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• EDITORIAL •
• SPECIAL TOPIC • Bio-based and Biodegradable Polymers

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Special Topic on Bio-based and Biodegradable Polymers

Yu-Zhong Wang[1*], Yun-Xuan Weng[2]

[1]*State Key Laboratory of Polymer Materials Engineering, National Engineering Laboratory of Eco-Friendly Polymeric Materials (Sichuan), College of Chemistry, Sichuan University, Chengdu 610064, China*
[2]*School of Materials and Mechanical Engineering, Beijing Technology and Business University, Beijing 100048, China*

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In the past decades, bio-based and biodegradable polymers have attracted wide and increasing interests because of the shortage of fossil resource, concerns on environmental pollution, demands for some medical fields as well as support of government policies. Depending on the sustainable source of organic carbon, biodegradability and biocompatibility, these polymers have shown promising applications in industry, agriculture, biomedicine and daily life. To impart excellent physical properties and functions to them, scientists and engineers have exploited versatile methods to tune their molecular structures, including monomer design, copolymerization and control of topological structure. In addition, remarkable progress has also been made in biosynthesis of biodegradable polymers and in new technologies for biomass processing. Notably, Chinese researchers have played a crucial role in pushing the development of bio-based and biodegradable polymers.

Recently, many achievements have been made in this rising field. To organize some representative works together, we have invited some Chinese scientists who come from leading research groups in the related field, to introduce their latest contributions in this special topic for *Science China Chemistry*. The topic includes 1 review article and 8 research articles. Zhu and his coworkers outlined the recent evolution with respect to the breakage of bottleneck of PLA, especially for enhancement of heat distortion temperature, toughening and reducing cost. Standing on the viewpoint of sustainable development of polyurethane industry, Wang and his coworkers described a pre-activation method to synthesize CO_2-polyols with controllable molecular weight as well as a low content of byproduct. Zhang and Wang's group reported the synthesis of bio-based elastomer, poly(diethyl itaconate-co-isoprene), by redox-initiated emulsion polymerization, the physical property of which was comparable to conventional synthetic elastomers. In Li, Pang, Chen, *et al.*'s work, copolymers of lactide and ε-caprolactone were synthesized using bimetallic Schiff aluminum complexes as catalysts. The resultant copolymers were confirmed as gradient polymers, whose glass transition temperature was regulated simply by changing the proportion of the two structural units. Chen and his coworkers employed a recombinant Escherichia coli with NAD kinase and phbCAB operon to increase the production of poly-3-hydroxybutyrate. As a combination of chemotherapy and gene therapy, Zhang and his coworkers developed a polymeric PEI-based prodrug to co-deliver gene and anticancer drug in response to the intracellular acid microenvironments of late endosome/lysosome compartments. Zhang and Cai's group described a sol-gel/self-assembly method to fabricate light weight and mechanically strong α-chitin aerogels. Aiming to establish new routes for preparing semicrystalline materials with a wide variety of physical properties and degradability, Lv and his coworkers presented in detail the stereoselective interaction in the mixture of enantiopure gradient polycarbonate and various isotactic polycarbonates with opposite configuration. To find new routes to process cellulose, Zhang's group revealed the effect of cation and anion structure of ionic liquids on the solubility of cellulose.

We wish the special topic is able to provide useful information to readers. With the successful publication of the special topic, we would like to thank the authors and the reviewers for their enthusiastic contributions. In the meantime, we appreciate the help from Dr. Jianfen Zheng from the editorial office of *Science China Chemistry*, in organizing and editing this special topic.

*Corresponding author (email: yzwang@scu.edu.cn)

Prof. Yu-Zhong Wang earned his Ph.D. degree at Sichuan University in 1994, where he was promoted to a full Professor in 1995. He is the Director of the National Engineering Laboratory for Eco-Friendly Polymeric Materials (Sichuan), which was founded by him. His research interests are focused on bio-based and biodegradable polymers, flame-retardant and functional polymeric materials. He has authored more than 430 publications in SCI journals and issued over 100 patents. He has been awarded eleven National and Provincial Science & Technology awards. He was selected as an Academician of Chinese Academy of Engineering in 2015.

Prof. Yun-Xuan Weng received his Ph.D. degree in Polymer Chemistry and Physics in 2010 from Sichuan University. He formulated and established Chinese national standards for methods of evaluation of biodegradability for biodegradable materials by monitoring their trace of life of organic carbon, and for various evaluation systems including aerobic composting, soil, aqueous medium, anaerobic aqueous medium and high-solid content condition. Moreover, he established the determination method of bio-based material content by using C14 isotope. He acts as the secretary-general of the Degradable Plastic Committee of CPPIA of China, and also as the secretary-general of the Technology Committee of Standardization of Bio-based and Degradable Materials.