David Nisbet: fresh approach to nerve regeneration

Neural track regeneration, especially in the brain, is the subject of extensive medical research in a race to treat neuro-degenerative diseases such as Parkinson's disease or trauma.

A PhD research project being conducted by CRC-P postgraduate student, David Nisbet, takes a fresh approach to nerve regeneration by examining novel materials as scaffolds that enhance neural track regeneration. David is investigating two candidate scaffolds for this purpose: thermally sensitive hydrogels and electrospun nano-fibres.

To improve his novel hydrogel system, David recently commenced a placement at the University of Toronto to work with one of the leading experts in neural tissue engineering, Prof. Molly Shoichet.

"I'll be working with Prof. Shoichet for seven months and in that time, I would like to achieve better neuron survival on the scaffold, and to be able to direct the differentiation of neurons," David said.

David also recently presented a poster of his work on electro-spun fibres at the Gordon Conference at Connecticut College, New London, which is near New York.

David has been associated with the CRC-P since his second year of undergraduate studies, having won a CRC-P undergraduate scholarship, and has worked through these years under the supervision of Dr John Forsythe in the Materials Engineering Department of Monash University.

For his PhD research, David was granted an Australian Postgraduate Award, and was awarded a top-up scholarship by the CRC-P. He is doing his PhD at Monash University, and his supervisors are Dr John Forsythe (Monash University), and Prof. Mal Horne (University of Melbourne – Howard Florey Institute) and Associate Prof. David Finklestein (Mental Health Research Institute).

Funding support for postgraduate students

The CRC-P is providing funding support for 40 high-calibre PhD students over the seven years of its new funding from the Commonwealth CRC Programme.

Half of the support is through full scholarships, and the other half through top-up scholarships to candidates who already have other scholarships.

If you wish to apply for a PhD scholarship with the CRC-P, you can obtain more details from our website www.crcp.com.au, in the Education section. Or alternatively email: beck@crcp.com.au

Research in the new CRC-P targets advanced polymeric materials *continued from page 1*

The Centre's four research programmes are:

- Biomedical polymers
- Advanced polymeric materials
- Polymers for sustainable development
- Polymer design and engineering.

The new CRC brings together ten innovative companies committed to commercialising the outcomes of the CRC's research. The companies continuing from the previous CRC are Ciba Specialty Chemicals (a global supplier of polymer additives), Moldflow (an Australian-grown company that provides software for injection moulding) and Carl Zeiss Vision (a global producer of spectacle lenses).

The global pharmaceutical company, Pfizer, and the large diversified mining firm, BHP Billiton, have joined the new CRC. There are five SMEs among the new user-participants: Plantic (a producer of biodegradable starch-based packaging materials), Integrated Packaging (a specialty film producer), FCubed (an early stage company developing innovative engineered structures based on polymer films) and two spin off companies from the previous CRC, Advanced Polymerik and Ceram Polymerik.

In addition, the Australian Stem Cell Centre is also a participant and is involved in a CRC-P project targeting the creation of a spin-off company to produce polymer-based materials for biomanufacturing.

The research provider network of the new CRC is comprehensive and includes some organisations from the previous CRC: ANSTO, CSIRO (Molecular and Health Technologies, and Manufacturing and Infrastructure Technology), Monash University, RMIT University, the University of Sydney and the University of New South Wales. The network has been extended in New South Wales with the inclusion of the University of Wollongong, and in Victoria, by the inclusion of the University of Melbourne and Swinburne University of Technology.

For the first time, the CRC for Polymers will have research nodes in Queensland, at the University of Queensland and Queensland University of Technology (QUT), and in South Australia, at the University of South Australia.

The other participants in the Centre are the Birchip Cropping Group and the State of Victoria.

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Cooperative Research Centre for POLYMERS

