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Polymer Architecture Effects on the Viscoelastic Bulk Modulus
SINDEE SIMON, JIAXI GUO, Texas Tech University — The hypothesis that the bulk and shear responses arise from the same molecular mechanisms at short times but that the long-time chain mechanisms are unavailable to the bulk response is consistent with the results of our first work on polystyrene as well as with previous work by Plazek on an epoxy. Here we examine the effects of polymer architecture on the viscoelastic bulk modulus and its relationship to the shear response. A custom-built pressurizable dilatometer is used to study linear and star polystyrenes, as well as polycyanurates of differing crosslink density. The pressure-volume-temperature behavior (PVT) of the materials in the glassy and rubbery regimes is well characterized. In addition, at temperatures in the vicinity of the pressure-dependent glass transition temperature, the pressure relaxation response is measured, and this data is transformed to yield the time-dependent bulk modulus. Relaxation and retardation spectra derived from the bulk relaxation modulus measurements are compared to those from shear stress relaxation experiments.

Sindee Simon
Texas Tech University

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