Effects of heat treatment on chitosan nanocomposite film reinforced with nanocrystalline cellulose and tannic acid

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doi:10.1016/j.carbpol.2015.12.068

Highlights

- A chitosan nanocomposite film (enhanced with additives) was heat treated.
- Heat treatment improved the film's mechanical properties.
- Water resistivity increased significantly after heat treatment.
- Chemical changes were observed through FTIR and XRD analysis.

Abstract

This article presents an analysis of the influence of heat treatment on chitosan nanocomposite film. A series of samples comprising: pure chitosan film, chitosan film embedded with nanocrystalline cellulose (NCC), chitosan film crosslinked with tannic acid and chitosan film with a blend of NCC and tannic acid were heat treated using a convection oven. Fourier-transform-infrared spectroscopy (FTIR) and X-ray diffraction test (XRD) shows the changes in chemical interaction of the heat treated films. The heat treated films show significant improvements in moisture absorption. Tensile strength and Young's Modulus were increased up to 7 MPa and 259 MPa, respectively when the samples were subjected to heat treatment. For the NCC particles, a transmission electron microscope (TEM) was used to inspect the structural properties of cellulose particle in suspension form.

Keywords

Chitosan film; Heat treatment; Nanocrystalline cellulose; Tannic acid; Thin film