

Modification of polylactic acid/ halloysite bionanocomposites using electron beam radiation: Physical, barrier and thermal properties

Abstract

This study aimed to develop novel Polylactic acid/ Halloysite (PLA/ HNTs) films which showed better properties when they were used for food packaging. They also displayed better mechanical, barrier, morphological and structural properties when the researchers analysed the impact of the electron beam irradiation on the nanomaterials. They prepared PLA-based nanocomposites containing 5% w/w of HNTs using the solution casting process. These nanocomposites were further exposed to different ebeam doses (i.e., 0, 20, 40 and 60 kGy). The researchers assessed the effect of the electron beam irradiation on the various properties of the PLA. All the composites showed a homogenous dispersion and distribution of the HNTs in this PLA matrix. Results indicated that the nanocomposites showed better barrier properties in comparison to the neat PLA. Furthermore, the ebeam irradiation could increase the glass-transition temperature and lead to the development of more crosslinks, which increased the degradation temperature and hydrophilicity of the nanocomposites. In this study, the researchers showed that the PLA/HNTs films were effective materials that could be used for the electron beam processing of the pre-packed foods. The best effect was noted for the 20 kGy dosage which was used in the study.

Keywords

Bionanocomposites; Electron Beam Radiation; Halloysite Nanotubes; Physical properties; Polylactic Acid; Thermal Properties