陈学思

报告人简介：

陈学思博士 1959 年 12 月出生在中国长春市，1978 年毕业于吉林大学化学系，1988 年在中国科学院长春应用化学研究所获得硕士学位，1997 年 3 月在日本早稻田大学他获得了博士学位。从 1997 年到 1999 年在宾夕法尼亚大学经历 2 年博士后。从 1999 年 6 月回到长春应化所聘为教授。现在任长春应化所学委会副主任，中科院生态环境高分子重点实验室学委会副主任。2004 年获得国家基金委杰出青年基金项目。国家科技部 2013 年科技创新创业人才。目前主要从事（1）席夫碱烷氧基铝催化剂的合成及其丙交酯的旋光聚合；（2）具有智能性生物医用高分子的结构设计与合成；（3）具有温度和 pH 双敏感性的生物可降解高分子智能性水凝胶的合成；(4)生物降解性聚乙撑亚胺基因转移载体的合成与表征；(5)抗肿瘤药物纳米高分子载体的合成与应用探索；（6）高分子材料在医药学领域应用的基础研究；（7）绿色塑料—聚乳酸产业化。陈博士已发表近 600 篇 SCI 论文（H 影响因子 63，引用率超过 10000 次）。任国际杂志《Advanced Healthcare Materials》,《Journal of Controlled Release》,《Biomacromolecules》,《Acta Biamaterialia》和《Macromolecular Bioscience》编委，《高等学校化学学报》和《Chemical Research in Chinese Universities》第四届编委会编委。

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Dr. Xuesi Chen was born in December 1959 in Chagnchun city China. He graduated from the Chemistry Department of Jilin University. He got his Master Degree from Changchun Institute of Applied Chemistry (CIAC), Chinese Academy of Sciences (CAS) in 1988. He obtained his Ph D. from Waseda University Japan in March 1997. He had post doctor experience in the University of Pennsylvania from 1997 to 1999. He works in CIAC from June 1999 as a professor. Now he is working in Key Laboratory of Polymer Ecomaterials of CAS in CIAC. His current research interests include synthesis of Schiff Base catalyst for ROP of lactides, preparation of biodegradable

polymers with fuctional properties, development of biodegradable polymers for medical applications such as, bone fixation part, bone repair by tissue enginerring scaffolds, antiadhesion membrane of tendon and intestine, anticancer nanocarriers for gene or drug dilevery, industrialization of polylactide (PLA) as green plastics. He has published about 600 peer-reviewed papers (H-index = 63, total citations > 10,000 based on Google Scholar). He is one of the board members of the journals of Journal of Controlled Release, Biomacromolecules, Advanced Healthcare Materials, Acta Biomateria and Macromolecular Bioscience.

聚乳酸薄膜树脂相容剂和扩链剂的合成与共混改性研究

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聚乳酸是新世纪最佳绿色环保材料，有望取代部分石油基资源。然而，聚乳酸柔韧性差、熔体强度低是其应用的一个瓶颈，限制了其广泛应用。本工作针对改性薄膜树脂的特点和不足，设计并制备了 PLA-*b*-PCL-*b*-PLA 嵌段共聚物和聚乳酸基扩链剂$(PLLA\text{-}b\text{-}PGMA)_3$，对 PCL/PLA 共混体系进行改性。PLA-*b*-PCL-*b*-PLA 提高了聚乳酸薄膜树脂的相容性，断裂伸长率具有很大的提高，同时仍能保持较高的拉伸强度。流变测试结果表明$(PLLA\text{-}b\text{-}PGMA)_3$中的环氧基团可以与聚乳酸共混组分中的末端羟基和羧基反应形成支化的结构，熔体强度大大提高。PLA-*b*-PCL-*b*-PLA 和$(PLLA\text{-}b\text{-}PGMA)_3$对聚乳酸薄膜树脂实现了协同增容，对加工性能的提高也起到了协同作用。结合共聚和原位反应增容，不仅提高了聚乳酸共混树脂的柔韧性，而且提高了聚乳酸共混树脂的熔体强度。与市场上其他完全生物降解薄膜树脂相比较，新开发的聚乳酸薄膜树脂的成本更低、加工性能、力学性能、热封性能、制品使用稳定性更好。本研究通过中试放大，批量生产聚乳酸助剂 PLA-*b*-PCL-*b*-PLA，获得规模化，连续化大分子助剂生产技术，开发出具有高性价比、可完全降解的聚乳酸薄膜树脂制备工艺及吹塑成型加工技术，实现低成本，高性能 PLA 薄膜的吹塑成型，研究结果对于扩大聚乳酸的应用具有重要的意义。

Synthesis and Blending Modification of Polylactic Acid Film Resin Compatibilizer and Chain Extender

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Abstract: Polylactic acid is the best green material in the new century and is expected to replace some petroleum-based resources. However, the poor flexibility and low melt strength of polylactic acid is a bottleneck in its application, which limits its wide application.

In this work, PLA-b-PCL-b-PLA block copolymer and polylactic acid based chain extender $(PLLA\text{-}b\text{-}PGMA)_3$ were designed and prepared for the characteristics and deficiencies of modified film resins to modify the PCL/PLA blend system. PLA-b-PCL-b-PLA improves the compatibility of the polylactic acid film resin, and the elongation at break is greatly improved while still maintaining a high tensile strength. The rheological test results show that the epoxy group in $(PLLA\text{-}b\text{-}PGMA)_3$ can react with the terminal hydroxyl group and carboxyl group in the polylactic acid blending component to form a branched structure, and the melt strength is greatly improved. PLA-b-PCL-b-PLA and $(PLLA\text{-}b\text{-}PGMA)_3$ achieve synergistic compatibilization of polylactic acid film resins and synergistic effects on processing performance. The combination of copolymerization and in-situ reaction compatibilization not only improves the flexibility of the polylactic acid blending resin, but also improves the melt strength of the polylactic acid blending resin. Compared with other fully biodegradable film resins on the market, the newly developed polylactic acid film resin has lower cost, processability, mechanical properties, heat sealing performance, and better product stability. In this study, the polylactic acid auxiliaries PLA-b-PCL-b-PLA were mass-produced by scale-up, and the large-scale, continuous macromolecular auxiliaries production technology was obtained, and a preparation process and blow molding processing technology for a polylactic acid film resin with high cost performance and complete degradation was developed, realized the blow molding of low-cost, high-

performance PLA film, and the research results are of great significance for expanding the application of polylactic acid.