NanoKTN: Linking Ideas and Supply Chains

The Nanotechnology Knowledge Transfer Network (NanoKTN) was set up by the Technology Strategy Board to promote and facilitate knowledge exchange, support the growth of UK capabilities, raise awareness of nanotechnology and provide thought leadership and input to the UK policy and strategy.

The NanoKTN has divided its activities into four themes: materials, metrology, manufacturing and processing, and bionano and nanomedicine. Focus groups have been built around these themes that engage as many potential stakeholders as possible and act as a three way communication channel between industry, academia and funding authorities. They identify the gaps in the supply chain as well as identifying the UK's potential in innovation. This information is reported back to the Technology Strategy Board to input into their UK Nanotechnology Strategy and also provides leverage for channeling government funds into specific areas of need.

Two focus groups have already been set up in the area of materials: HiPerNano and Nano4Energy. Nanotechnology is generating new materials solutions by improving the performance of existing materials, or developing new materials and coatings. HiPerNano (High Performance Nano-enhanced Materials) focuses on material challenges which may be common to a number of performance engineering industries. These materials challenges include mechanical performance, physical properties and chemical durability.

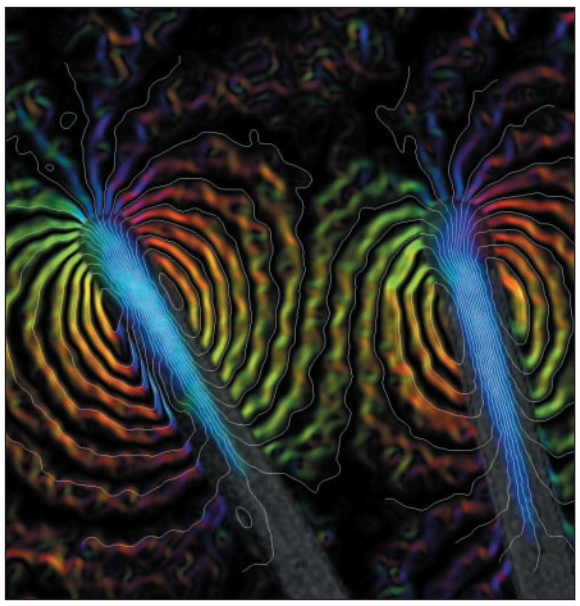
Nanotechnology has the potential to provide enabling technologies to develop innovative and improved clean energy solutions. Development of clean energy from renewable sources is seen as a priority by UK government. The UK boasts an impressive academic base in clean energy technologies, with university spin-out companies bringing many of these to commercialisation.

A significant number of next-generation clean energy solutions already involve nanotechnology and ongoing research in this area promises further developments and significant commercial rewards. However, in order to realise the commercialisation of these technologies, sustainable supply chains need to be developed, this is the aim of the Nano4Energy focus group.

> ***"Nanotechnology has the potential to provide enabling technologies to develop innovative and improved clean energy solutions."***

In the area of Metrology, the NanoKTN has signed a Memorandum of Understanding with the National Physical Laboratory (NPL). This agreement marked the beginning of a partnership where the NanoKTN and NPL will work together to promote nanometrology activities, an area which the UK has an acknowledged strength. The NanoKTN and NPL will collaborate on joint events and seminars to help disseminate information on the nanometrology field. The majority of these activities will be run through the MNT Measurement Club, which is led by NPL and focuses on metrology and related issues, such as national and international standards and regulations, measurement issues and best practice.

The NanoKTN has partnered with Leatherhead Food International (LFI) on a Nanotechnology in Food focus group to concentrate on the role of emerging micro- and nanotechnologies in food and drink applications. Implementation of micro- and nanotechnologies in this sector is predicted to grow rapidly due to the benefits they can bring for the consumer in terms of health, safety and quality.



The fourth theme of the NanoKTN, Bionano & Nanomedicine, is being delivered in partnership with Bio Nano Consulting (BNC) Ltd which is jointly owned by University College London (UCL) and Imperial College and was founded in 2005 as part of the DTI (now Technology Strategy Board) Micro & Nano Technology (MNT) initiative.

Bionano and Nanomedicine is being widely applied with positive affect and the major areas where nanotechnology can address problems in bio and pharma developments includes drug discovery, drug delivery and formulation, diagnostics, and imaging.

Nanotechnology has enhanced the drug discovery process, through miniaturisation, automation, speed and reliability of assays. An additional benefit being seen is the decrease in the amounts of expensive reagents through integration of microfluidics with lab-on-a-chip systems.

Numerous systems have been developed over the past few years that apply micro and nanotechnology to detect ligand interactions. For example, microcantilevers have been used as a label free way of directly measuring binding kinetics of drug candidates.

