

MEASURING TRANSIENT EXTENSIONAL VISCOSITY USING FILAMENT STRETCHING ON AN ARES G2 RHEOMETER

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ABSTRACT

Many polymer processing flows involve extensional flow, which makes the extensional viscosity measurement a valuable testing method. Currently, the most commonly used extensional viscosity measurement technique on rotational rheometers is using the counter-rotating drums (CRD), which is available via SER, EVA or EVF fixtures. In a CRD test, the sample is placed horizontally and attached to the surface of 2 drums with metal clips, then stretched by rotation of the drums which creates a constant Hencky strain rate. This type of measurement requires solid-like samples for loading and a relatively high viscosity after melting to prevent sagging during the course of testing. In this work, we program the axial motion of the ARES G2 to increase exponentially. Samples are confined between parallel plates and a filament is formed by the exponential stretching. The normal force transducer measures the transient extensional behavior of selected materials. In addition to higher viscosity molten polymers, this method allows extensional viscosity measurements on lower viscosity polymer melts and polymer solutions. By selecting the appropriate filament aspect ratio, we show that the measurements obtained by this method are in good agreement with the measurements from CRD test methods.