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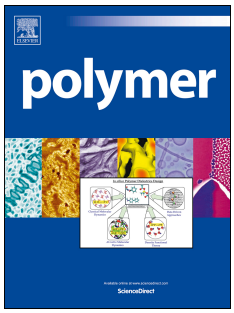

Bio-based alternatives in the synthesis of aliphatic-aromatic polyesters dedicated to biodegradable film applications

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Bio-based alternatives in the synthesis of aliphatic-aromatic polyesters dedicated to biodegradable film applications

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Abstract

The pilot scale synthesis of poly(butylene succinate) copolymers with rigid bio-based comonomers, namely isosorbide and 2,5-furandicarboxylic acid (FDCA) was investigated. The synthesis and properties of these copolymers were compared with aliphatic-aromatic polyesters containing the petrochemical terephthalic acid (PTA), such as poly(butylene succinate-*co*-terephthalate) (PBST) and commercial poly(butylene adipate-*co*-terephthalate) (PBAT). Compared to PBS, polycondensation was much faster with up to 20 mol-% of FDCA in the feed whereas polycondensation rate was negatively affected for isosorbide and terephthalic acid modified PBS. These phenomena were attributed to the low reactivity of the isosorbide secondary endo hydroxyl function for poly(butylene-*co*-isosorbide succinate) (PBIS) and to kinetic effects for poly(butylene succinate-*co*-terephthalate) (PBST). The ^{1}H-NMR analyses of triads of PBST and poly(butylene succinate-*co*-furanoate) (PBSF) were typical of random copolyesters. The thermal properties of the polymer materials showed an increase in the glass transition temperature from -30°C for PBS up to -11°C for PBS that contained 14 mol-% isosorbide. The ability of the copolymer to crystallize was drastically reduced with the addition of the comonomer; this trend was observed to a smaller extent for PBST. This low crystallinity had as