吴林波

报告人简介:

吴林波，博士，浙江大学化工学院教授、博导。从事生物基/可生物降解聚合物等绿色聚合物产品工程和过程技术的研究开发工作，包括聚乳酸、可生物降解共聚酯、呋喃二甲酸聚酯的合成技术、聚合工程、改性和加工技术等；先后承担 5 项国家自然科学基金及多项 863/973/支撑计划/国家重点研发计划项目和企业委托项目；发表学术论文 90 多篇，他引 1600 多次；获 30 项中国发明专利授权。

Linbo Wu

Profile of the Author:

Dr. WU Linbo is a full professor at College of Chemical & Biological Engineering, Zhejiang University. He is a selected member of New Century 151 Talent Project of Zhejiang Province, an Invited Vice Director of Degradable Material Committe of CPPIA, a peer reviewer for National Natural Science Fund Council and for over 30 domestic and international journals. His researches focus on the Product Engineering and Process Technologies of Biobased and Biodegradbale Polymer Materials, including (1) Polylactic acid, (2) Aliphatic-Aromatic Copolyesters, and (3) Furandicarboxylic Acid Based Polyesters. He has published over 90 peer-reviewed papers which have been non-self-cited over 1600 times. He is an inventor of 30 authorized patents.

生物基聚酯—聚呋喃二甲酸乙二醇酯：合成与改性*

吴林波
化学工程联合国家重点实验室，生物质化工教育部重点实验室，浙江大学化学工程与生物工程学院，杭州 310027
wulinbo@zju.edu.cn

生物质转化和利用的研究开发和生物炼制产业的蓬勃发展为生物基能源、化学品和聚合物材料的发展提供了巨大的机遇。生物基聚合物的合成与应用在新世纪吸引了全世界学术界和产业界的广泛关注。2,5-呋喃二甲酸(简称呋喃二甲酸，FDCA)是来源于淀粉、纤维素等生物质的新型生物基单体。FDCA 与对苯二甲酸（TPA）具有类似的理化性质，可用于合成聚酯、尼龙等生物基高性能聚合物或生物基可生物降解共聚酯。由于自然界存在巨量的纤维素以及聚酯在聚合物工业中的重要性，基于呋喃二甲酸的聚酯和共聚酯具有成为大品种生物基聚合物的潜力，部分取代现有的石油基聚酯 (如 PET、PBAT)，提供更好的性能(如力学性能、气体阻隔性)或新的功能和用途(生物降解、弹性体等)。

浙江大学化工学院生物基聚合物课题组近年来开展了基于呋喃二甲酸的系列聚酯和共聚酯的合成、结构-性能和改性研究工作。针对聚呋喃二甲酸乙二醇酯易变色、结晶性差、韧性差等问题，研究解决了高分子量、浅色泽 PEF 树脂的制备技术；发现 PEF 合成中因存在明显的醚化副反应导致二甘醇链节含量高、结晶性差；通过链结构调控[1]、溶剂诱导构象调节、纳米复合等手段改善了 PEF 的结晶性；通过无规和嵌段共聚，在显著改善 PEF 的拉伸和冲击韧性的同时很好地保持其拉伸强度、模量，制得高延展性 PEF、高抗冲性 PEF 和 PEF 基热塑性弹性体。

Biobased Polyester Poly(ethylene 2,5-furandicarboxylate) (PEF): From Synthesis and Modification

Linbo Wu*
State Key Laboratory of Chemical Engineering at ZJU, Key Laboratory of Biomass Chemical Engineering (Ministry of Education), Department of Chemical & Biological Engineering, Zhejiang University, Hangzhou 310027
wulinbo@zju.edu.cn

Developing new biobased monomers and polymers from renewable biomass resources has gained increasing attention in recent decade. As a biobased platform chemical, 2,5-furandicarboxylic acid (FDCA) has better carbon footprints and comparable physicochemical properties and prospective production cost in comparison with its petroleum-based counterpart, terephthalic acid (TPA). Therefore, it is a promising monomer for novel biobased polyesters like poly(ethylene 2,5-furandicarboxylate) (PEF) and copolyesters which may provide high performance and new function or use.

R&D of FDCA-based (co)polyesters was conducted in our Lab of Biobased Polymers for a couple of years. High molecular weight poly(ethylene furandicarboxylate) (PEF) with light color was successfully synthesized. DEGF unit was readily formed in PEF synthesis and the existence of DEGF is one of the important reasons for slow crystallization of PEF. The crystallization of PEF was improved via screening catalyst, tuning chain structure and nanocomposite. Random and multi-block PEF-based copolymers were designed and synthesized and exhibited super tensile and impact toughness, keeping high strength and modulus concurrently. Such modified PEF materials with improved crystallization and toughness may find practical gas barrier applications.