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Abstract

The Potential of Biopolyesters as Plasticizers for Polylactide †

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It is estimated that fossil fuel resources will dwindle by the end of 2050 if the current utilization rate persists [1]. Consequently, the scientific community has searched for new polymer materials that can decrease the consumption of fossil plastics, with focus on biodegradable bioplastics. Poly(lactic acid) (PLA) is the frontrunner of bioplastics due to its excellent mechanical properties, compostability, bio-based nature and a cost comparable to conventional polyolefins [2,3]. Still, its inherent brittleness often hinders its utilization where ductility of the material is required. Therefore, in this study, we focus on solving this issue by synthesizing bio-based polyesters for tuning PLA's ductility. These materials were obtained from 1,4-butanediol (B) and sebacic acid (S) in various molar ratios, using titanium (IV) butoxide (TBT) as a catalyst.

The sebacic acid (S) (purity 99%), 1,4-butanediol (purity 99%) (B) and titanium (IV) butoxide (TBT)were used as received without further purifications. The PLA was blended with the obtained bio-based polyesters via melt mixing. The obtained polyesters and PLA-based blends were characterized by FT-IR, TGA, DSC, DMA, water contact angle and tensile properties.

The introduction of the bio-based polyesters in the PLA matrix led to a monotonous decrease of the tensile strength, along with a considerable increase of elongation at break.

The proposed bio-based polyesters exhibited a good plasticizing effect on PLA, thus broadening its applications.

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