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Compatibility, mechanical properties and stability of blends of Polylactide and Polyurethane Based on Poly(ethylene glycol)-*b*-polylactide Copolymers by Chain Extension with Diisocyanate

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Abstract: A novel biodegradable polyurethane based on poly(ethylene glycol)-*b*-polylactide copolymers (PELU) was prepared by chain extension with isophorone diisocyanate (IPDI). The copolymers were used to toughen polylactide (PLA) by melt blending. The results of DSC and SEM uniformly indicated that PELU were partially compatible with PLA and the PLA segment in PELU could effectively improve the compatibility between PLA and PELU. PELU as a plasticizer could significantly improve the toughness of PLA materials and remain their high strength and modulus. When the PELU content was 10-20 wt%, the elongation at break of PLA/PELU-40/ADR (0.4 wt%) and PLA/PELU-50/ADR (0.4 wt%) reached up to 250%-350%. When the PELU content was 20 wt%, the tensile strength and modulus of PLA blends containing PELU-30, PELU-40 and PELU-50 maintained 35-38 MPa and 1300-1500 MPa, respectively. The moisture absorption of the PLA materials enhanced because of blending with PELU containing PEG segments, but the hydrolytic degradation property of PLA materials was little affected by this.

Keywords: polylactide; poly(ethylene glycol); polyurethane; toughening modification

1 Introduction

As a member of the aliphatic polyester family, poly(lactic acid) (PLA) or polylactide is a biodegradable, compostable, and biocompatible thermoplastic polymeric material derived from renewable resources such as potato cassava, corn and beet sugar [1]. PLA has extensively been used in biomedical materials, disposable plastics, and fiber applications [2-4]. Many performances of PLA are

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