Impact of a Temperature-Dependent Stretching Exponent on Glass Relaxation

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The nonexponential relaxation behavior of glass is governed by the dimensionless stretching exponent, $\beta$, which is typically assumed to be a constant but is more accurately described as a function of temperature. Herein, relaxation calculations of glassy materials are undertaken via an iterative differential equation-based algorithm to determine when the use of a temperature-dependent (or dynamic) stretching exponent is required to capture the industrially relevant evolution of fictive temperature components, which is necessary for process engineering. Results reveal a range of liquid fragility index ($m$) in which a static $\beta$ description is roughly equivalent to the behavior observed with a dynamic $\beta$. However, fast primary ($\alpha$) relaxation modes demonstrate unique behavior in systems exhibiting excessively strong or fragile liquid behavior when a temperature-dependent stretching exponent is considered. In this special issue dedicated to the International Year of Glass, we also provide broader perspectives regarding the importance and impact of a temperature-dependent $\beta$. 