polymernews

News from the CRC for Polymers

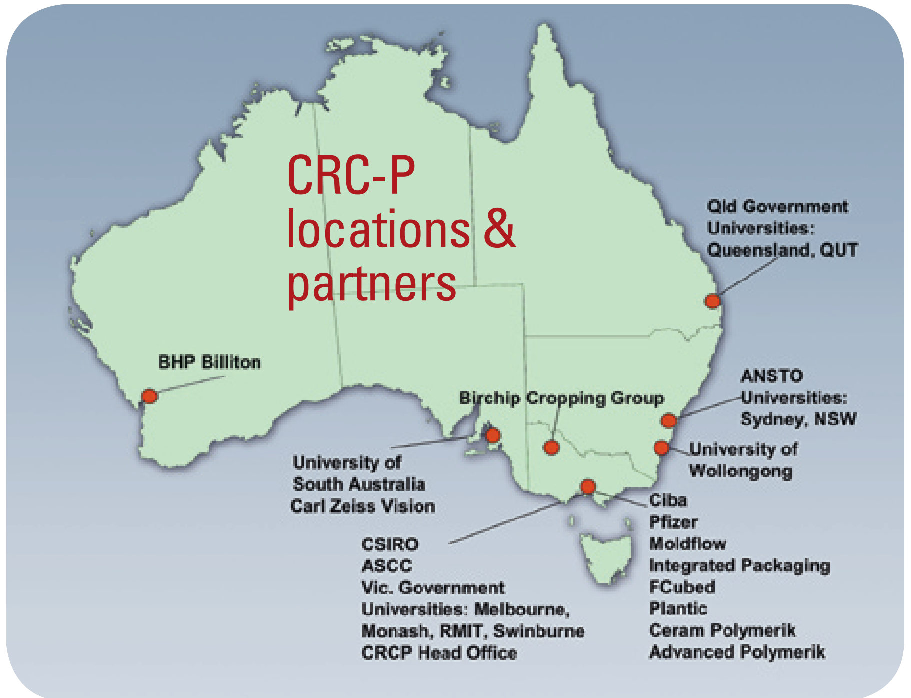
August 2006

Welcome

"The new Centre is focused on developing 'functional' advanced polymer materials for emerging high-growth opportunities and new applications."

CRC AUSTRALIA

Established and supported under the Australian Government's Cooperative Research Centres Programme



in this issue

Research in the new CRC-P targets advanced polymeric materials

Research on 13 projects has progressed in earnest since the new CRC for Polymers (CRC-P) began operations in 2005. The new CRC is investing more than $100 million in these projects during a seven-year period, with research activities being conducted in New South Wales, Queensland, South Australia, Victoria and Western Australia. $32 million of this funding is coming directly from the Commonwealth's CRC Programme, with the rest coming from the Centre's participants.

The new Centre is focused on developing 'functional' advanced polymer materials for emerging high-growth opportunities and new applications. In contrast, the previous CRC for Polymers focused on improving 'commodity polymers' for existing applications.

Dr Ian Dagley, CEO of the CRC-P, said the new Centre was working with both large companies and small and medium enterprises (SMEs) to develop specialised materials for agriculture, biomedical engineering, mining, energy, and more broadly, for manufacturing applications.

"We have an exceptional suite of research projects which will, collectively, deliver substantial economic benefits to Australia," he said. These benefits include increased employment from the creation of spin-off SMEs; significant export and licensing income from the Centre's global exploitation of technologies; and competitive advantages by providing the new polymer materials required for sustainability and high technology developments.

continued on page 4

Planted at the same time, the maize plants covered by plastic film (right) tower above the others (left)

Plastic film accelerates growth of young plants

Crops could grow faster and produce higher yields when covered by a thin plastic sheet that creates a temporary greenhouse environment, providing extra warmth and trapping moisture during the periods of germination and early plant growth.

The technology relies on the plastic film being degraded by sunlight so that plants can penetrate the weakening film at a critical time in their growing cycle without mechanical damage, and before they suffer heat stress. CRC-P scientists are developing the technology required to control and adjust the rate of degradation of the film to suit the growing pattern of particular crops.

Films are already commercially used in Ireland and Scandinavia on maize crops, but a team of researchers from the CRC-P and Integrated Packaging Pty Ltd aims to improve the technology and tailor it to Australian broadacre crops such as wheat, barley and to other crops that will benefit most from the technology, including cotton.

Dr Bronwyn Laycock, a CRC-P Deputy Program Leader based at the Queensland University of Technology (QUT), says the team was looking at improving the system by controlling degradation through the use of novel additives.

"We are also trying to determine the critical point in the plant's growing cycle when they need to be able to break through the film, so that we can develop a film that will weaken at the right time for a given crop," she adds.

The research team is also investigating how to improve degradation under the ground. Bronwyn says that at the moment, films only degrade rapidly in the sunlight and the films' edges, which are buried, disintegrate much more slowly.

Bronwyn was brought into the project early this year partly for her experience in providing a bridge between polymer scientists and agricultural experts, and for her experience in synthetic polymer chemistry. She obtained her PhD in Chemistry (organo-metallic synthesis) from the University of Queensland, after which she worked in Tasmania as a pulp and paper bleaching chemist. She later joined CSIRO in Melbourne to work as a synthetic polymer chemist on contact lens research, after which she spent time as a consultant while bringing up a family.

