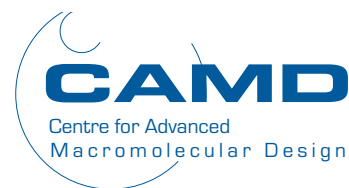


CAMD NEWS

News from the Centre for Advanced Macromolecular Design



The seventh year of the Centre for Advanced Macromolecular Design's operation has seen many highlights.

In February 2007, Prof. Christopher Barner-Kowollik and Dr. Leonie Barner organized the **29th Australasian Polymer Symposium (29APS)**, which saw more than 270 delegates from all over the globe come to the beautiful city of Hobart in Tasmania for a 4 day feast of fundamental and applied polymer science. The conference – run in three parallel sessions – featured a range of high profile plenary and invited speakers, but also allowed for students and post-doctoral researchers to present their studies. The **Australian Journal of Chemistry** dedicated a special **Polymer Edition** to the event [see *Aust. J. Chem.* 2007, 60, 697ff], which featured select papers given at the 29APS. CAMD was represented at 29APS with a contingent of 25 PhD students, post-docs and staff. 2007 also saw a substantial publication output from CAMD researchers in a wide field, ranging from several studies on high resolution mass spectrometry for the study of polymerization processes and γ -induced grafting published in *Macromolecules* to highlights in protein-polymer conjugation published in *JACS* and *Angewandte Chemie* as well as RAFT combined with *Click* Chemistry published in *Chemical Communications*. Overall, CAMD publications have been cited over 1000 times in 2007, with a total of 30 papers appearing in the same year.

The CAMD team has grown to a total of 55 active researchers, which are now housed on the 5th and 6th floor of the Chemical Sciences Building of the University of New South Wales. As the Centre has grown in size considerably, a synthetic laboratory was opened on the 6th floor, which will house 9 fume hoods suitable for 15 researchers after completion of the refurbishment. Contemporarily with the expansion to the 6th floor, CAMD led the process of installing a new state-of-the-art γ -source irradiation facility, which we manage on behalf of the entire university and extensively use for ambient temperature polymerization experiments.

In 2007, significant new grants were awarded to CAMD researchers. A high profile **Discovery Grant** from the **Australian Research Council (ARC)** was awarded to Dr. Leonie Barner from 2008 to 2010 to work in collaboration with Prof. Axel Müller and Dr. Holger Schmalz (both University of Bayreuth) on well-defined and

functionalized microspheres as devices for biomedical applications. Associate Prof. Martina Stenzel was awarded a 3 year **Industry Linkage Grant** (also from the ARC) to work on microspheres for liver cancer treatment together with the Sydney based company Sirtex. Prof. Christopher Barner-Kowollik entered into a collaborative research agreement with Bayer Materials Science, funding a post-doctoral researcher. 2007 also saw significant promotions to CAMD staff members. Dr. Leonie Barner was promoted to the rank of Senior Research Fellow and Dr. Martina Stenzel was promoted to Associate Professor. Prof. Christopher Barner-Kowollik became co-Director of CAMD. In addition, Prof. Barner-Kowollik received the **Cosmos Bright Sparks Award** recognizing the top 10 leading Australian scientists under the age of 40. Dr. Jinquan Liu was awarded a **Vice-Chancellors Post-doctoral Fellowship** to work on polymer-protein conjugation for the next three years at CAMD.

CAMD continues to be very active in international collaborations: CAMD PhD student Raymond Joso spent 3 months in the group of Prof. Axel Müller at the University of Bayreuth working on functional polymeric microspheres, and CAMD saw the visits of Bayreuth PhD students Anja Goldmann (RAFT and Click Chemistry) and Andreas Walther (amphiphilic triblock copolymers). Minna Carlberg came from the Royal Technical University in Stockholm (Prof. Eva Malmström) to carry out her master's thesis at CAMD working on dendronized RAFT agents. In addition, Andreas Holzmeister from Marburg University from the group of Joachim Wendorff stayed for 3 months working on polymer nanoobjects functionalized by polymer brushes.

