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Inducing PLA/starch compatibility through butyl-etherification ofwaxy and high amylose starch

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Abstract

In this study, waxy and high amylose starches were modified through butyl-etherification to facilitatecompatibility with polylactide (PLA). Fourier transform infrared spectroscopy, proton nuclear magneticresonance spectroscopy and wettability tests showed that hydrophobic butyl-etherified waxy and highamylose starches were obtained with degree of substitution values of 2.0 and 2.1, respectively. Dif-ferential scanning calorimetry, tensile testing, and scanning electron microscopy (SEM) demonstratedimproved PLA/starch compatibility for both waxy and high amylose starch after butyl-etherification. ThePLA/butyl-etherified waxy and high amylose starch composite films had higher tensile strength and elon-gation at break compared to PLA/non-butyl-etherified composite films. The morphological study usingSEM showed that PLA/butyl-etherified waxy starch composites had a more homogenous microstructurecompared to PLA/butyl-etherified high amylose starch composites. Thermogravimetric analysis showedthat PLA/starch composite thermal stability decreased with starch butyl-etherification for both waxy andhigh amylose starches. This study mainly demonstrates that PLA/starch compatibility can be improvedthrough starch butyl-etherification.