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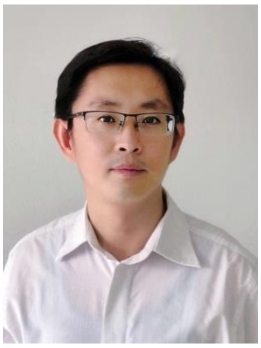

马丕明，江南大学教授，博士生导师。中国塑协降解塑料专业委员会副主任、专家委员，江苏省中青年学术技术带头人，无锡市社会事业领军人才，《e-Polymers》和《山东化工》杂志编委。2011 年于荷兰埃因霍温理工大学获得博士学位，2012-至今在江南大学化学与材料工程学院工作。入选江苏省“333 创新人才”培养工程、江苏省博士积聚计划、江苏省企业创新特聘专家等人才计划。近 5 年，承担国家自然科学基金、江苏省优秀青年基金、国家科技支撑计划子课题等省部级项目以及企业委托课题 10 余项，多项研究成果实现应用与转化，在 ACS Nano、 Biomacromolecules 等杂志发表 SCI 论文 60 余篇，授权发明专利 20 余项（含 PCT 国际专利 1 件），获得中国轻工业联合会科技进步二等奖 1 项。主要研究方向为生物基与可降解高分子材料改性及功能化。

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Profile of the Author:

Piming Ma is a professor and doctoral supervisor of Jiangnan University. He is an expert member of the biodegradable plastic specialized committee of the China plastic association. He received his PhD from Eindhoven University of Technology in the Netherlands in 2011, and started his academic career in Jiangnan University since 2012. He is selected as an editorial board membership of the "e-Polymers" and "Shandong chemical" journals, and several provincial-level talent programs. In recent years, he undertook 10 governmental and industrial projects, published 60 papers and granted 20 patents. Moreover, he won a science and technique award of China Light Industry Federation. His main research area is modification and functionalization of bio-based and degradable polymeric materials.

基于界面立构复合调控 PLA 的性能及功能化

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摘要：聚乳酸（PLA）是一种生物基与可生物降解的高分子材料，具有生物相容性好、强度高、易成型等优点，但结晶速率慢、热变形温度低、韧性差等问题却局限了其应用领域。本研究基于PLA立构复合（SC）技术对PLA进行性能及功能化改性。首先，针对高分子量PLA难以立构复合的问题，分别以纳米纤维素和PLA修饰的纳米纤维素作为成核剂，使PLA立构复合的温度提高了26 ºC、结晶周期缩短了95%以上，提出了异相成核与PLA分子链的位置记忆效应对促进PLA立构复合的协同作用[1,2]；其次，采用低温SC技术，在PLLA/PDLA非对称旋光异构体系中通过原位立构复合诱导微/纳尺度相分离同时实现了PLA的增强与增韧，并提高了PLA的耐热性[3]，进而在PLA/弹性体合金中通过界面立构复合实现了相结构细化与PLA的超韧改性；在此基础上，制备了多种纳米粒子杂化物，通过界面立构复合调控杂化纳米粒子在PLA及其合金中的分布与界面作用力，赋予PLA低黏度、接触抗菌、导电等功能特性[4,5]。上述研究为PLA立构复合技术应用及PLA改性与功能化提供了新思路。

关键词：聚乳酸；立构复合；结构与性能；功能化

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Modification and Functionalization of PLA by Interfacial Stereocomplexation

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Abstract: Poly (lactic acid) (PLA) is a bio-based and biodegradable material with biocompatibility, high-strength and processability. However, some drawbacks such as low crystallization rate, low HDT and brittleness restrict its application. High-performance and functionalization of PLA were achieved by using stereocomplex (SC) technology. First, the SC temperature was increased by 26 ºC while the crystallization time was reduced by 95% after addition of (PLA-g-) cellulose nanocrystals. Second, the strength and toughness of PLA were improved simultaneously by low-temperature SC-induced phase separation accompanied with improved heat resistant property. Moreover, super-tough PLA can be obtained by interfacial SC in PLA/elastomer alloys. Finally, different PLA-based nanohybrids were prepared. The dispersion and interfacial adhesion of the nanohybrids in PLA (or alloy) were tailored by interfacial SC technology. Consequently, PLA with low viscosity, antibacterial performance or conductivity were achieved. This work broadens the application range of stereocomplex technology and provides new routes for PLA modification and functionalization.

Keywords: Poly (lactic acid); stereocomplexation; structure-property; functionality