MECHANICAL DEGRADATION OF POLYMER SOLUTIONS : IMPACT ON SHEAR AND EXTENSIONAL VISCOSITIES

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The use of water soluble polymers such as polyacrylamide in enhanced oil recovery (EOR) aims at reducing the mobility of the injected fluid during flow by increasing its viscosity**.** However, harsh injection conditions cause the degradation of the polymer and hinder its efficiency**.** In this study, mechanical degradation of model aqueous solutions of PEO (polyethylene oxide) was undertaken through an abrupt contraction under fast transient flow (FTF) conditions. The experiments were carried out for various molecular weights M_w, and the critical extensional rate $\dot{\varepsilon}_c$, above which chain scission occurs, was determined. These experiments first confirmed the well established relationship, $\dot{\varepsilon}_c \propto 1/M_w$, in dilute regime. The originality of our experimental work was to establish a scaling law in the semi-dilute regime. Actually, a change in scaling exponent was observed when changing concentration regime,-which was interpreted on the basis of structural analysis. Shear viscosity and extensional properties were also investigated using respectively a controlled stress rheometer and a microfluidic device: the results show that extensional properties are much more affected than shear viscosity.