

On some application of rheology: Packaging sealing and swelling in gels

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ABSTRACT

In this presentation, two applications of rheological measurements will be illustrated: one in packaging sealing and the other on swelling in gels. In the first study, Elongational rheological measurements on various polyethylene resins (linear and branched) were used to evaluate the linear viscoelastic elongational viscosity and its correlation to molecular weight and adhesion strength. The results also showed that melt toughness, i.e. the area under the stress-strain curve in extensional flow, correlates well with the plateau sealing temperature, probably due to long chain branching.

In the second application, rheological measurements were used on smart hydrogels that can respond to external stimuli. In this study, we developed a fibrous structured poly(N-isopropylacrylamide) (PNIPAM) hydrogel and characterized its rheological behavior in swollen and shrunk states under different temperatures. Under small-amplitude oscillatory shear, we found that both storage and loss moduli were at least 8 times higher in the shrunk state compared with the swollen state. We also investigated the elastic response behavior through compression of the hydrogel using rheometry. We were able to detect the swollen/shrunk transition temperature of the hydrogel through monitoring the force change of the hydrogel as a function of temperature in the rheometer.