

Abstract Submitted
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Thermodynamic Scaling of Polymer Dynamics versus Shifting by T-T_g JIAXI GUO, SINDEE SIMON, Texas Tech University — A universal scaling law for the relaxation time (τ) of amorphous liquids as a function of temperature and volume has been proposed by Roland and coworkers: $\tau(T,V) = F(TV^\gamma)$, where γ is a material-dependent constant. We test this law for four materials, linear polystyrene, star polystyrene, and two polycyanurate networks using PVT data obtained in our laboratory coupled with the temperature dependent shift factors used to reduce the viscoelastic bulk modulus at different pressures and the dynamic shear properties at ambient pressure. In all cases, τ can be reduced both by the scaling law and by shifting to account for the changes in T_g with pressure, i.e., by plotting versus $T - T_g(P)$. In the polycyanurate case, time-crosslink density superposition holds and τ for the two materials can be reduced simply by shifting the temperature with respect to T_g to account for the changes in T_g with crosslink density; however, the thermodynamic scaling for the two materials does not superpose unless the thermodynamic function is normalized by $T_g V_g^\gamma$. The validity of the scaling function and its relationship to $T - T_g$ will be further examined. In addition, the impact of errors in T , T_g , and V on the ability to satisfactorily reduce data and obtain universal scaling will be discussed.

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