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In-depth investigation on the effect and role of cardanol in the compatibilization of PLA/ABS immiscible blends by reactive extrusion

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Abstract

In this work, a sustainable approach was developed to melt-blend and enhance the compatibility of the immiscible blend of polylactide (PLA) and poly(acrylonitrile–butadiene–styrene) (ABS). Cardanol, a bio-based phenolic compound, was used as an interfacial (reactive) compatibilizer. The blending was conducted by a solvent-free reactive extrusion. The incorporation of cardanol resulted in an enhancement of the compatibility evidenced by the decrease of ABS nodules size within PLA from few micrometres to several tens of nanometres and the convergence of both polymers T_g around 68.5 °C. In-depth investigation evidenced that cardanol grafted onto ABS during the reactive extrusion via its phenolic ring, leading to a substantial plasticizing effect and a significant decrease of the surface energy of ABS, similar to those of PLA. This work paves the way to a multitude of new compatibilization strategies based on the reaction of phenolic compounds during the extrusion of PLA and ABS.

Keywords: PLA; ABS; Immiscible blend; Cardanol; Reactive extrusion;

Compatibilization

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