IVi32-001

LDPE films produced with Montmorillonite-Erucamide nanocomposite: evaluation of the mechanical properties.

Fiori, M.A.(1); Cima, L.B.(1); Breitenbach, E.R.(1); Dalcanton, F.(1); Zanetti, M.(1); Colpani, G.L.(1); Silva, L.L.(1); Mello, J.M.M.(1); Silvano, J.R.(2); Carniel, T.A.(1);
(1) Unochapecó; (2) SATC;

One of the biggest challenges in the manufacture of polymeric products is the adjustment of the friction coefficient (COF) of the surfaces. COF values in products made from polymers are established with the incorporation of sliding additives, as the erucamide molecules, during manufacturing processes. Erucamide, in particular, has high mobility in apolar polymers due to its chemical structure having polar functional groups. The mechanisms for their migration are dependent of the interaction of these groups with the polymeric matrix molecules and that interfere on the diffusion mechanisms and COF values. In this sense, nanocomposites based on nano-clay have contributed significantly to the definition of low and stable values of COF and to establish procedures for the control of the migration from erucamide to the surfaces of polymeric products. In this project, a Montmorillonite-Erucamide nanocomposite (MMT-EU) was obtained and characterized and applied to low density polyethylene (LDPE) films. The nanocomposites were produced with MMT (Closite 20A) and EU (Erucamide) in a glass reactor with mechanical stirring at 3000 rpm and for 60 minutes, with a mass ratio of 85% Erucamide and 15% Closite 20A, and with controlled temperature of 100 oC by a glycerin water bath system. The nanocomposite was incorporated with different concentrations in LDPE films with the extruder with a mono-screw with diameter of 16 mm and L/D = 28 (length/diameter). The nanocomposite was characterized with x-ray diffraction techniques, infrared spectroscopy with Fourier transform and differential calorimetry. The surfaces of LDPE films containing the different concentrations of MMT-EU were characterized with atomic force microscopy and with tests for the determination of the COF. With a view to future technological applications, weld regions were produced with the films and characterized with tensile strength tests. The results indicated the production of an MMT-EU type nanocomposite, with the MMT and EU phases well defined. The results From the X-ray diffraction technique it was possible to identify the phases corresponding to erucamida molecules in 2Theta equal to 4.5o, 6.14o, 6.8o, 10.11o, 12.12o, 14.20o and for the Closite 20A at 7.15º. The tensile tests showed that the addition of nanocomposite MMT-EU improves the mechanical properties of the weld without harming the the friction coefficient values of the films.