2008 will see the continuation and growth of our strong research output, but further personnel increase is not envisaged at this stage. In early 2008, the **Handbook of RAFT Polymerization** (edited by Prof. Christopher Barner-Kowollik, Wiley-VCH) will be published, featuring a complete overview of the reversible addition fragmentation chain transfer (RAFT) polymerization in 13 chapters written by leading RAFT experts from around the globe, including current and past CAMD researchers.





Hien Duong

Hien Duong completed her Bachelor in Chemistry at Hanoi University, Vietnam in 1998. After graduating, she worked in PetroVietnam, the leading oil and gas company in Vietnam for 3 years in the field of reservoir fluid sample analysis. In March 2005, she completed her Master by Research in Chemical Engineering at the University of New South Wales sponsored by an AUSAID scholarship with a project on 'Polyurethane Foams for Oil Spill Applications'. She then decided to start her PhD studies at CAMD funded by an Endeavour Postgraduate Award in March 2007. Her research is focused on nanoparticles synthesized via the RAFT process for a new therapeutic strategy for ageing in the liver.

Francesca Ercole

Francesca Ercole completed an Honours Degree in (Organic) Chemistry in 1995 at Monash University in Melbourne. She then worked for one and half years at CSIRO (then Chemicals and Polymers Division) as a research project officer as part of a DuPont project which developed engineered resins and processes used to control polymerisation such as RAFT and NMP. In 1997, she entered the private sector to work as a Polymer Development Scientist at Mimotopes (Australia). During her time there she contributed to the development and production of polymer related products used in solid-phase applications using gamma-irradiation grafting and chemistries in order to produce novel functional surfaces. In 2004, she also worked in the same company carrying out the synthesis of custom peptides and peptide libraries. In 2005, she returned to CSIRO (Molecular and Health Technologies) and worked in a project called 'Crop Bio-factories Initiative' aimed at synthesising functional monomers and polymers related to vegetable oils. In August 2007, she started her PhD studies with CAMD situated at CSIRO and continues her research into Photochromic Polymers. Her proposed research is to carry out an investigation into the behaviour of photochromic conjugates, the factors that influence their performance and the influence of their components on each other and with their environment.

Wenfang Gu

Wenfang completed his Bachelor in Polymer Science and Engineering at Zhejiang University/China in 2005 with an undergraduate project on 'Synthesis of Polymerizable Surfactants and Preparation of Microporous Materials'. After working in Ningbo LG Yongxing Chemical Co., LTD for one year in the field of thermoplastic resins as a chemical engineer, he started his Master by Research study at CAMD in April 2007. He focuses on the synthesis of micro-particles for drug delivery using suspension polymerization.

Till Gründling

Till Gründling started his PhD at CAMD in February 2007. His research is focused on developing advanced methods in liquid chromatography-mass spectrometry for polymer characterization. Later he will employ these techniques amongst others to study the mechanisms and kinetics of (living) free radical polymerization. Till completed his Masters in Chemistry at the Philipps-Universität Marburg, Germany in January 2007.

Jatin Kumar

Jatin Kumar completed his Bachelor of Engineering with Honours in Chemical Engineering at the University of New South Wales in 2006, with an honours project titled 'The Effects of Plate Membrane Configuration on The Mixing Efficiency of Membrane BioReactors'. In March 2007, he started his PhD studies at CAMD in conjunction with the Australian Institute of Biotechnology and Nanotechnology (AIBN) at the University of Queensland as a recipient of a CRC for Polymers scholarship. His research focuses on the fundamental relationship between polymer composition, size and architecture to polymer rheology and thermodynamic properties. Synthesis of polymers with complex architectures are carried out at CAMD while assessment of polymer rheology and thermodynamic properties will be carried out at AIBN.

