polymer LINKS

News from the UK's # 1 academic/industrial polymer research network

Issue 13 September 2009

MARIE CURIE INITIAL TRAINING NETWORK GETS UNDERWAY

Peter Olmsted and Daniel Read at Leeds are leading a new Marie Curie Initial Training Network, Dynamics of Architecturally Complex Polymers (DYNACOP). The carefully selected 12 participating research groups from across Europe will combine their expertise, working around a limited number of model systems; exchanging samples, and applying the techniques and/ or theoretical approaches developed in the different laboratories.

The scientific objective of DYNACOP is to obtain a fundamental understanding of the flow behaviour and the dynamics of blends of topologically complex macromolecular fluids and their role in processing and properties of nano-structured blends. The project aims to capitalise on current opportunities offered by tailored molecular engineering of polymers at the industrial scale, and the proposed use of these materials in nano-structured composites for smart applications in devices, electronics and high-performance applications. The training objective is to provide young post-doctoral researchers with the necessary interdisciplinary knowledge and experience in the field of soft materials properties, which will allow them to address some of the many scientific and technological challenges in the field. This will be achieved through a collaborative research program and portfolio of training courses linking industry and academia.

p.d.olmsted@leeds.ac.uk d.j.read@leeds.ac.uk

PPE '09

27 - 28 OCTOBER 2009 UNIVERSITY OF BRADFORD

Where is polymer processing going? What are the key trends in technology in this vital international industry?

PPE 09 aims to:

- provide a timely forum for presentation & discussion of key developments in engineering excellence in polymer processing;
- cover leading edge developments in polymer processing technology, in-process measurements and process flow modelling, and control;
- provide a technical focus for the processing and technology industries.

For information go to www.brad.ac.uk/PPe

Or email events@brad.ac.uk

POLYMER IRC LOOKS TO THE FUTURE

Dr Randal Richards took over as Director of the Polymer IRC in November 2008. Randal previously worked as Chief Executive, Strategic Delivery for RCUK; Interim Chief Executive for EPSRC; and Director, Research and Innovation at EPSRC. Prior to this he was Head of the Chemistry Department at Durham University and an active member of the Polymer IRC during its first 11 years of operation, specialising in Polymer Physical Chemistry.

Randal's objectives for the IRC include encouraging inter university research collaborations and promoting the benefits of the IRC network model to Research Councils, Industry and Government bodies. This has included the formation of a new research group from early career stage academics, led by Dr Lian Hutchings (Durham). The group will look at opportunities for collaborative research and form teams of IRC academics with the necessary interdisciplinary expertise who will submit proposals to funding bodies. Membership of the IRC Board has been revitalised with Dr David Bott from the Technology Strategy Board taking the chair and new industrial and academic representatives.

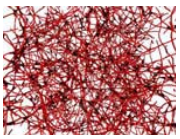
h.e.clancy@leeds.ac.uk

bringing UK polymer researchers together

RESEARCH NEWS

ACTIN DYNAMICS AND THE ELASTICITY OF CYTOSKELETAL NETWORKS

The cytoskeleton is an intricate network of biomacromolecules which pervade the cytoplasm of cells. The structural integrity of a cell depends upon its cytoskeleton, and for small deformations the elasticity of a cell depends on its actin network, a major constituent of the cytoskeleton. Actin networks are dynamic and consist of growing and shrinking filaments, and the cross-linking of these filaments into a dynamic network. The correlation between actin dynamics and cellular elasticity can indicate the presence of disease. For example, cancerous cells have been found to exhibit an increase in deformability commensurate with disease progression. Understanding the interplay between cytoskeletal structure and stiffness, therefore, is important for both the diagnosis and treatment of this disease. Gavin Buxton, Nigel Clarke and Patrick Hussey at Durham University have recently developed a model of actin dynamics which generates network structures and simulates their network elasticity. This enables us to directly relate the elastic properties of an actin network to the actin dynamics responsible for the formation of this network.



Snapshot of the cytoskeleton network, with filaments shown in red and crosslinking proteins in black.

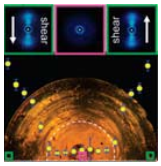
Faculty of Science, Robert Morris University, Pittsburgh, buxton@rmu.edu. eXPRESS Polymer Letters, September 2009
nigel.clarke@durham.ac.uk

FLOW-INDUCED CRYSTALLIZATION IN POLYMER MELTS

The Microscale Polymer Processing Project has made considerable progress in understanding the effects of flow on crystallization of polymers. Until the development of powerful theories of molecular rheology, fast time-resolved X-ray techniques, and new flow cells able to probe model flow geometries, it has been difficult to obtain clear quantitative conclusions that can help with prediction and process control.

Combined teams from Leeds, Sheffield, and Cambridge have generated new results in the last year. The Sheffield team have shown that a parameter with dimensions of energy density, which is proportional to the mechanical work applied to a melt, controls the crossover between oriented and unoriented growth. They have also uncovered an instability akin to elastic turbulence, which may be ubiquitous in many processing flows.

