

Influence of Polymer Specimen Structure on The Reproducibility of Micro-thermomechanical Transitions

Abstract

Glass transitions of amorphous polystyrenes with low polydispersity were evaluated using the modulated Local Thermal Analysis mode of the TA Instruments 2990 μ TA and evaluating the thermomechanical signal. Transition temperature variance and fraction of transitions measured were compared for high molecular mass thermosetting materials and the melt of Nylon 6.6. The transition reproducibility was found to decrease as the molecular size of the polymer samples increased. Reproducibility also decreased for thermosetting materials when the experimental ramp rate was decreased. Heat transfer within the specimen was evaluated using finite element analysis, allowing scaling of microscale experimental results for comparison to bulk transitions.