

Abstract Submitted
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Framework for analyzing hyper-viscoelastic polymers¹ AKASH TRIVEDI, CLIVE SIVIOUR, Oxford Univ-USE 4643 — Hyper-viscoelastic polymers have multiple areas of application including aerospace, biomedicine, and automotive. Their mechanical responses are therefore extremely important to understand, particularly because they exhibit strong rate and temperature dependence, including a low temperature brittle transition. Relationships between the response at various strain rates and temperatures are investigated and a framework developed to predict response at rates where experiments are unfeasible. A master curve of the storage modulus's rate dependence at a reference temperature is constructed using a DMA test of the polymer. A frequency sweep spanning two decades and a temperature range from pre-glass transition to pre-melt is used. A fractional derivative model is fitted to the experimental data, and this model's parameters are used to derive stress-strain relationships at a desired strain rate. Finite element simulations with this constitutive model are used for verification with experimental data.

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