CSIRO PUBLISHING

www.publish.csiro.au/journals/ajc

Aust. J. Chem. **2009**, *62*, 749–750

Vibrant Macromolecular Science at the 30th Australasian Polymer Symposium

Christopher Barner-Kowollik[A]

[A]Preparative Macromolecular Chemistry, Institut für Technische Chemie und Polymerchemie, Universität Karlsruhe (TH)/Karlsruhe Institute of Technology (KIT), Engesserstr. 18, 76128 Karlsruhe, Germany. Email: christopher.barner-kowollik@polymer.uni-karlsruhe.de

Polymer science is a dynamic field: It spans from mechanistic investigations and organic synthetic aspects to materials science applications as well as, increasingly in recent years, biology and medicine. A successful conference on polymer science must capture all these aspects via a diverse program composed of plenary, keynote, and contributed lectures. The 30th Australasian Polymer Symposium (30APS), held in Melbourne in December of last year, is an excellent example of a diverse and vibrant polymer conference. The convener, Professor George Simon from Monash University, assembled a program that reflected the vibrancy of contemporary polymer science. In addition to invited contributions from senior researchers, the APS has always been a place for young researchers at Ph.D. and post-doctoral level to present their work and receive recognition. It is particularly pleasing to note that the current special issue, which features contributions from the plenary and invited speakers, also contains two articles from the Treloar Prize winners. The Treloar Prize is awarded to the best presentations made at an APS by a scientist under the age of 30. Herein, we include contributions from the awardees of the two best oral presentations, Geoffrey Johnston-Hall and Dominik Konkolewicz. Commensurate with Australia's traditional strength in unravelling the mechanism and kinetics of polymerization methods, the current special issue contains two contributions dedicated to mechanistic issues. Konkolewicz[1] examines via modelling the effect of the preparation method on the position of the end groups on hyperbranched polymers, whereas Johnston-Hall and Monteiro[2] present new insights into chain-length dependent termination processes via the use of living free-radical polymerization methods. The development of effective methodologies to generate complex polymers with well defined properties is the topic of three contributions. Addressing the preparation of spherical glycopolymers via the reversible addition–fragmentation chain transfer (RAFT) process is the work by Zhang and Stenzel,[3] while two further contributions describe approaches to modify the end groups of RAFT made polymers. One is provided by the team of Davis and Bulmus,[4] who detail the end-group modification of thiocarbonyl thio groups via disulfide linkages, the other by the group of Barner-Kowollik,[5] who present a facile approach to convert well defined RAFT polymers into hydroxy terminated macromolecules. In two additional synthetically focussed articles – however not employing living radical polymerization – Hayes[6] and his team present a method to prepare thermally responsive supramolecular polymers, whereas Nagamura and Sota[7] prepare photoelectrochromic polymers and determine their photophysical properties. Finally, Bompart and Haupt[8] summarize – in the form of a highlight article – the current state of the art in molecularly imprinted polymers, while McNally and colleagues review the current state of the art for the preparation and characterization of polymer carbon nanotube composites.[9]

While the chemistry of polymerization processes is highly important to prepare macromolecules of a specific topology as well as functionality, the applied polymerization conditions and processes are equally important. In recent years the use of unconventional solvents, such as supercritical carbon dioxide or ionic liquids, for (radical) polymerizations has seen increasing interest and the current special issue is no exception. Thurecht and Howdle[10] examine in their highlight article the use of supercritical carbon dioxide as a solvent for living/controlled dispersion polymerization.

Professor Christopher Barner-Kowollik – Associate Editor of the Australian Journal of Chemistry *– studied chemistry at the Universities of Konstanz and Göttingen in Germany. He completed a Ph.D. in Physical Chemistry at the University of Göttingen, before joining the University of New South Wales in Sydney, Australia, where he led a research group as Full Professor at the Centre for Advanced Macromolecular Design until mid-2008. He is currently Full Professor and Chair of Preparative Macromolecular Chemistry at the Karlsruhe Institute of Technology (KIT), Germany. Professor Barner-Kowollik has published over 175 peer-reviewed research papers, over 140 conference papers/abstracts, and seven book chapters, and he is the editor of the 'Handbook of RAFT Polymerization' (Wiley-VCH, 2008). He currently serves (or has served) on the editorial boards of* Macromolecules, Polymer, Polymer Chemistry, Progress in Polymer Science, Macromolecular Theory and Simulations, *and* Macromolecular Rapid Communications. *His main research interests range from the synthesis of complex macromolecular architectures via living/controlled radical polymerization and their applications as well as material properties, the development of novel polymer conjugation and controlling protocols, polymer reaction kinetics and mechanism, to (quantitative) high-resolution mass spectrometry on polymer systems coupled with chromatographic techniques.*

10.1071/CH09129 0004-9425/09/080749

Polymers can have fascinating properties ranging from a stimuli responsive nature to the ability to self-organize in the liquid and solid state. Abetz[11] and co-workers demonstrate how triblock terpolymers can phase-separate into cylindrical domains. These authors show that, via casting onto a porous substrate, the casting conditions can be chosen so that a block copolymer morphology can be obtained where the cylindrical domains are aligned perpendicular to the porous substrate. While the above study employs microscopy techniques to investigate the behaviour of solid-state polymer systems, Spiess[12] and colleagues employ solid-state ^{1}H, ^{13}C, and ^{31}P NMR spectroscopy to investigate the molecular structure and dynamics of polymer blends. Phase separation phenomena were also investigated by Runt[13] and his team, who prepared phase-separated morphologies of polydimethylsiloxane-based polyurethanes and studied these via small-angle X-ray scattering techniques. It is fascinating to observe how the morphologies of these polymers are closely related to their oxidative biostability.

