between a 5K benchtop electron micropscopr and conventional TEM for number size distribution of powders and colloids (DAZON Claire)
  - Analysis and Optimization of nanoscale InxGa1−xN heterojunction solar cells design (KADDECHE Mourad)
  - How to meet new challenges in advanced nanoparticle analytics (KUNZ Valentin)
  - Data-rich OECD (Organization for Economic Co-operation and Development) WPMN (Working Party on Manufactured Nanomaterials) test materials - suitable for establishment and testing of grouping, read-across and risk assessment models? (JENSEN Keld Alstrup)

Bio-related Nano-objects

- **Oral presentation:**
  - Contrast enhancement for lipid nanoparticles characterization using TEM (ARNOULD Amandine)
  - Enhanced protein corona characterization using novel corona isolation and capillary electrophoresis-mass spectrometry techniques (CHETWYND Andrew)
  - Optimization of physic-chemical parameters of Chitosan nanoparticles extracted from exoskeleton of crayfish (EL-NAGGAR Marwa)
- **Posters:**
  - Grouping nanomaterials by bio dissolution and transformation –comparing abiotic, in-vitro, in-vivo (KELLER Johannes)
  - Interaction of silver nanoparticles with metalloproteins : corona formation, NPs dissolution and protein conformation changes (LIU Wei)
  - Yttria influence of structure and bioactivity of zirconia nanopowders (LAZAR VULPOI Adriana)

Challenge in Monitoring of Nano-objective in the Ambient Air



Zhu et al (2002) "Study of Ultrafine particles near a major highway with heavy-duty diesel traffic", Atmospheric Environment 36:4323-4335

Characterization of nano-agglomerates?

Sensors need to be:

- *Low cost*
- *Reliable*
- *Less maintenance*
- *Less calibration*
- *Easy to be field-deployed*

Solution to this monitoring task is the sensor network, especially for wireless sensor network

Challenge in Monitoring of Nano-objective in Liquids

- Issues:
  - Interference from liquid carry media
  - Interference from other material (i.e., impurity) in liquids
  - Status change of nano-object (individual or agglomerate)
  - No personal sensor available
- Possible solutions:
  - Separation and purification
  - using the unique property of nano-object to be measured
  - …….

Challenge in Monitoring of Nano-object in Food, Consumer product and Medicine

- Various carry media
- Various status of nano-objects (changed as the carry media varied)
- The presence of other materials in carry media

- Measurement tasks required to be done on the individual cases (i.e., case by case)
- No personal/hand-held devices available

Final Remark

- The concern and study of nano-Safety requires the support of measurement techniques for nano-objects in various media, presenting the challenge (or opportunity) for research and development.

- Possible solutions have been suggested to fulfill the measurement tasks but they are far from the ideal…

- Nano- object sensors for personal use are needed but not readily available in all the aspects.

- Much work/effort in research is required to achieve the desired measurement objective.

Please Join Us after the Lunch

THANKS FOR YOUR ATTENTION