STUDY OF THE PROPERTIES OF BLEND OF MALEIC ANHYDRIDE GRAFTED POLYETHYLENE AND PLASTICIZED STARCH WITH HYPERBRANCHED POLIOL POLYESTER

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ABSTRACT

Low density polyethylene is a hydrophobic polymer, low cost, high chemical resistance, high impact resistance, ductility and toughness, and this is widely employed in the package industry [1]. The hyperbranched polymers have been widely employed in so many applications because they have a high packing structural, great number of functional group in the periphery, low viscosity in solution and molten state, low degree of entanglement molecular than linear polymer [2]. The starch have been plasticized to obtain thermoplastic starch (TPS), with some compounds such as glycerol [3], sorbitol [3] etc. Starch and LDPE blends, without modifying agent and plasticizer for starch, have poor physicochemical properties, even with only 10 % of starch. An alternative to improve the compatibility of the components is adding polyethylene grafted with maleic anhydride (PE-gMA), which induces polarity and improve the compatibility. The result is still a dispersion of starch granules in the LDPE, but with better adhesion [4].

So far none study has reported the employed of HBP in the plasticized of starch and less that this material has been employed to obtain blends with LDPE-gMA. Therefore in this work is done a new contribution in the study of TPS and starch blends Therefore various blends of starch plasticized with a HBP (TPS) and LDPE-gMA were obtained. The structural, thermal, rheological, morphological and mechanical properties of the blends were studied and compared with the properties of LDPE-gMA and TPS.

Different blends of maleic anhydride grafted Low density Polyethylene (LDPE-gMA) and plasticized starch (thermoplastic starch or TPS) were prepared using LDPE functionalized with AM and starch plasticized with 40 wt % of a hyperbranched polyester poliol of fourth generation (HBP). The blends were obtained employing a torque rheometer. The compositions of the blends (LDPE-gMA/TPS) were: 20/80, 30/70, 40/60 and 50/50. IR spectra of the blends were different that those or the individual components evidencing the interaction between LDPE-gMA and TPS. Differential scanning calorimetry (DSC) analyses showed a slight increases in melting point with the content of LDPE-gMA. The thermal stability showed insignificant changes, plus the weight loss curves are located between the individual components of the blends showing good compatibility. X ray diffraction (DRX) analysis of the materials showed a reduction in the A type crystallinity (17.5°). The blends exhibited pseudoplastic behavior, due to the bonds rupture between LDPE-gAM and TPS. Scanning electronic microscopy (SEM) analysis, showed starch granules without deconstructing, but a good compatibilzation. Mechanical properties, such as the elastic modulus decreased with increments of polyethylene proportion.

References

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