IMPEDANCE BASED CHARACTERISATION OF NANOPARTICLE SUSPENSIONS

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Us...

Christchurch, New Zealand

Oxford, United Kingdom
Customers & Research Partners
ASIA PACIFIC

National Institute of Water and Atmospheric Research (NIWA)
Commonwealth Scientific and Industrial Research Organisation (CSIRO)
National Measurement Institute
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University of Queensland
University of South Australia
University of Sydney
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The Chinese University of Hong Kong
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Cawthon Institute
Academia Sinica
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Victoria University of Wellington
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Nanyang Technological University
Invirogen
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University of Potsdam
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Amsterdam Medical Centre
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Nanovector
University of Madeira
Sepmag
GE Healthcare
University of Applied Sciences Northwestern Switzerland
Erasmus Medical Centre
Jenner Institute
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American Type Culture Collection (ATCC)
Amgen
Aura Biosciences
Beckman Coulter
Boston University
Draper Laboratories
Duke University
Harvard University
Liquidia Technologies
Massachusetts Institute of Technology (MIT)

Memorial Hospital
Rhode Island University
National Cancer Institute
Old Dominion University
T2 Biosystems
University of California, Santa Cruz
University of Houston
University of Massachusetts Lowell
University of Wisconsin–Madison
US Army
The Salk Institute
The Technology
How does it work?

Resistive Pulse Sensing = Single particle detection

Please see our website to view this animation (SIOS) animation:

http://www.izon.com/about-us/the-technology/
Detecting blockade events

- Current (nA)
- Time
- Magnitude
- Duration
What can you measure?

• Any surface charge (+ve or –ve), no charge
• Size range ~ 50nm – 10µm
• Wide range of particles, synthetic and biological
  • Viruses e.g. Adenovirus, Lentivirus, Dengue, Baculovirus, Influenza, HIV...
  • Bacteria, Yeast, Phages
  • Blood particles – platelets, red blood cells
  • Polystyrene particles, poly(meth)acrylates
  • Metallic nanoparticles, Magnetic particles, Silica
  • Liposomes, Micelles, Exosomes and other vesicles
  • Protein Bioconjugates, Lipids, Cubosomes
  • Emulsions (oil-in-water)
• ...
Nanomedicine
Case Studies
Case Study 1: Characterisation of Liposome Preparations

- Characterise in physiologically relevant solutions (aggregation effects easily measured and quantified)
- Rapid, accurate, repeatable counting and sizing
- Statistically significant (few hundred or thousand counts)
- Conceptually simple measurement. No complex algorithms, no additional input parameters
- Small sample volume

Case Study 2: Reaction Dynamics for Diagnostic Assays

- Using aggregation effects to advantage
Case Study 1: Characterisation of Liposome Preparations

Assessment of Aggregation effects upon freeze/thaw treatment

<table>
<thead>
<tr>
<th>Sample</th>
<th>Particle concentration</th>
<th>Size $d_{90}/d_{10}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liposome</td>
<td>$3.5 \times 10^{13}$ particles/mL</td>
<td>1.3</td>
</tr>
<tr>
<td>Liposome (frozen)</td>
<td>$2.9 \times 10^{13}$ particles/mL</td>
<td>2.6</td>
</tr>
</tbody>
</table>

*Samples provided by University of Oxford, Dept of Biochemistry*
Detection of Surface Modification & Functionalisation Reactions

Confirm PEGylation of Liposomes

Case Study 1: Characterisation of Liposome Preparations*

Size Change

Charge Change

*Samples provided by University of Oxford, Dept of Biochemistry
Case Study 2: Reaction Dynamics for Diagnostic Assays

Immuno Nano Metrology (INM)

Please see our website to view this animation (INM) animation:

http://www.izon.com/about-us/the-technology/
Optimisation of particle immunoassays

Insitu: Real time creation of dimers and higher order aggregates upon introduction of antigen to antibody coated particle population in fluid cell.
Summary – Application in Nanomedicine

- Particle-by-particle measurement solution for:
  - Concentration
  - Sizing
  - Surface functionalisation (confirmation)

- Solution for complex particle systems
  - Diagnostic system development
  - Multi-dimensional analysis
For Particles 2011 participants...

- **New Zealand wine and networking**
  - Monday 11th July 19:45 after poster session
  - Main Foyer
  - Register at IZon booth

- **Interested in a qNano?**
  - Place an order for a qNano within one month of Particles 2011 and we will fly one researcher from your group to our New Zealand labs to work with our scientists for training and developing your application.
Thank you