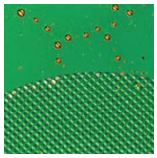
The Leeds team developed a multiscale simulation technique that combines state-of-the-art molecular theory devised at Leeds with a kinetic Monte Carlo algorithm that is tractable even at low undercooling. These simulations predict both enhanced nucleation and the growth of shish-like elongated nuclei for sufficiently fast flows, and justify a previous empirical result for the fow-enhanced nucleation rate.



The Cambridge team has studied crystallization in the multipass rheometer flow cell, and showed by accompanying numerical calculations developed by the Leeds team how the critical "work" criterion outline by the Sheffield team can help understand the emerging morphology even in complex flows.
p.d.olmsted@leeds.ac.uk

NON-STICK APPROACH TO REGULAR POLYMER VESICLES

Sheffield researchers led by Jon Howse have devised a new method for making polymer vesicles – microscopic, liquid-filled spheres enclosed by a membrane – that keeps tight control over the vesicles' size. Polymer vesicles have a wide range of potential applications, from drug delivery to 'micro-reactors', but controlling their size has proved a problem.

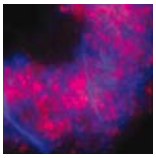


Recent work has shown that it is possible to create a pattern of tiny 'islands' upon which the polymer building blocks of the vesicles spontaneously assemble and bud off as spheres whose diameter is governed by the size of the island. The team hit upon the idea of forcing the polymers to assemble on a surface with a pre-determined area. Because the surface can accommodate only a given quantity of polymer, the resulting vesicles would be of uniform size.
'We took a silicon surface and coated it with a layer of gold,' explains Howse. 'We then coated that layer with fluorocarbon, which repels both hydrophobic and hydrophilic molecules – effectively a non-stick surface.'
A grid of 'sticky' islands were then created in a non-stick sea. The polymer was deposited onto the surface using a technique called spin coating. As it came into contact with the non-stick channels it 'dewetted', and retreated, confining itself only to the islands.

j.r.howse@sheffield.ac.uk

SMART POLYMERS CLEANING UP WOUNDS

A multidisciplinary team from Sheffield including chemists, microbiologists and tissue engineers, has shown how state of the art polymer chemistry can be used to produce materials that can bind bacteria, sense their presence by luminescence and help remove them from wounds.
This new technology, based on work by Ian Douglas, Sheila MacNeil, Steve Rimmer and Linda Swanson at Sheffield has just been described in the Royal Society of Chemistry's *Chemistry World* magazine in an article on skin therapies. By coupling an antibiotic to smart, luminescent polymers, the team have been able selectively to detect bacteria in open wounds by the induction of a colour change in the polymer.



s.rimmer@sheffield.ac.uk

YORKSHIRE CONCEPT AWARD FOR BATTERY TECHNOLOGY

Professor Ian Ward has received an award from the Yorkshire Concept Proof of Commercial Concept Fund for the application of a novel solid polymer-based electrolyte for lithium ion batteries. Significant commercial relevance stems from the use of the polymer gel electrolyte including safety where the gel is more stable than liquid electrolyte conventionally used and the availability of a continuous extrusion lamination process. A wide range of potential applications is envisaged for the tough transparent polymer gels with a first target being smart cards where there is an excellent fit to existing technology and several industrial collaborations have been established.

i.m.ward@leeds.ac.uk

Funding Call

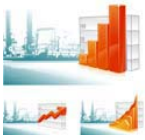
Autumn 2009

The METRC Proof of Concept Call opened on September 1 2009 and will close on October 16 2009. Projects between METRC's academic members and industry partners will be funded.

Up to £50,000 funding available per project.

For more information visit http://www.molecularengineering.co.uk

Mini KTP Announced



Knowledge Transfer Partnerships (KTP) is a UK-wide programme enabling organisations to improve their competitiveness, productivity and performance by engagement with universities, FE colleges and research and technology organisations.
KTP announces the addition of the Mini KTP to its portfolio of funding options. This shorter format will support projects of 10-40 weeks fte duration.
Shorter KTP projects act as a stepping-stone for those organisations that have not worked with a knowledge base before to realise the benefits that can be achieved through knowledge transfer and collaborative partnerships. KTP is also part-funded by the Government so is a cost effective method of:

- Accessing highly qualified people to spearhead new projects
- Accessing experts who can help take your organisation forward
- Developing innovative solutions to help your organisation grow

Visit KTP Online for more information on the scheme. www.ktponline.org or contact Joe Gaunt at Sheffield Polymer Centre.

j.gaunt@sheffield.ac.uk

Become Part of the IRC Network

A major aim of the IRC is to build strong relationships with the industrial community. Industrial Network Members can:

- access the research, technical development, knowledge transfer and enterprise activities of internationally recognized experts through a single gateway;
- Network with other researchers to gain understanding across disciplines to develop new thinking and approaches;
- plug into technical and scientific developments at an early stage;
- convert networking opportunity into technical innovation;
- gain interdisciplinary understanding and develop new thinking and approaches;
- Take advantage of opportunities to identify potential industry recruits from networking with academic researchers.

Membership offers immediate access to one of the largest networks of polymer expertise in Europe.
3 Levels of Membership according to your company's needs, from £999 + VAT.

