TA Instruments

Thermal Analysis & Rheology

RHEOLOGY SOLUTIONS

PROCESSING CHARACTERISTICS OF POLYCARBONATE/ ACRYLIC ALLOYS

PROBLEM

Subtle differences in batch-to-batch polymer alloy composition can significantly affect processability and final product quality. Hence, a test is desirable which can predict how a process should be altered to ensure consistent product .

SOLUTION

Controlled stress rheology, which assesses the flow properties of molten polymers at processing temperatures, provides a convenient technique for detecting batch-to-batch differences. Specifically, oscillatory tests, which subject the polymer to a cyclic stress, enable dynamic properties related to processability such as complex viscosity (η*) to be measured. Figure 1, for example, compares the complex viscosities of two batches of polycarbonate/acrylic alloy at several different potential processing temperatures as a function of frequency. As expected, at all the temperatures chosen, the viscosities for both batches decrease as the frequency (roughly speed of extrusion) is increased. Note that at 200°C, however, the two batches exhibit identical behavior. Hence, 200°C should be the best extrusion temperature for obtaining consistent product. Figure 2 compares the viscosities of the two batches at constant temperature (200°C) and constant oscillation frequency over time. The more rapid increase in viscosity for Batch B with time indicates lower stability (faster onset of decomposition). Therefore, a processing window less than 1000 seconds is desirable for consistent product.

Figure 1. POLYCARBONATE ALLOYS AT 180, 200, 220°C

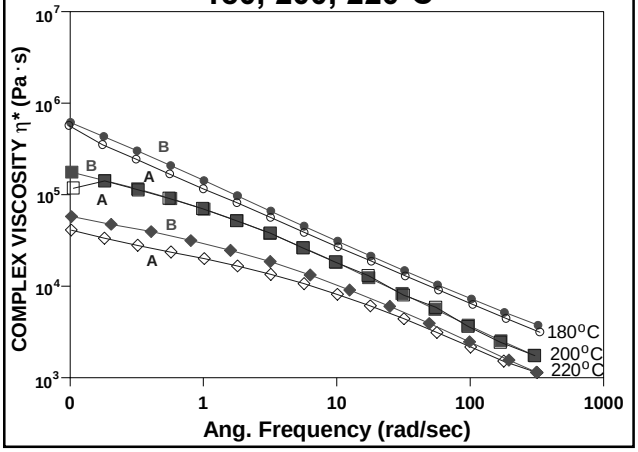
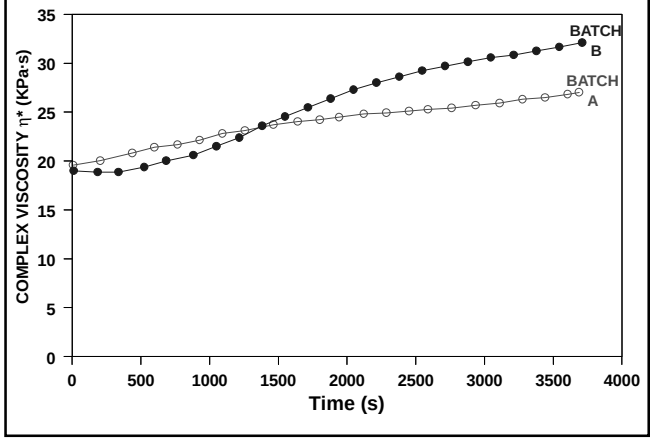


Figure 2. POLYCARBONATE ALLOYS THERMAL STABILITY AT 200°C



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