

Preparation and Characterization of Polyethylene Nanocomposites Using Pristine Clay via Novel Water Injection Method in a Twin-Screw Extruder

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In this study, saline water was used as a pre-intercalating agent to modify clay surface in order to promote clay dispersion in one step melt state process. Polyethylene nanocomposite was prepared via injection of saline water into the mixture of polymer melt and pristine clay within a lab scale twin-screw extruder. The solution contains Dodecyl Trimethyl Ammonium Chloride salt in distilled water and was injected into the twin-screw extruder using a high pressure dosing pump. To investigate the effect of dissolution of alkyl salt on clay dispersion, two samples with the same compositions were prepared through both salt solution and pure water injection. The resultant compounds were characterized using X-Ray Diffraction (XRD), dynamic rheological measurements by means of RMS and Differential Scanning Calorimetry (DSC). Tensile and notched-Izod impact properties of the samples were measured, as well. The XRD results showed no peak for sample containing 2wt% pristine clay and prepared via injection of salt solution representing exfoliated microstructure, and for other sample the peak was shifted to lower values indicating intercalated morphology. Furthermore, RMS results showed that the slope of the storage modulus has been declined and cross over frequency of loss and storage moduli shifted to lower frequencies as a result of increasing the interaction and change in dynamics of polymer chains due to intercalation/exfoliation of clay. Tensile results also showed an increase of tensile modulus in the range of about 22% for sample containing 2 Wt. % of clay prepared via injection of salt solution.