Sandy Koo

Sandy Koo completed her Bachelor of Engineering (Industrial Chemistry) with honours in 2006. In her honours thesis she studied the radical behaviour of various photoinitiators via pulsed laser polymerization. She is now a PhD student working on the kinetics of acrylate free radical polymerization, with an interest in photoinitiators for free radical polymerization; combined with the techniques of pulsed laser polymerization and electrospray ionization mass spectrometry for polymer characterization.

Leena Nebhani

Leena Nebhani completed her Master of Technology in Polymer Science and Technology at the Indian Institute of Technology, Delhi, India. She completed her Masters final year project at the Technical University Dresden, Germany, under a DAAD fellowship. In September 2007, she started her PhD in CAMD. Her research is focused on the design of core-shell microspheres using different living polymerization techniques.

Visitors

Andreas Holzmeister

Andreas Holzmeister has graduated in chemistry at the University of Marburg, Germany in 2006 and now continues with his PhD research at the same university under the supervision of Prof. Joachim Wendorff. He spent three months at CAMD at the beginning of this year to work on 'Grafting of Polymers from Nanotubes' under the supervision of A/Prof. Martina Stenzel and Dr. Leonie Barner. This collaborative project between Prof. Wendorff and CAMD is supported by the DFG (Deutsche Forschungsgemeinschaft) and the ARC (Australian Research Council).

Christopher Synatschke

Christopher Synatschke has studied chemistry at the University of Bayreuth, Germany for the last 3 years and is currently doing his Master thesis under the supervision of Prof. Christopher Barner-Kowollik at CAMD. Christopher is working on the 'Stability of Dithioketals in Block Copolymers', which are formed by the Hetero Diels-Alder reactions of RAFT polymers with diene functionalized polymers. His project runs for six months and is funded by a scholarship from the DAAD (Deutscher Akademischer Austauschdienst).

Andreas Walther

Andreas Walther is a PhD student in Prof. Axel H. E. Müller's group, Makromolekulare Chemie II at the University of Bayreuth in Germany and was working at CAMD as a visiting research associate under the supervision of Prof. Christopher Barner-Kowollik. His PhD project focuses on the development of 'Higher Levels of Self-Assembly of Ionic Amphiphilic Copolymers' and 'Biofunctional Self-Organized Nanostructures'. At CAMD, he synthesised amphiphilic triblock copolymers using the RAFT technique. This collaborative project between Axel H. E. Müller's group (MC II) and CAMD is supported by the DFG (Deutsche Forschungsgemeinschaft) and the ARC (Australian Research Council).

Post docs



New Postdocs

Dr. Maribel Hernández Guerrero

After finishing her PhD at CAMD, Maribel Hernández Guerrero took up a post-doctoral position in CAMD in March of 2007. Her PhD project focused on the study of the mechanism of formation, characterization and post-treatment of honeycomb structured porous polymer films. The post-treatment of the films included surface modification to impart them with hydrophilic properties desirable for cell culturing. Her post-doctoral research, an Australian Research Council (ARC) Industry Linkage project in collaboration with Carl Zeiss Vision, involves polymer grafting with a focus oriented towards surface engineering.

Dr. Maude Le Hellaye

Dr. Maude Le Hellaye joined CAMD in January 2007. She obtained her PhD in 2006 from Bordeaux University in France, in Dr. Yves Gnanou's Laboratoire de Chimie des Polymères Organiques. Her PhD research focused on the synthesis of biocompatible, degradable and bioresorbable diblock amphiphilic polyester-*b*-poly(glutamic acid) architectures, and the study of their self-assembling properties. Maude worked for 8 months on the synthesis of functional polymers for tissue engineering and is now working on the functionalization of membranes for reverse osmosis.

