SCIENCE CHINA
Chemistry

• EDITORIAL •
• SPECIAL TOPIC • Progress in Synthetic Polymer Chemistry

November 2015 Vol.58 No.11: 1631–1632
doi: 10.1007/s11426-015-5486-7

Preface

The past two decades have witnessed a rapid growth in the field of synthetic polymer chemistry, focusing on the fine control of molecular weights, molecular weight distributions, chain topologies, and sequence structures of synthetic polymers. For example, a variety of controlled radical polymerization techniques have been invented and become indispensable in the toolbox of current polymer chemists. The advent of high-efficiency coupling chemistry including copper(I)-catalyzed cycloaddition reaction further enriches the arsenal of controlled polymer synthesis. Aiming to achieve more intricate control towards synthetic polymers with complex microstructures, unique properties, and advanced functions, polymer chemists are still learning diligently from relevant diverse fields including organic chemistry, colloidal science, biochemistry, and chemical biology. By learning from nature, biomimetic chemistry and biomimetic polymer synthesis under mild conditions provide the most recent surge.

Encouraged by considerable contributions made in this field by Chinese polymer chemists, we feel very appropriate to organize a special topic on the most recent advances in synthetic polymer chemistry. This special topic encompasses 11 articles including 3 reviews, 4 mini-reviews, 3 research articles, and 1 communication. Three subfields are mainly involved in this special topic: (1) named reactions in polymer synthesis; (2) new methodologies for controlling chain topologies and sequences of synthetic polymers; (3) screening of new catalysts for polymerization and coupling reactions.

Concerning the integration of diverse named reactions with polymer synthesis, Xiaoyu Huang *et al.* reviewed recent developments of emerging synthetic techniques such as transition metal-catalyzed cross-coupling reactions, metal-free cross-coupling reactions, and multi-component reactions, and Aiguo Hu *et al.* summarized the current status of applying Bergman cyclization reaction to the fabrication of synthetic polymers and relevant potential applications in materials science.

The development of new methodologies for controlling chain topologies and sequences of synthetic polymers has attracted the attention of many polymer chemists. In this context, the contributions from Professors Xiulin Zhu and Zhenping Cheng *et al.* and Guowei Wang *et al.* elaborated the controlled polymerization of phosphorus-containing monomers and 1-ethoxylethyl glycidyl ether monomer, respectively, as well as their potential functions. The contribution from Chuanbing Tang *et al.* (a Chinese citizen working at University of South Carolina, USA) highlighted a new category of polymers with thiophene moieties in the side chains. Youliang Zhao *et al.* reported the synthesis of multifunctional miktoarm star polymers through the combination of ring-opening polymerization (ROP), reversible addition-fragmentation chain transfer (RAFT) polymerization, atom transfer radical polymerization (ATRP) techniques. In the context of polymers with controlled sequence structures, Junpo He *et al.* reviewed basic principles and strategies in the synthesis of sequence-controlled polymers, and Chunyan Hong *et al.* exemplified the preparation of sequence-defined polymers through the combination of Passerine three-component reaction and three-component amine-thiol-ene coupling reactions.

In the direction of screening of new catalysts for polymerization and coupling reactions, Benzhong Tang and Anjun Qin *et al.* demonstrated neat azide-alkyne click reactions that can be conducted in the presence of air-stable supported Cu(I) catalyst. Xuesi Chen and Xuan Pang *et al.* explored the polymerization of lactides using Schiff base-based aluminum catalysts. Changle Chen *et al.* reviewed recent advances of homopolymerization of ethylene and its copolymerization with other polar monomers by utilizing (α-diimine) palladium catalyst.

In summary, we would like to acknowledge gracious contributions from all the authors and constructive comments from our reviewers. We are grateful to Dr. Jianfen Zheng from the editorial office of *Sci. China Chem.* for her assistance in organizing this special topic. We hope that this special topic can provide an overview of the most recent advances made by Chinese polymer chemists, which will inspire further research and bring more creative methodologies into polymer chemistry.

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Prof. Shiyong Liu obtained his B.S. degree in 1993 and M.S. degree in 1996 from Wuhan University. After obtaining Ph.D. degree in 2000 at Fudan University under the supervision of Prof. Ming Jiang, he spent three and a half years at University of Sussex and University of Delaware as a postdoctoral fellow, working with Prof. Steven P. Armes (currently at University of Sheffield) and Prof. Eric W. Kaler (currently at University of Minnesota), respectively. Since 2004, he has been a professor of polymer science and engineering at the University of Science and Technology of China. His current research interests include the design and synthesis of functional polymeric materials, colloids, and stimuli-responsive polymeric assemblies with controlled properties for applications in imaging, sensing, diagnostics, and nanomedicine.

Prof. Zhiyuan Zhong received his Ph.D. degree in 2002 from the University of Twente (The Netherlands). He was appointed as an assistant professor in the University of Twente from 2002 to 2007 and as a full professor in Soochow University from 2007. In 2011–2012, he worked as a vice president of Suzhou BioBay (a top Biomedical Park in China). His research focuses on biomedical polymers and drug delivery. He has published over 140 papers with ca. 8000 times of citation (H-index: 49). He currently serves as an Associate Editor for *Biomacromolecules*, and an EAB Member for the *J. Controlled Release*, *J. Mater. Chem. B*, and *J. Biomater. Sci. Polym. Ed.* He has received several prestigious awards such as *Biomacromolecules*/*Macromolecules* Young Investigator Award and the Bessel Research Award (Humboldt Foundation).