

Tailoring polylactic acid properties for packaging applications: Effects of Co-addition of halloysite nanotubes and selected plasticizers

Abstract

Poly(lactic acid) (PLA) has recently given a huge attention because of its mechanical properties and good physical like good biodegradability and processability, high tensile modulus and strength. In the current research, the researchers utilized sesame oil (SO) and low molecular weight poly(ethylene glycol) (PEG) as hydrophobic and hydrophilic plasticizers, towards improve the ductility and toughness of PLA. The researchers synthesized nanocomposites by solution casting of the neat PLA/HNTs and PLA blends with weight ratio of (0,10, 20 and 30 wt%) for PEG and (0, 5 and 10 wt%) for SO. The influence of both plasticizers on chemical, thermal and mechanical properties of the nanocomposites were investigated. Characterization of the systems was achieved by mechanical testing and thermogravimetric analysis (TGA), field emission scanning electron microscope (FESEM), Fourier transform infrared spectroscopy (FTIR). The FTIR analyses confirmed the existing of hydrogen bonding between PLA and both PEG and SO. significant improvement was shown by the plasticized nanocomposites in elongation at break with the adding of PEG and SO, meanwhile, the plasticized films' strength were decreased. For the thermal analyses, all the films exhibited lower thermal stability compared to PLA/HNTs film.

Keywords

Bionanocomposites; Halloysite Nanotubes; Plasticizer; Poly(ethylene Glycol); Poly(lactic Acid); Sesame Oil