Nanotechnology can be applied to drug formulation and delivery systems in order to increase the delivery efficiency, or target certain tissues or cells. Nano carriers such as solid lipid particles, albumin, or polymer-based systems are being developed to aid drug delivery.

Nanotechnology has already enabled new formulations for drugs that are commercially available, and there are a number of drugs in the R&D pipeline or in the regulatory approval stage. In the future, nanotechnology will enhance the drug discovery process, through miniaturisation, automation, speed and reliability of assays. It will also allow greater selection of the right drug for the right patient and enable the tests to support this decision process to be done in the doctor's clinic.

Author Details:

Dr Alec Reader
Director
Nano KTN

Certified Service Provider for CGH, Gene Expression, MicroRNA Microarrays

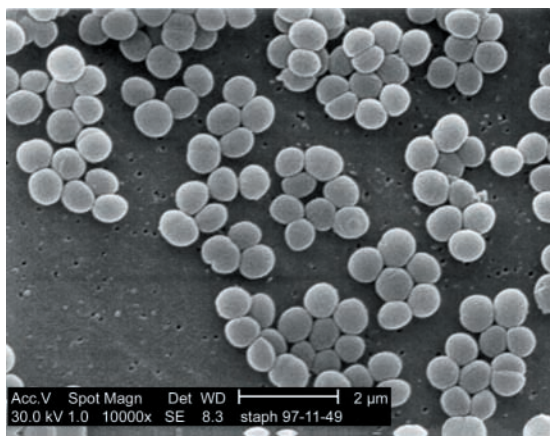
Agilent Technologies, Inc recently announced that the Institut de cancerologie Gustave Roussy (IGR) Genomic Centre has renewed its status as an Agilent Certified Service Provider and Reference Training Centre for a broad panel of microarray technologies including comparative genomic hybridisation (CGH), one-colour and dual-colour gene expression, and microRNA profiling. The IGR Genomic Centre first achieved Agilent Certified Service Provider status for gene expression microarrays in 2005. Now the IGR has expanded the panel of services to CGH and miRNA, and become the first centre in Europe to achieve this status for both DNA and RNA technologies. The centre is authorised to perform training for the same technologies that meets Agilent certification standards.

The IGR Genomic Centre achieved this status after passing a rigorous series of assessments. The assessments included proficiency in analysing Agilent's 60-mer oligo microarrays using the complete Agilent workflow from sample quality control using Agilent's 2100 Bioanalyser, to sample labelling, hybridisation, array scanning, feature extraction and data analysis. According to Prof. Jean-Charles Soria, Head of the Early Therapeutics Innovations Service (SITEP), acquiring an integrated genomic vision is extremely important for IGR research programmes. Such certified technology reinforcement enables IGR to conduct innovative research.

"The partnership between IGR and Agilent is very comprehensive and efficient, ranging from Certified Service Provider, to European Training Centre, but also at the R&D level," said Michael Mc Nulty, Senior Director of Agilent Diagnostics. Frédéric Laget, Agilent Senior Director, Life Sciences, adds that the impact on overall quality and harmonisation of procedures by this collaboration is very positive.

Circle no. 522

Nanoparticle Detection Technique to Combat MRSA



Virus particle detection and counting using Nanoparticle Tracking Analysis is providing essential information for researchers at the University of Strathclyde's Institute of Pharmacy and Biomedical Sciences (SIPBS). This team develops methods to employ naturally occurring bacteriophages to combat MRSA (Methicillin resistant Staphylococcus aureus) and other bacteria.

It is in characterising bacteriophage cultures that NanoSight comes into play, employed within a team lead by Dr Mike Mattey, Honorary Lecturer at SIPBS. Prior to deploying bacteriophages as a dry-coat, to protect high-risk bacterial invasion sites (sutures, instruments and wounds), the cultures need characterisation and their concentration needs assessing. NanoSight allows the team to view and size viral cultures rapidly, in real time and at low cost.

"The characterisation of virus populations requires assessment of aggregation in the 20nm – 1,000nm range," says Dr Mattey. "NanoSight provides fast and easy quantitative sample characterisation not possible with other methods and at a much lower cost. Additionally, NanoSight's technology provides a reassuring view of the particle population that supports the counting results."

The **NanoSight** LM system uses a novel employment of laser light scattering. These instruments visualise and dynamically size populations of suspended particles on an individual basis down to a particle size of approx 20nm, dependent on material. NanoSight directly tracks the Brownian motion of each and every particle separately but simultaneously using a CCD camera and from a high-resolution plot of the particle size distribution profile. Aggregation and flocculation are immediately apparent. This particle-by-particle approach avoids the ensemble assumptions of dynamic light scattering (DLS) and provides a unique image, going beyond light scattering in assessing polydisperse systems and providing insight into aggregation.

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