Cellulose nanofiber-reinforced poly(lactic acid) nanocomposite film for packaging application

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Cellulose nanofibers (CNFs) derived from renewable biomass have recently drawn much attention as the reinforcements due to their excellent thermal, mechanical properties, and high aspect ratios. Accordingly, such nanofillers have been utilized in the preparation of polymer nanocomposites with improved performances. In this study, in order to prepare biodegradable poly(lactic acid) (PLA)-based nanocomposite film with improved thermal, machanical, and barrier properties, we attempted the incorporation of cellulose nanofibers via solution blending method. The CNFs were obtained from native celluloses (bleached hardwood pulps) by employing TEMPO-mediated oxidation followed by physical treatments including homogenization and sonication. The compatibility and morphological structure of prepared nanocomposites were evaluated through XRD analysis and SEM observation. The influence of incorporated CNFs loading level on the thermal, mechanical, and oxygen barrier properties of nanocomposite films was investigated in terms of DSC experiment, tensile testing, and oxygen transmission rate measurement.