Rheological, Thermal and Mechanical Properties of PET Nanocomposites

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Polyethylene Terephthalate nanocomposites (PET/nanoclay) were prepared by melt mixing using a twin-screw extruder incorporating dual motor feeders. The rheological behaviour of PET with various nanoclays (Somasif MAE, Somasif MTE and Cloisite 25A) at different concentrations (1, 3, 5 and 20%) was studied in the molten state under a wide range of shear rates (0.1 to 5000 s-1). The thermal properties were also investigated for these nanocomposites. Differential Scanning Calorimetry (DSC) measurements were performed to study the crystallinity changes due to the presence of the nanoclays. It has been observed that the clays enhanced the crystallisation temperature and accelerate the crystallisation rate of PET nanocomposites with increasing nanoclay content. Oscillatory tests were conducted on the PET nanocomposites in order to study the effect of adding the nanoclay on the viscoelastic properties of the PET at low shear rates while capillary rheometry was used to study the viscosity behaviour at high shear rate. At low shear rates, an increase in the shear viscosity, storage modulus and loss modulus was observed in the PET nanocomposites with increasing nanoclay content while the viscosity decreased with increasing nanoclay content at high shear rates. It has been shown that the PET nanocomposites do not obey the Cox-Merz rule. Films of each nanocomposite were manufactured using cast film extrusion and tested using uniaxial and biaxial stretching. These results will also be presented.
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