

Thermal and dynamics mechanical analysis of polypropylene blown films with crude palm oil as plasticizer

ABSTRACT

This research aims to investigate the effect of crude palm oil (CPO) as a plasticizer in polypropylene blown film on thermal and dynamic mechanical properties. Polypropylene (PP) was blended with 1, 3, and 5% of CPO using a twin screw extruder. The extruded samples were blown using the blown thin film technique. The samples were analyzed using dynamic mechanical analysis (DMA), differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA). From the dynamic mechanical analysis, the storage modulus and loss modulus for PP presented decreasing pattern about 3–5% due to the action of CPO as plasticizer which introduced free volume and enabled the polyolefins chains to deform more easily. The glass transition temperatures (T_g) of PP were found being shifted to lower temperature from 10 to 1 °C with the increasing CPO content. The fraction of crystallization was determined using DSC. The thermogravimetric analysis (TGA) results showed that the incorporation of CPO as plasticizer showed a small increased effect in the thermal stability for PP. These findings have contributed new knowledge to the additives area and give important implications for designing and manufacturing polymer packaging materials.

Keyword: Crude palm oil; Polypropylene; Plasticizer; Thermal properties