

Effect of Polymer Concentration on the Rheological Properties of Polyelectrolyte Solutions

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Abstract : The rheology of aqueous solutions of polyelectrolyte (polyanionic cellulose, PAC) at high molecular weight was investigated using a controlled stress rheometer. Several rheological measurements; viscosity measurements, creep compliance tests at a constant low shear stress and oscillation experiments have been performed. The concentrations ranged by weight from 0.01 to 2.5% of PAC. It was found that the aqueous solutions of PAC do not exhibit a yield stress, the flow curves of PAC over a wide range of shear rate (0 to 1000 s⁻¹) could be described by the cross model and the Williamson models. The critical concentrations of polymer c^* and c^{**} have been estimated. The dynamic moduli, i.e., storage modulus (G') and loss modulus (G'') of the polymer have been determined at frequency sweep from 0.01 to 10 Hz. At polymer concentration above 1%, the modulus G' is superior to G'' . The relationships between the dynamic modulus and concentration of polymer have been established. The creep-recovery experiments demonstrated that polymer solutions show important viscoelastic properties of system water-PAC when the concentration of the polymer increases.

Keywords : polyanionic cellulose, viscosity, creep, oscillation, cross model

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