Organocatalyzed ROP to Prepare Close-loop Recyclable Polyesters

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The development of chemically close-loop recyclable polymers represents one of most appealing solution to address white pollution challenge. Despite the recent advancements, it is highly desirable to prepare chemically recyclable polymers from commercially available monomers and avoid the costly and time-consuming synthesis of new monomers. Here, we firstly developed a highly efficient strategy to make high molecular weight poly(4-hydroxybutyrate) (P4HB) with comparable mechanical properties as bio-synthesized P4HB. We also realized the controlled synthesis of bis-hydroxyl functional P4HB prepolymers, which were applied to prepare recyclable polyurethane elastomers. We then studied the effects of substitutes on the ROP of six membered ring monomers, and successfully achieved the controlled ROP of bio-sourced δ-caprolactone (δCL) and functional α-Methylene-δ-valerolactone (MVL) using strong base/urea binary catalysts at room temperature. By using a combination of organobases and ureas, we have developed a facile strategy to realize ROP of low ring-strain five and six membered cyclic ester towards degradable and recyclable plastics and elastomers.

CV

Zhibo Li obtained his B.S. (1998) and Master (2001) degrees from the University of Science and Technology of China (USTC). In 2006, he completed his Ph.D. at the University of Minnesota under the supervision of Prof. Tim Lodge and Prof. Marc Hillmyer. He then joined the group of Prof. Tim Deming in University of California, Los Angeles, as a postdoctoral fellow. In late 2008, he became a faculty member at the Institute of Chemistry, and moved to the Qingdao University of Science and Technology in 2014. Since January 2025, he has been a professor in the College of Chemical and Biological Engineering of Zhejiang University. His current research interests include organocatalysts for ROP of cyclized monomers and circular-loop recyclable polymers.