To discuss membership options contact Helen Clancy: h.e.clancy @ leeds.ac.uk or go to http://www.polymerirc.org/pages/TheIndustrialClub

Polymer Science & Technology Modular Course

The ever popular annual 10 Day Modular Course will be held from the 26th October to the 6th November 2009 at the Novotel Sheffield.

The course is designed for personnel with a need to know more about polymer science and technology and should appeal to those with some back ground in the sciences who wish to broaden their horizons. The subjects covered are:

Basic Polymer Science 1
Basic Polymer Science 2
Polymer Chemistry
Polymer Engineering
Polymer Physics
Macromolecular Rheology
Multiphase Polymer Materials & Composites
Organic Electronics
Polymeric Biomaterials
Introduction to Polymer Nanotechnology
Polymer Dynamics &

Modules may be booked individually or as a block and are approved by IOM3 for professional development.

Details and how to register can be found at:
http://www.polymerirc.org /pages/CoursesDescriptions
or contact Shelagh Cowley : s.h.cowley@sheffield.ac.uk

Calling all Polymer Materials Scientists!

If you would be interested in joining, or even helping to run a new sub-group of IOM3 dedicated to polymer materials science, we want to hear from you.

We are currently proposing to launch this group with an inaugural meeting in September 2010. Whilst the role of the group is not yet set in stone, we aim to provide a forum for any scientists and engineers with an interest in polymer materials, blends, composites and nanocomposites.

For further information, please contact:
Richard Thompson (North East Polymer Association secretary)
email: r.l.thompson@dur.ac.uk

NEW FACES

SUZANNE FIELDING, DURHAM

suzanne.fielding@durham.ac.uk

Dr. Suzanne Fielding has recently joined the Department of Physics at the University of Durham. Suzanne's research interests lie in theoretical soft condensed matter physics, using statistical mechanics and dynamical systems theory to study non-equilibrium phenomena in complex fluids such as liquid crystals, polymers, emulsions, foams and surfactants.

Suzanne is currently developing interests at the interface of soft matter science with biology. The work forms several distinct yet related strands, with projects currently underway on: (i) shear banding and flow-induced transitions in complex fluids. Particularly exciting recent developments here have focused on oscillatory and chaotic dynamics of shear banded flows, widely seen experimentally. (ii) swimmers and biologically active suspensions, in particular in their tendency to exhibit hydrodynamic instabilities that can often resemble the shear banded flows just described. (iii) the kinetics of fluid-fluid demixing, and the effect of an applied flow field on this process. (iv) the transition to viscoelastic turbulence and (v) glassy ageing dynamics of disordered soft materials.

Suzanne has also been appointed a Visiting Fellow in the Polymers and Complex Fluids Group, School of Physics and Astronomy at Leeds.

JOHAN MATTSSON, LEEDS

Johan Mattsson, currently Associate Professor in the Department of Applied Physics at Chalmers University of Technology, Sweden will join the Polymers and Complex Fluids Research Group in the School of Physics and Astronomy at the University of Leeds in December 2009, as Lecturer in Experimental Soft Matter Physics.

His research focuses on the physics of disordered matter with an emphasis on soft condensed materials. He is interested in understanding how different control parameters such as temperature, pressure and shear affect the formation and properties of non-equilibrium states, such as glasses or gels.

Johan studies materials characterized by a wide range of time and length scales including simple liquids, macromolecular systems, polymers and colloids. He is interested in reaching a better understanding of the role played by hydrogen bonding in determining the properties of materials ranging from liquids to complex biological systems. Johan has a longstanding interest in how confinement affects the dynamics of polymers and other glass-forming materials. To address these questions, he uses a wide range of experimental techniques, including: Light/X-ray/neutron scattering, dielectric spectroscopy, calorimetry, microscopy techniques and rheology.

RHEOLOGY AWARDS

Tom McLeish

Peter Olmsted

Tom McLeish, former Director of the IRC, now PVC Research at the University of Durham, has been awarded the British Society of Rheology's (BSR) Gold Medal. This is the Society's premier award, given to individuals who have made an outstanding fundamental contribution to rheology. Only 16 awards have been made since the introduction of the medal in 1966.

Peter Olmsted, IRC Associate Director at Leeds, was awarded the 2008 Annual Award by the BSR at the Winter meeting in Leeds for his research into Theoretical Soft Condensed Matter Physics.

CHEMICAL CONUNDRUM

Solve the anagram below to find a polymer related word.

S	O	M	E	I	R	O	N

Send your answer to h.e.clancy@leeds.ac.uk to receive a mystery prize!

[Last time: SEPTICMOO = COMPOSITES]

PROFESSOR IN PRINT

Elsevier's Polymer journal recently celebrated 50 years of publication. The IRC's first director, Professor Ian Ward, featured in second place in the magazine's top 50 authors listings for both the most prolific author and all time most cited categories!

Ian Ward FRS

Keep up the good work Ian!

To look at the rest of the ratings go to www.polymer50.com/top-authors

For further enquiries or feedback on our Newsletter, please contact:

Helen Clancy, Polymer IRC Manager:
h.e.clancy@leeds.ac.uk