

Enhanced Mechanical Performance of PBAT/Thermoplastic Starch Blends via Reactive Compatibilization Using Liquid Polyisoprene

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Abstract. Poly(butylene adipate-co-terephthalate) (PBAT) is a promising biodegradable polyester for flexible packaging applications; however, its relatively high cost limits its broader industrial use. Blending PBAT with thermoplastic starch (TPS) offers a cost-effective solution, although poor interfacial compatibility between hydrophobic PBAT and hydrophilic TPS leads to inferior mechanical properties of the resulting blends. In this work, reactive compatibilization of PBAT/TPS blends using carboxylated liquid polyisoprene and dicumyl peroxide was employed to enhance interfacial adhesion and improve their mechanical performance. The compatibilized blend exhibited a significant increase in tensile strength (from 12 to 21.5 MPa) and tensile strain (from 470 % to 666 %) compared to the non-compatibilized system, indicating a pronounced toughening effect. This improvement is attributed to enhanced interfacial interactions and the formation of covalent bonds between the phases during reactive blending. Storage of the blends for three months led to a decrease in mechanical performance, particularly in the non-compatibilized system, indicating deterioration of interfacial adhesion. The compatibilized blend maintained better performance than the non-compatibilized blend, even in its freshly prepared state. These findings demonstrate that reactive compatibilization is an effective strategy to improve both the mechanical properties and storage stability of PBAT/TPS blends for sustainable packaging applications.