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Structural and morphological evaluation of CNC reinforced PVA/Starch biodegradable films

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Abstract

Nanocomposite films containing cellulose nanocrystals (CNC), as the reinforcing phase, and poly(vinyl alcohol) (PVA)/starch (S) blend, as the matrix, were prepared by solution casting technique. For the preparation, 5, 10, 15 wt% CNC suspension were incorporated in blends containing 90 wt% PVA/10 wt% S, 75 wt% PVA/25 wt% S and 50 wt% PVA/50 wt% S. Structural evaluation was done by Fourier transform infrared spectrometry and X-ray diffraction, and the morphological aspects by atomic force microscopy. Infrared spectroscopy evidenced the presence of H-bond interactions between the PVA and S and between PVA/S blend and CNC, and also variation in the conformational rearrangement, while the X-ray diffraction showed that the crystallite size and the degree of crystallinity were strongly affected by blending of PVA with S and also by the incorporation of CNC in the nanocomposite films. The surface roughness of studied samples increased with the increasing of S and filler content.

Keywords: poly(vinyl alcohol) (PVA), starch (S), cellulose nanocrystals (CNC), H-bond interaction, surface roughness