The influence of concentration and temperature on the rheological behavior of sodium carboxymethyl cellulose solutions

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The purpose of this work is to investigate the rheology of aqueous solutions of sodium carboxymethylcellul(Na-CMC) -a flexible polymer- at high molecular weight using a rotational viscosimeter at various concentrations (0.2, 0.4, 0.6, 0.8, 1.0 %) and different temperature (20-80°C). The Solutions were subjected to a programmed shear rate increasing linearly from 0 to 600 s-1 in 10 min. The obtained rheograms(apparent viscosity vs shear rate curves) showed that the addition in continuous of polymer to the water increases progressively the apparent viscosity. All Na-CMC solutions exhibit a shear-thinning non-Newtonian behavior The experimental results show that these fluids did not develop dynamic yield stresses for all concentrations and temperatures. The flow curves of polymer solutions over a wide range of shear rate have been fied using several rheological models such as Ostwald –de Waele power law and cross, to assess the concentration effect and the temperature on rheological parameters. Based on several statistical parameters (correlation coefficient, best index value and square error), the Cross and Carreau –yasuda rheological models described adequately the flow curves. The temperature dependency of the rheological parameters was modelled using a Turian approach. The apparent viscosity decreases as the temperature increases. The measured data can be fitted satisfactorily to the Arrhenius equation. The energy of activation for flow increased with concentration.

Keywords: *rheology, carboxymethylcelulose, viscosity, consistency index, flow index, temperature*

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