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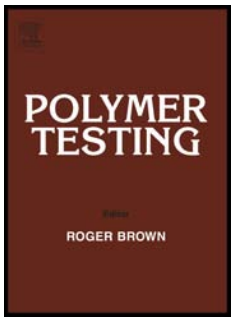

Detecting extensional viscosity of polypropylene melt using the Rheotens test: A comparison between standard and steady state test modes

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Test Method

Detecting extensional viscosity of polypropylene melt using the Rheotens test: A comparison between standard and steady state test modes

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ABSTRACT

The Rheotens test was used to determine the extensional viscosity of a polypropylene (PP) melt at three different extrusion velocities and using two capillaries with different length-to-diameter ratios. Results showed that, in the standard Rheotens test, the extensional viscosity curves determined under different testing conditions exhibit an obvious difference, especially under low extensional strain rates. This is attributed to the pre-orientation of macromolecular chains taking place in the capillary. Hence, a steady state Rheotens test was tentatively proposed. It was demonstrated that the extensional viscosity curves determined under most of the testing conditions by this test mode almost overlap, which is attributed to the fact that the pre-orientation of chains relaxes sufficiently near the capillary exit. This implies that equivalent extensional viscosities can be obtained under a wider range of extrusion velocities and capillary length-to-diameter ratios. Moreover, the equivalent extensional viscosities determined in the steady state Rheotens test exhibit good agreement with the extrapolated extensional viscosity curve determined using the Cogswell convergent flow method.

Keywords: Extensional viscosity; Polypropylene melt; Rheotens; Steady state test

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