Simulation of Pressure-Shear Tests on Soft Elastomers Based on a Physically Motivated Constitutive Model

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Based on a master curve developed by Knauss (*Interim Report to ONR,* GALCIT, Pasadana, CA 2003*)* and a number of split Hopkinson-bar experiments, we have produced a model for the elastic-viscoelastic response of polyurea, an ealstomeric block co-polymer. The experimental observations suggest that the response of this class of polymers is strongly pressure-dependent. The model integrates the classical Williams-Landel-Ferry (WLF) time-temperature transformation and pressure sensitivity into a thermodynamically sound dissipation mechanism to develop a constitutive model that reliably predicts the material response over broad ranges of strains, strain rates, pressures, and temperatures. We show that using this model for the shear behavior of polyurea along with a nonlinearly elastic bulk response, one can successfully reproduce the very high strain rate pressure-shear experimental results reported by Jiao *et al.* (High strain rate response of an elastomer, in *Shock Compression of Condensed Matter 2005*, American Institute of Physics, New York, NY, 2005). We also compare the results with those obtained using a finite elasticity constitutive model.

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