Dr. Zhongfan Jia

Dr. Zhongfan Jia received his PhD in January 2007 in the group of Prof. Junlian Huang at Fudan University, Shanghai, China. His PhD work focused on the studies of the synthesis and properties of amphiphilic copolymers with special architectures such as comb-like, multi-block and cyclic-grafted. To approach this aim, he designed and synthesized PEO-supported TEMPO groups and trithiocarbonate-embedded macro-CTA (chain transfer agent). Through living radical polymerization, he obtained some novel-structured amphiphilic copolymers. Further applications about self-assembly, dye-extraction and fabrication of metal nanoparticles of these polymers were also investigated. His current research in CAMD is the synthesis of well-defined functional biocompatible copolymers and conjugation with oligonucleotide for LbL self-assembly (in collaboration with Prof. Frank Caruso at University of Melbourne), and also applications in polymer anticancer drug systems.

Dr. Sebastian Sinnwell

Dr. Sebastian Sinnwell studied chemistry at the University of Düsseldorf (Germany) and received his Masters in 2004. During his PhD at the group of Prof. Helmut Ritter (Düsseldorf, Germany), he investigated the influence of microwave irradiation on the ring-opening polymerization of lactones and cyclic imino ethers. In May 2007 he joined CAMD, his current investigations are focused on the generation of complex macromolecular architectures encompassing ring-diblocks, star blocks, ring-cycle-ring blocks as well as dumb-bell and palm tree shapes via the use of novel RAFT agents for living/controlled polymerization. Subsequently, the self-organising properties of these architectures will be investigated with the aim of employing these complex architectural self assemblies as drug delivery vectors.

Dr. David Valade

Dr. David Valade joined CAMD in June 2007. He obtained his PhD in January 2007 from the University of Montpellier II in France, under the direction of Dr. Bruno Ameduri. His PhD research focused on the synthesis of hydroxide-exchange fluorinated polymers for applications as electrode binders for solid alkaline fuel cells. Currently, David is working on the development of well-defined polymer-RNA conjugates as improved therapeutics.

Dr. Jiangtao Xu

Dr. Jiangtao Xu received his PhD in January 2007 from Fudan University, China and joined CAMD in May 2007. His PhD research focused on the preparation of novel well-defined amphiphilic side-chain copolymers via the RAFT process and the investigation of interesting solution behaviors of these copolymers such as self-assembly into thermo-sensitive aggregates. In addition, the kinetics and mechanism of RAFT polymerizations of methacrylate monomers were further extended, such as thermal decomposition and aminolysis of polymers prepared by the RAFT technique. Currently, Jiangtao is working on *in-situ* synthesis of polymer-glycopeptide conjugates for the application of drug delivery, gene delivery and nanotechnology.

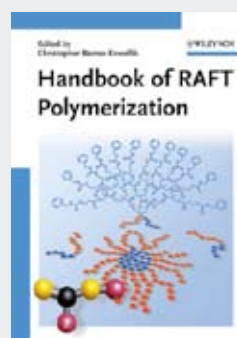
Grants

Dr. Leonie Barner and collaborators Prof. Axel H. E. Müller and Dr. Holger Schmalz from the University of Bayreuth (Germany) were granted an ARC Discovery Grant on 'Design of Polymeric Devices for Biotechnology Applications' over the next three years. The research project focuses on the development of functional polymer particles for diagnostic applications. Advanced polymer chemistry (e.g. RAFT and anionic polymerization techniques) will be used to synthesize devices for reliable and fast diagnostic systems. The outcome of this work will help promoting and maintaining good health in Australia by developing novel technologies and advanced materials based on polymer science. Dr. Leonie Barner also received an award from AINSE (Australian Institute of Nuclear Science & Engineering). She will work together with Dr. Suzanne Smith from ANSTO (Australian Nuclear Science and Technology Organisation) on 'Characterisation of Biosensors via Radiolabeling Technology'.

