

Preparation and properties of poly(vinyl alcohol)/chitosan blend bio-nanocomposites reinforced by cellulose nanocrystals

ABSTRACT

The aim of this paper is to report the effect of the addition of cellulose nanocrystals (CNCs) on the mechanical, thermal and barrier properties of poly(vinyl alcohol)/chitosan (PVA/Cs) bio-nanocomposites films prepared through the solvent casting process. The characterizations of PVA/Cs/CNCs films were carried out in terms of X-ray diffraction (XRD), transmission electron microscopy (TEM), scanning electron microscopy (SEM), thermogravimetric analysis (TGA and DTG), oxygen transmission rate (OTR), and tensile tests. TEM and SEM results showed that at low loading levels, CNCs were dispersed homogeneously in the PVA/Cs matrix. The tensile strength and modulus in films increased from 55.1 MPa to 98.4 MPa and from 395 MPa to 690 MPa respectively, when CNCs content went from 0 wt% to 1.0 wt%. The thermal stability and oxygen barrier properties of PVA/Cs matrix were best enhanced at 1.0 wt% of CNCs loading. The enhanced properties attained by incorporating CNCs can be beneficial in various applications.

Keyword: Bio-nanocomposite; Poly(vinyl alcohol)/chitosan; Cellulose nanocrystals; Mechanical properties; Thermal properties