The team has so far made over 25 films with different properties, some of which are new experimental materials and some were blown so as to understand the properties of existing materials.

Dr Jamie Warner, also from QUT, is responsible for synthesising different types of novel additives that will promote polymer degradation, and incorporating them into polymers to produce films with different properties.

Dr Bronwyn Laycock

Dr Jamie Warner

Dr Ranjith Jayasekara

A physicist by training, Jamie did his PhD at the University of Queensland (UQ) Centre for Quantum Computer Technology. His PhD research involved synthesising semi-conductor materials for quantum computing applications.

Jamie subsequently did a post-doctoral degree at the McDiarmid Institute for Advanced Materials and Nanotechnology, Victoria University of Wellington in New Zealand. For 18 months he synthesised new compounds for all sorts of applications. He joined this project in March 2006.

Another member of the research team is Dr Ranjith Jayasekara from Swinburne University of Technology, who is responsible for eco-toxicology, testing and assessing the environmental impact of the degraded films.

"We are evaluating potential toxicity at three stages in the application. The first is the direct effect of the film itself, which is in contact with the soil and the plant. There is also the intermediate effect. During degradation, other intermediate molecules are formed and we are assessing the impact of these molecules. And finally, we're looking at the impact of the metabolites resulting from extensive degradation of the film," Ranjith explained.

The Swinburne node of the research is also modelling field trials in the laboratory. The research team has been running field trials around Australia, but Ranjith is doing simulations of what happens in the field so films could be tested more often and relatively quickly. "Otherwise, we can only test one crop a year in the actual field," he said.

Ranjith joined the CRC-P in early 2006, equipped with a PhD research in polymer biodegradation, as well as his long experience in biodegradation research at the former CRC for Food and Packaging.

As well as QUT, Swinburne and Integrated Packaging, other participants in the CRC-P's research project on degradable polymers for agricultural applications are: University of Queensland; Australian Nuclear Science and Technology Organisation; and the Birchip Cropping Group which is based in Victoria.

Ceram Polymerik announces its first export order

Ceram Polymerik, a participant in the new CRC for Polymers, has recently obtained its first export order. The product, developed through research conducted between Ceram Polymerik, CSIRO, Monash University and RMIT University within the new CRC for Polymers, is a novel ceramifying material that will be used in the manufacture of door edge protectors for fire doors by Lorient Polyproducts Limited. Lorient is a UK-based world leader in sealing systems for door assemblies for fire protection and smoke control. The announcement was made on 26 July 2006 by Andre Haermeyer, Minister for Manufacturing and Export in the Victorian Government, and received coverage on a television news service that evening.

Plastics and other polymers typically ignite and collapse when exposed to a fire because they decompose. Ceramifying polymers are materials designed to convert from a polymer to a ceramic without changing their shape. This makes it possible to make polymer-based fire protection products that will form effective fire barriers.

The ceramifying polymer technology was originally developed in the previous CRC for Polymers in a collaborative project involving Olex Australia, Monash University, the University of New South Wales, CSIRO and DSTO, and is used in Olex's Pyrolex® Ceramifiable® fire performance range of cables. This range of cables was launched in July 2003, and these cables have been used in many infrastructure projects including the redevelopment of the MCG, the Austin Hospital and Melbourne Central.

Ceram Polymerik, a spin-off company from the previous CRC for Polymers, was created to commercialise this exciting ceramifying polymer technology in non cable applications. The technology has the potential to address the needs of a $3 billion segment of the global market for passive fire protection products. In buildings it can be used in products designed to seal doors and windows, gaps between concrete panels, and gaps around ducting and building penetrations. By better containing a fire within a compartment of a building, ceramifying polymers will help reduce the spread of fires within a building and provide the occupants with more time to escape the building. Since ceramifying polymers will help better contain the fire, the resulting damage to the building inflicted before the fire is extinguished will be reduced. The CRC for Polymers anticipates further exciting products and Australian exports will result from its ongoing research activities with Ceram Polymerik.

Pictured left to right: Ian Dagley, (CEO) CRC for Polymers; Jim Hall, (Director) Ceram Polymerik; Vicki Tutungi (Division Chief) CSIRO MIT; Tony Tapper (GM) Lorient, Minister Andre Haermeyer; Peter Brooksbank (Chairman) Ceram Polymerik; Peter Kay (Executive Director) Ceram Polymerik.