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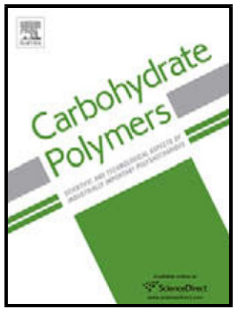

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Reactive coating of soybean oil-based polymer on nanofibrillated cellulose film for water vapor barrier packaging

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Abstract

Nanofibrillated cellulose (NFC) easily forms a high strength film but is unable to withstand the influence of water vapor when used in high moisture situations. The water vapor transmission rate (WVTR) of a NFC film was as high as 5088 g/m^2·24h (38℃, 90% RH). The addition of beeswax latex in a NFC casting film (NFX) lowered the WVTR to 3918 g/m^2·24h. To further reduce the WVTR, a coating agent comprised of acrylated epoxidized soybean oil (AESO) and 3-aminopropyltriethoxysilane (APTS) was applied onto the NFX film using a rod coater. A combination of the suitable AESO/APTS ratio, initiator dosing, curing time and temperature could reduce the WVTR to 188 g/m^2·24h when the coat weight was 5 g/m^2. Moreover, the coated NFX film was highly hydrophobic along with the improved transparency and thermal stability. This biodegradable polymer-coated NFC film can be used as potential packaging barrier in certain areas.

Keywords: Nanofibrillated cellulose; Acrylated epoxidized soybean oil; Water vapor transmission rate.

1. Introduction

Packaging plays an important role in production, transportation and storage of food or pharmaceutical. This requires the packaging material to have a low water vapor transmission rate (WVTR). The most commonly-used packaging material nowadays is petrochemical-based plastics such as polyolefins, polyesters, and polyamides, which do own low WVTR feature but they are totally non-biodegradable. As thousands of tons of these plastic packagings are discarded daily and most of them are normally put in land-fills, they increasingly lead to serious ecological problems.

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