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Nonlinear Elasticity and Cavitation of a Triblock Copolymer Gel SANTANU KUNDU, SEYED MEYSAM HASHEMNEJAD, MAHLA ZABET, SATISH MISHRA, Dave C. Swalm School of chemical engineering, Mississippi State University, MS State, MS — Polymer gels are subjected to large-strain deformation during their applications. The gel deformation at large-strain is non-linear and can often lead to failure of the material. Here, we report the large-strain deformation behavior of a physically cross-linked, swollen polymer gel, which displays unique strain-stiffening response at large-strain. Investigations were performed using large amplitude oscillatory shear (LAOS) and custom developed cavitation rheology techniques. Gent constitutive model, which considers finite extensibility of midblock, was fitted with the LAOS data, therefore, linking the estimated parameters from LAOS analysis to the structure of the gel. Cavitation experiments were conducted as a function of temperature. Both analytical method and finite-element based modeling have been implemented to capture the pressure response in cavitation experiments. Our results provide a critical understanding of gel failure mechanism at large-strain.

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