

MC8: Advancing Materials by Chemical Design 2 – 5 July 2007, University College London, UK

Report by Paul McMillan

During July 2-5 2007, the Bloomsbury campus of University College London played host to nearly 500 delegates to MC-8, Advancing Materials by Chemical Design, the eighth international conference in the biennial series organised by the Materials Chemistry Forum of the Royal Society of Chemistry.

Materials chemistry has now come of age, as a truly interdisciplinary field with "chemistry" at its centre, but extending seamlessly into biology, medicine, physics, nanotechnology and materials engineering.

The meeting extended over four full days. It was opened by Malcolm Grant, Provost and President of UCL, who welcomed the delegates to MC-8: he stressed the importance of chemistry as a central discipline relevant to the growth and development of existing and emerging technologies. Each morning of the conference began with a plenary lecture. The first presentation by Paul Alivisatos from UC Berkeley covered latest results from his group on designing shaped and functionalised nanoparticles and nanoparticle clusters for biomedical and other materials applications. He was followed by Roald Hoffmann from Cornell, who described how insights from molecular bonding would lead to studies of new chemical behaviour in solid state materials compressed to extreme conditions of high pressure and temperature. Next came Heino Finkelmann from Freiburg, who described how coupling between various mechanical, thermal and optical effects in polymer elastomers and liquid crystals could lead to new devices, including switches and actuators and artificial muscle tissue. Finally, George Whitesides from Harvard described a series of simple and elegant experiments that shed new light on the "old" problem of how "electrets", or particles with permanent electrical charges or dipoles, work and interact with each other and with their environment. The results and applications range from paint mixing to xerography and thunderclouds; the new physical insights will allow electret properties to be controlled by chemistry.

The sessions were arranged around theme areas, and collected into topical symposia including "Materials at the Bio-Ceramic Interface", "Materials for Sustainable Energy", "Electronic and Optoelectronic Polymers", "Bio-nanotechnology", "Framework Materials by Design", "Photoactive Thin Films and Particles", "Complex Structures", "Hierarchical Porous Materials" and "Framework Materials", "Colloidal Crystals", "Hydrogels and Peptide Self-Assembly", "Nanostructured Polymers", "Functional Liquid Crystals", and "Nanotubes and Nanowires" as well as "Nanoparticles". Solid state chemistry, that has traditionally formed a core area within the subject, was represented by three sessions directed particularly at "Magnetic and Electronic Solids", "Materials under Extreme Conditions", and "Advanced Ceramics". There were also sessions on "Catalysis and Green Materials", and a special symposium was organised on "Advanced Structural Probes" for materials chemistry research. Each morning and afternoon session was opened by a Keynote speaker, followed by 7-8 contributed talks in the area. Obviously, because of the intensely interdisciplinary character of the field, there was considerable overlap between sessions. An organisational decision was made early on by the conference committee

to bias the selection of talks toward those from younger speakers, so that many of the oral presentations were made by students attending their first large conference. There were nearly 200 posters presented at the meeting. Attendees commented on the very high quality of both the oral and poster presentations, from both "younger" and "more established" speakers.

In a large meeting such as this, it is impossible to mention each talk or poster presentation individually, and it can be highly arbitrary or even *dangerous* to mention only a few. All of the talks were of very high quality. However, I do wish to highlight some talks that caught the particular attention of my group of PhD students (C. Knapp, K. Woodhead, A. Salamat, R. Quesada, V. Lees), who attended all the sessions as ushers and technical aides, who were not at all experts in most of the fields presented. They sent me their notes and a list of their particular "favourites" - the speakers mentioned can be particularly pleased that they managed to suitably impress such unbiased young scientists. Julie MacPherson (Warwick) opened the "structural probes" session with a spectacular talk on scanning probe microscopy methods applied to materials characterisation. Within "traditional" solid-state materials chemistry, that now encompasses "green" materials and catalysis, multi-ferroics, and batteries and other energy storage materials, Bob Cava (Princeton) developed the topic of multi-ferroic materials development around his current interests in rare earth pyrochlores. Lee Cronin (Glasgow) gave a superbly visual talk on the structure and properties of polyoxometallate clusters (POMS), that show unusual and potentially useful redox properties of compounds included within the cages. Arne Thomas (MPI, Germany) gave a superb talk on the development of new mesoporous carbon nitride materials. Andreas Züttel (Fribourg, Switzerland) impressed us with his presentation of hydrogen-storage materials - including their potential and various limitations. David Porter (QunietQ UK) gave a great talk on spider silk, and Chris Murray's talk (Penn State, USA) on nanoparticles and self-assembly into different types of nanomaterials was quoted as "simply stunning". A. Laromaine (Imperial College) covered the use of gold nanoparticles for early cancer detection, and A. Calmark (Sweden) developed the topic of functionalised cellulose as a biobased substrate for specific hydrophobic activity. In the various "polymer", bio-ceramic and bio-nanotechnology sessions, Klaus Müllen (MPI for Polymer Research, Germany) gave an inspiring talk on molecular electronics, along with Saif Haque (Imperial) who talked about electron transfer in nanostructured molecular solar cells. Ian Hamley (Reading) gave a good presentation on amyloid fibrils. Ulrich Wesner's talk on nanoparticle assemblies was considered as "simply great" by one of my students. Tom Russell (Univ. Massachussetts, USA) led the conference chair (P.F. McMillan) in a live "dance" designed to illustrate the binding and formation of block co-polymer structures. Hiroshi Matsui (City University of New York) described a biotechnology approach to developing antibodies for virus assays. Stephen Mann (Bristol) impressed with his exposition of functional organic-bio-derived objects and their templating, and M. Schoichet (Toronto, Canada) with her excellent talk on hydrogels for tissue engineering. B. Saunders (Manchester, UK) gave an inspiring presentation on designing injectable dispersions to repair degenerated tissue as microgels between spinal rings.

The poster sessions had their special stars. The Royal Society of Chemistry journals division had designated three poster prizes, including two one-year subscriptions to Journal of Materials Chemistry, and one to Soft Matter. Members of the journal

editorial board and the MC-8 committee selected approximately twenty of the nearly 200 poster presentations as especially visually appealing and scientifically relevant. Of these, the poster prizes for "Materials Chemistry" went to N. Bastus (Barcelona) and A. Thomas (Golm, Germany), and the "Soft Matter" award to S. King (Imperial College, London).

Now we look forward to MC-9 that is being held in two years' time (during July 2009) as an embedded conference within the IUPAC meeting in Glasgow (Scotland). We are sure that it will be as well attended and successful as this and previous conferences in the RSC-MC series.