As noted above, it is pleasing to see how polymer science more and more bridges the gaps between various disciplines, most importantly those to the biological sciences. The present special issue contains three contributions highlighting this fact. Supramolecular bionanocomposites have been prepared by Dorgan[14] and colleagues via the grafting of polylactides to nanoparticle surfaces, to prepare a nanocomposite that is 97% made from materials derived from renewable resources. In a highly interesting contribution from the team around Bowman,[15] polymerization-based amplification combining bio-recognition events with polymerization reactions on surfaces is detailed, while Miletic and Loos[16] detail how lipases can be chemically modified with epoxides to improve their enzymatic activity and thermal stability.

Finally, it should be noted that the Australasian Polymer Symposium – as the annual gathering of the Australian polymer community – is the place where the Polymer Division of the Royal Australian Chemical Institute bestows awards on its members. The 30th APS was no exception. Most notably, Associate Professor Martina H. Stenzel, from the University of New South Wales, was the inaugural recipient of the Sangster Polymer Science and Technology Achievement Award, which was formally established at the 29th APS in Hobart based on the existing Polymer Science and Technology Achievement Award. Associate Professor Stenzel was recognized for her outstanding achievements in the field of employing RAFT chemistry for the construction of drug delivery vehicles as well as the generation of complex macromolecular architectures via the same process. In addition, a Polymer Division Citation was awarded to Professor Geoff Spinks from Wollongong University as well as to Professor Christopher Barner-Kowollik from the Karlsruhe Institute of Technology.

I hope that the current collation of contributions from the field of polymer science based on presentations given at the 30th Australasian Polymer Symposium is a valuable selection not only for the polymer scientist, but also for the wider chemistry community.

References

[1] D. Konkolewicz, *Aust. J. Chem.* **2009**, *62*, 823. doi:10.1071/CH09091
[2] G. Johnston-Hall, M. J. Monteiro, *Aust. J. Chem.* **2009**, *62*, 857. doi:10.1071/CH09089
[3] L. Zhang, M. H. Stenzel, *Aust. J. Chem.* **2009**, *62*, 813. doi:10.1071/CH09108
[4] C. Boyer, J. Liu, V. Bulmus, T. P. Davis, *Aust. J. Chem.* **2009**, *62*, 830. doi:10.1071/CH09062
[5] T. Gruendling, M. Dietrich, C. Barner-Kowollik, *Aust. J. Chem.* **2009**, *62*, 806. doi:10.1071/CH09080
[6] P. Woodward, A. T. Slark, W. Hayes, *Aust. J. Chem.* **2009**, *62*, 790. doi:10.1071/CH09088
[7] T. Nagamura, Y. Sota, *Aust. J. Chem.* **2009**, *62*, 871. doi:10.1071/CH09099
[8] M. Bompart, K. Haupt, *Aust. J. Chem.* **2009**, *62*, 751. doi:10.1071/CH09124
[9] C. McClory, S. J. Chin, T. McNally, *Aust. J. Chem.* **2009**, *62*, 762. doi:10.1071/CH09131
[10] K. J. Thurecht, S. M. Howdle, *Aust. J. Chem.* **2009**, *62*, 786. doi:10.1071/CH09081
[11] D. Fierro, A. Boschetti-de-Fierro, V. Abetz, *Aust. J. Chem.* **2009**, *62*, 885. doi:10.1071/CH09094
[12] Ü. Akbey, R. Graf, P. P. Chu, H. W. Spiess, *Aust. J. Chem.* **2009**, *62*, 848. doi:10.1071/CH09066
[13] T. Choi, J. Weksler, A. Padsalgikar, R. Hernández, J. Runt, *Aust. J. Chem.* **2009**, *62*, 794. doi:10.1071/CH09096
[14] M. J. Sobkowicz, J. R. Dorgan, K. W. Gneshin, A. M. Herring, J. T. McKinnon, *Aust. J. Chem.* **2009**, *62*, 865. doi:10.1071/CH09097
[15] L. M. Johnson, H. J. Avens, R. R. Hansen, H. L. Sewell, C. N. Bowman, *Aust. J. Chem.* **2009**, *62*, 877. doi:10.1071/CH09095
[16] N. Miletic, K. Loos, *Aust. J. Chem.* **2009**, *62*, 799. doi:10.1071/CH09033