

# Meeting Report

## Nano-Particles

### Cambridge, Jan 6<sup>th</sup> 2004

Jesus College, Cambridge was the stylish setting for the meeting on nano-particles, hosted and organized by Dr Ian Wilson. With over 30 attendees and 13 presentations over a wide range of topics, the day was quite a success. The day started with an overview of the subject by Alan Smith of the ACORN Partnership covering the potential benefits of nano-particles - some of which are already with us. These include coatings for glass windows, tennis bowling balls and polymer composites. A novel use is that of coating textiles to prevent liquid spills from staining clothes, ably demonstrated by Alan as he poured coffee over himself, which ended up on the wooden flooring. Unfortunately the audience was not allowed to throw other items at him to test the range of materials it can repel! He did receive verbal abuse for soiling the floor...

Alan then went on to describe the ACORN consortium on nano-particles, which covers 7 universities and 16 different companies. Among the many useful statistics was the fact that a seagull landing on an aircraft carrier will cause the ship to lower by one nanometer.

The day was organized into two sessions, one focusing on the manufacture of nano-particles and the second on exploiting (and measuring) their properties. Among the areas of work presented were a range of papers on carbon nanotubes. The use of nano-metal templates to control the growth of nanotubes gives rise to interesting structures from highly porous horn structures for catalysts, (Dr Junfeng Geng, [jg201@cus.cam.ac.uk](mailto:jg201@cus.cam.ac.uk)) to brush type structures and the use of fluidised beds to generate single walled tubes (Dr Ian Kinloch, [iak21@cam.ac.uk](mailto:iak21@cam.ac.uk)). Prof Alan Windle ([ahw1@msm.cam.ac.uk](mailto:ahw1@msm.cam.ac.uk)) described the incorporation of nano-tubes into polymeric structures, yielding many potential applications from reinforcement of composites to high charge density capacitors.

The production of oxide particles was another theme of the meeting. Prof Allan Hayhurst ([allan\\_hayhurst@cheng.cam.ac.uk](mailto:allan_hayhurst@cheng.cam.ac.uk)) reported on the chemistry of silicon oxides in flames as well as measuring the development of the particle size distribution within the flame. This experimental approach was complemented by presentations on theoretical modelling by Dr Kraft ([markus\\_kraft@cheng.cam.ac.uk](mailto:markus_kraft@cheng.cam.ac.uk)) and Neal Morgan ([nmm22@cam.ac.uk](mailto:nmm22@cam.ac.uk)) who demonstrated the power of Stochastic Particle Modeling to describe these processes using very efficient computer codes.

The wide range of applications for nano-structured ceramics was demonstrated by Prof Jon Binner ([J.Binner@Lboro.ac.uk](mailto:J.Binner@Lboro.ac.uk)) who showed the benefits of these materials, along with a number of practical problems of dispersion, densification and controlling grain growth in sintering. Dr Sharon Williams ([slw40@cam.ac.uk](mailto:slw40@cam.ac.uk)) spoke about the use of affinity purification of nano-sized proteins, - a technique that could dramatically improve the efficiency of drug production and hence reduce costs. On the electronics side, Dr Jon Preece ([j.a.preece@bham.ac.uk](mailto:j.a.preece@bham.ac.uk)) described advances in both "top down" and "bottom up"

approaches for fabricating micro/nano transistors that will allow transfer of single electrons in a bid to make nano-processors.

Finally, on the nano-property side, Dr Yulong Ding ([cheyd@leeds.ac.uk](mailto:cheyd@leeds.ac.uk)) described the growing interest in nano-particle-containing fluids, which exhibit enhanced thermal conductivities. Why this happens is still not fully understood. Dr Zhibing Zhang ([Z.Zhang@bham.ac.uk](mailto:Z.Zhang@bham.ac.uk)) presented the progress of his work on measuring the mechanical properties of single particles. He has developed a new device that can measure compressive force as a function of displacement for particles as small as 100 nanometers in diameter. On the subject of size, Malcolm Connah ([malcolm.connah@malvern.co.uk](mailto:malcolm.connah@malvern.co.uk)) spoke about the new NIBS unit from Malvern that has been calibrated to measure particle size down to 0.7 nm in dilute dispersions.

Apart from a good range of informative papers, it was also interesting to see a number of groups making connections for future collaboration, which would not have happened without this seminar. Overall the day demonstrated that nano-particles are big technology and likely to become big business!

NB The meeting website at [www.cheng.cam.ac.uk/research/conferences/nano2004](http://www.cheng.cam.ac.uk/research/conferences/nano2004) will remain active for a period for readers to view titles and abstracts from the talks.

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