

Cyclic Trimeric Phosphazene Base as Catalyst for ROP of Cyclic Esters

ZHIBO LI

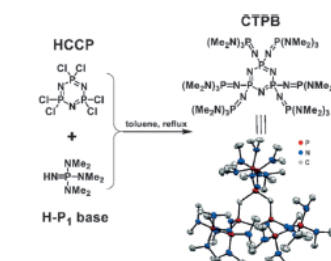
Key Laboratory of Biobased Polymer Materials, Shandong Provincial Education Department; School of ; School of Polymer Science and Engineering, Qingdao University of Science and Technology, Qingdao, China 266042
Email: zbli@iccas.ac.cn

Keywords: polyester, ring opening polymerization, superbase

Synthesis of biodegradable aliphatic polyesters via metal-free catalyzed ring-opening polymerization of cyclic esters is of great importance to their applications in biomedical and microelectronic fields, and is therefore becoming the most appealing research topic in polyester synthesis. As a category of organic superbases, phosphazene exhibits good biocompatibility and considerably high catalytic activity in ring-opening polymerization of cyclic

esters. The catalytic performances of phosphazene catalysts highly depend on their structure and basicity. However, the application of phosphazene catalysts is limited due to the lack of structural diversity and successive basicity. Therefore, it is of great urgency and necessity to design and develop novel phosphazene catalysts.

From the point of view of catalyst design, we proposed a series of novel phosphazene catalysts. Herein, a new superbase, cyclic trimeric phosphazene base (CTPB), was prepared with high yield and purity. In the presence of alcohol, the CTPB can serve as highly efficient organocatalyst for ring-opening polymerization (ROP) of “non-polymerizable” γ -butyrolactone to offer well-defined poly(γ -butyrolactone) with high conversions (up to 98%) at -60°C . The produced polymers have high molecular weights (up to $22.9\text{ kg}\cdot\text{mol}^{-1}$) and low polydispersity distributions (1.27-1.50). NMR analysis of initiation process and the structural analysis of resulted polymers by MALDI-TOF suggest an activating initiator mechanism.



Scheme 1. Synthesis of a cyclic trimeric phosphazene base.

Acknowledgement: Financial support from NSFC (No.21434008), NSFC Funding for Distinguished Young Scholar (No.51225306) is gratefully acknowledged.

References

- [1] N. Zhao, C. Ren, H. Li, Y. Li, S. Liu, Z. Li, *Angew. Chem. Int. Ed.* **2017**, 56, 12987-12990.