CORRELATION BETWEEN SOLUTION AND MELT STATE RHEOLOGICAL BEHAVIOR OF PVA/NA-MMT NANOCOMPOSITE

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In this study, dynamic viscoelastic properties of PVA/Na-MMT/H_2O solution and PVA/Na-MMT nanocomposite in the melt state were investigated. For preparation of PVA nanocomposite solution, at first, PVA was dissolved in the hot distilled water and then a proper amount of Na-MMT was added in the mixing condition. Nanocomposite film was prepared by the solution casting method. The PVA/Na-MMT solution showed thixotropic behavior with a yield stress. The yield value was correlated with the amount of nanoclay. Also, the complex viscosity and storage modulus of the aqueous solution increased with clay loading. Based on the XRD results, the exfoliation microstructure could be suggested for the PVA nanocomposite films. The melt rheological properties of PVA nanocomposite film was measured in the linear viscoelstic region under oscillatory shear conditions. The elastic behavior is dominated in all frequencies, G' >> G", for the nanocomposite films. The storage modulus in the low frequencies region was increased with amount of nanoclay and correlated with the yield value in the solution state. It was concluded that in the PVA nanocomposite film a 3D microstructure of silicate layers was formed and controlled the rheological properties in all frequencies. This microstructure was initially established in the solution state, which dramatically increased the yield value and storage modulus of aqueous solution of PVA/Na-MMT.