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Cavitation of a Physically Associating Gel SATISH MISHRA, SANTANU KUNDU, Mississippi State University — Self-assembly of block copolymers in selective solvents form ordered structures such as micelles, vesicles, and physically crosslinked gels due to difference in their interaction with solvents. These gels have wide range of applications in tissue engineering, food science and biomedical field due to their tunable properties and responsiveness with changing environmental conditions. Pressurization of a defect inside a physically associating gel can lead to elastic instability (cavitation) leading to failure of the gel. The failure behavior involves dissociation of physical networks. A thermoreversible, physically associating gel with different volume fractions of a triblock copolymer, poly (methyl methacrylate)-poly (n-butyl acrylate)-poly (methyl methacrylate) [PMMA-PnBA-PMMA] in 2-ethyl 1-hexanol, a midblock selective solvent, is considered here. Mechanical properties were investigated using shear rheology and cavitation experiments. The experimental data is fitted with a constitutive model that captures the stiffening behavior followed by softening behavior of a physical gel. Finite element analysis has been performed on cavitation rheology geometry to capture the failure behavior and to calculate energy release rate during cavitation experiments.

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