

Formulation et caractérisation des matériaux biodégradables à base de l'acide polylactique-Plastifiants

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Abstract: In this study, the characterization of plasticized PLA with TEC and ATBC by melt blending method was reported. The value of the melt flow index (MFI) observed for all samples are higher than those of neat PLA. The evaluation of the influence of the type and plasticizer content on the viscoelastic properties of PLA with DMA indicates a decrease in the storage modulus for plasticized PLA, indicating the flexibility and mobility of the amorphous phase of PLA caused by TEC and ATBC. UV-Visible spectroscopy shows that the two plasticizers: TEC and ATBC have no effect on the color change of the films. The opacity values of the PLA films plasticized with TEC and ATBC were slightly lower than the value of the treated PLA film. X-ray diffraction shows the appearance of a strong diffraction at 16.7° assigned to the crystalline phase, which confirms that the PLA has no crystalline polymorph transition. FTIR spectra indicate that there are some molecular interactions by intermolecular hydrogen bonds between PLA and citrate ester. The thermal properties of plasticized PLA shows that TEC and ATBC are effective in lowering the glass transition temperature (T_g), the melting temperature (T_m) and the cold crystallization temperature (T_{cc}) of the PLA. In addition, its crystallinity increases with increasing content of plasticizer. The TGA results indicated that the TEC and ATBC promote a decrease in thermal stability of the PLA. The weight loss plasticizer with heating time and at 100°C is lesser than at 135°C . Leaching of TEC and ATBC results in cracks and changed color of material. The tensile test showed that the formulations of the plasticized PLA with citrate ester (TEC and ATBC) give better mechanical properties by providing treated PLA. The observation by SEM confirmed there is miscibility between the PLA and plasticizer. Finally it can be said that the higher molecular weight of citrate exhibited a greater plasticizing effect.

Keywords : Polylactic acid (PLA), plasticizing, Triethyl Citrate (TEC), Acetyl Tributyl Citrate (ATBC)