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Polystyrene Nanocomposites: Shear and Bulk Rheology and PVT Behavior RAN TAO, SINDEE SIMON, Texas Tech University — One potential strategy to mitigate thermal residual stresses in polymer materials is to reduce the thermal pressure coefficient, a product of the bulk modulus and thermal expansion coefficient. Recent model predictions show that the liquid bulk modulus could decrease by incorporation of well-dispersed spherical nanoparticles into polymer matrix. In this work, the pressure-volume-temperature (PVT) behavior and pressure relaxation response of a 10 wt% silica nanoparticle-filled polystyrene nanocomposite sample are measured using a custom-built pressurizable dilatometer. The glass transition temperature (T_g) is calculated as a function of pressure from the PVT data, and the PVT data are fitted to the Tait equation. Isothermal pressure relaxation experiments are performed in the vicinity of the pressure-dependent T_g, from which the time-dependent bulk modulus is calculated. The temperature dependence of the horizontal shift factors is examined and compared to those obtained from the shear response. In addition, the retardation spectra for the bulk and shear responses are compared and the implications are discussed. The results are consistent with literature prediction indicating that bulk modulus will increase in aggregated nanocomposites system.

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