Influence of solvent properties on polyethylene-alkane solution viscosity: A torque scaling model

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Rheological investigations of polymers offer important insights into processing behavior and viscoelastic properties, which are closely linked to their molecular structure. These findings are essential for tailoring polymeric materials for specific applications. Moreover, understanding these relations can help predict changes in response to external parameters, such as temperature, variations during processing. [1]

The viscosity of polymer solutions is a critical parameter that plays a major role in polymer synthesis, such as solution and bulk polymerization, as well as in manufacturing and dissolution processes.
Solvent supported recycling relies on the dissolution of polymers, followed by purification, and reprecipitation. Viscosity holds significant importance in this process since it influences processability and efficiency in terms of energy consumption. [2]

This work focuses on the development of a torque scaling model for polyethylene-alkane blends.
Utilizing a laboratory scale mixer equipped with a torque sensor, the relationship between the carbon chain length of various alkanes and the corresponding torque measurements is systematically examined. Furthermore, the pursued model shall incorporate the influence of temperature (T) and the amount of solvent (m). The experimental temperatures are chosen below, near and above the melting temperature of polyethylene. An excess amount of solvent is used for the experiments. Ultimately, the model aims to evaluate and predict a relative viscosity shift based on chain length, temperature and solvent concentration.

Keywords: Polyethylene, viscosity, modelling

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