

Influence of Simultaneous Biaxial Stretching on the Structure and Performance of PLA-Based Blend Films

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Abstract

Poly(lactide (PLA))-based biodegradable films have attracted significant attention as sustainable alternatives to conventional petroleum-based packaging materials because of their bio-based origin, transparency, and good processability. However, the inherent brittleness and low toughness of PLA limit its application in flexible packaging. Blending PLA with other components is considered an effective approach to improve flexibility, although phase separation and weak interfacial adhesion often limit the overall performance improvement.

Recently, simultaneous biaxial stretching at high stretching rates has emerged as an effective processing technique for improving the toughness and mechanical balance of PLA-based films through molecular orientation and microstructural control. In this work, blend modification and simultaneous biaxial stretching were integrated to develop high-performance PLA-based biodegradable films. The effects of phase morphology and strain-induced crystallization on structural development, mechanical properties, and oxygen barrier performance were investigated. Biaxial stretching promoted molecular alignment and crystallization, leading to enhanced toughness, dimensional stability, and barrier properties. The results demonstrate that combining blend design with biaxial orientation is a promising strategy for developing biodegradable films for sustainable packaging applications.

Research Keyword: Biodegradable film, Polylactide, Biaxial stretching

Biography

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Personal History:

Suttinun Phongtamrug is an Associate Professor in the Department of Industrial Chemistry, Faculty of Applied Science, at King Mongkut's University of Technology North Bangkok, Thailand. She earned her Ph.D. in Polymer Science from The Petroleum and Petrochemical College, Chulalongkorn University, where she studied the supramolecular chemistry of benzoxazines. After completing her doctorate, she conducted postdoctoral research at the Department of Future Industry-oriented Basic Science and Materials, Toyota Technological Institute, Japan, focusing on the structural analysis and phase transition behavior of polymers. Currently, her research interests include analyzing polymer structures, studying phase transitions, and developing biodegradable films and biocomposites.