A/Prof. Martina Stenzel in collaboration with Dr. S. Jones from Sirtex Technology Pty. Ltd. received an ARC Industry Linkage Grant on 'Degradable Hollow Microspheres for Liver Cancer Treatment' over the next three years. The expected outcome of this multidisciplinary approach is a controlled drug delivery system for the treatment of liver cancer. We aim to increase the understanding of drug release using polymeric microspheres and the influence of the polymer properties on the release kinetics resulting in the tailored drug release for liver cancer treatment. An in-depth knowledge in drug delivery can lead to optimised release kinetics leading to an increased patient convenience and life prolonging treatments. An in-depth knowledge in drug delivery can lead to optimised release kinetics resulting in an increased patient convenience and life prolonging treatments.

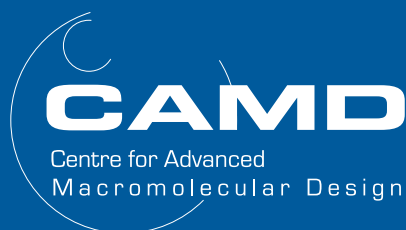
Handbook of RAFT polymerization

In early 2008, the Handbook of RAFT Polymerization (edited by Prof. Christopher Barner-Kowollik, Wiley-VCH) will be published, featuring a complete overview of the reversible addition fragmentation chain transfer (RAFT) polymerization in 13 chapters written by leading RAFT experts from around the globe. The Handbook is envisaged to be the one-stop source of comprehensive information on the RAFT technique ranging from fundamentals to applications in material science (see www.wiley-vch.de for more information).



Top Ten Most Cited Publications of CAMD

1. 'RAFTing down under: Tales of missing radicals, fancy architectures, and mysterious holes.' J. Polym. Sci., Part A: Polym Chem. 2003, 41, 365, 185 citations.
2. 'Modeling the reversible addition-fragmentation chain transfer process in cumyldithiobenzoate-mediated styrene homopolymerizations: Assessing rate coefficients for the addition-fragmentation equilibrium.' J. Polym. Sci., Part A: Polym Chem. 2001, 39, 1353,
3. 'Kinetic investigations of reversible addition fragmentation chain transfer polymerizations: Cumylphenyldithioacetate mediated homopolymerizations of styrene and methyl methacrylate.' Macromolecules 2001, 34, 7849, 160 citations.
4. 'Origin of inhibition effects in the reversible addition fragmentation chain transfer (RAFT) polymerization of methyl acrylate.' Macromolecules 2002, 35, 8300, 135 citations.
5. 'Kinetic analysis of reversible addition fragmentation chain transfer (RAFT) polymerizations: Conditions for inhibition, retardation, and optimum living polymerization.' Macromol. Theory Simul. 2002, 11, 823, 111 citations.
6. 'Long-lived intermediates in reversible addition-fragmentation chain transfer (RAFT) polymerization generated by gamma radiation.' Polym. Sci., Part A: Polym Chem. 2002, 40, 1058, 96 citations.
7. 'Star-polymer synthesis via radical reversible addition-fragmentation chain transfer polymerization.' Polym. Sci., Part A: Polym Chem. 2001, 39, 2777, 94 citations.
8. 'The reversible addition-fragmentation chain transfer process and the strength and limitations of modeling: Comment on "the magnitude of the fragmentation rate coefficient"' Polym. Sci., Part A: Polym Chem. 2003, 41, 2828, 84 citations.
9. 'Ambient temperature reversible addition-fragmentation chain transfer polymerisation.' Chem Commun. 2001, 1044, 82 citations.
10. 'Porous polymer films and honeycomb structures made by the self-organization of well-defined macromolecular structures created by living radical polymerization techniques.' Angew. Chem. 2001, 40, 3428, 72 citations.



Centre for Advanced Macromolecular Design,
School of Chemical Sciences and Engineering,
UNSW Sydney NSW 2052

Tel.: +61 2 9385 4964
Fax: +61 2 9385 6250
E-mail: camd@unsw.edu.au
Website: www.camd.unsw.edu.au
Newsletter coordinator: Dr Leonie Barner
Photos: Hugh Chaffey-Millar