Electronic Supplementary Information (ESI)

Nonlinear Elasticity and Cavitation of a Triblock Copolymer Gel

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Gelation temperature: Figure S1 displays storage (G'_1) and loss (G''_1) moduli as a function of temperature ramp during cooling at 2°C/min for a sample with polymer volume fraction (ϕ) of 0.05. At T = 33 °C, $G'_1 = G''_1$, is considered as the gelation temperature for this gel.

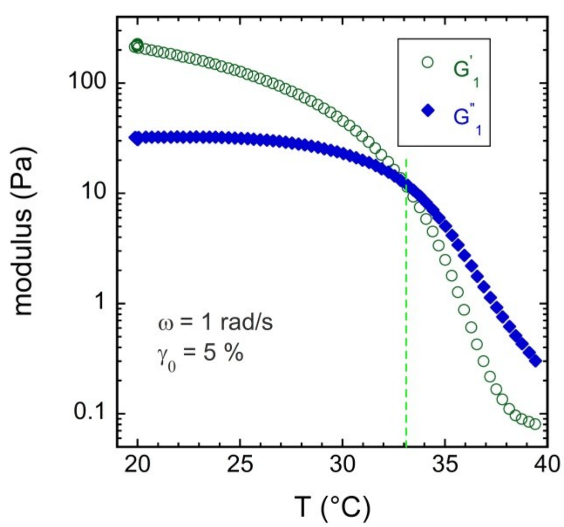

Figure S1: Storage (G'_1) and loss (G''_1) moduli as a function of temperature during cooling at 2°C/min.

Modulus Independency of geometry: Figure S2 compares the results obtained from 25 mm parallel plate and cone-plate geometries. Both these results are comparable.

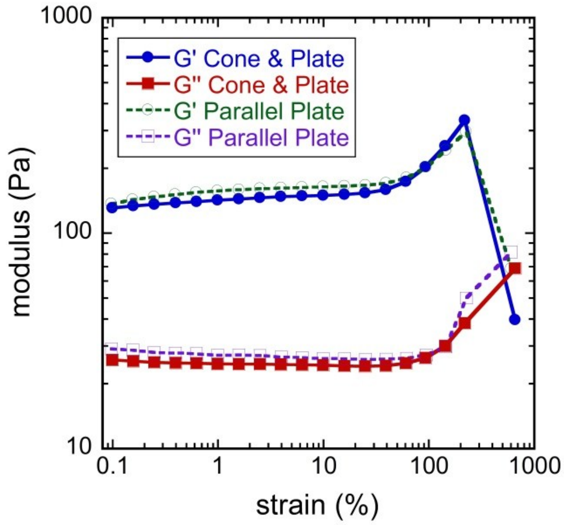

Figure S2: Storage (G'_1) and loss (G''_1) moduli for parallel and cone plate geometries; 22°C, ϕ = 0.05.

Moduli as a function of frequency**:** Figure S3 displays the results from frequency sweep tests at different strain amplitude values (γ_0 = 0.5, 10 and 200%) and temperatures (22°C and 6°C).

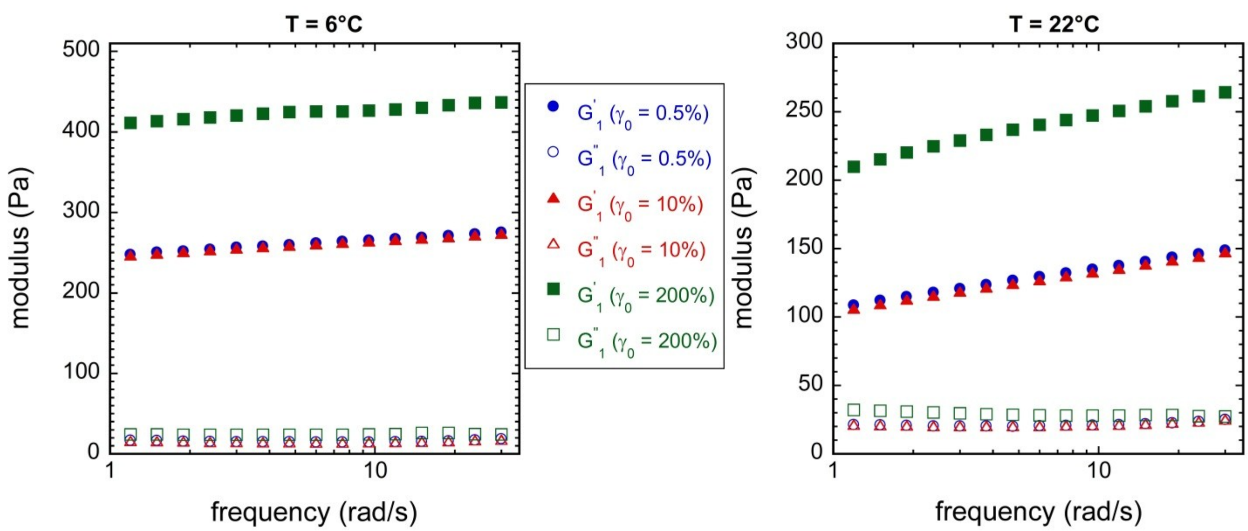

Figure S3: Storage (G'_1) and loss (G''_1) moduli as a function of frequency a) 6°C and b) 22°C. (ϕ = 0.05)

Fracture of gel under shear deformation**:** Figure S4 displays the initiation and propagation of fracture in the bulk gel captured using a high-speed camera.

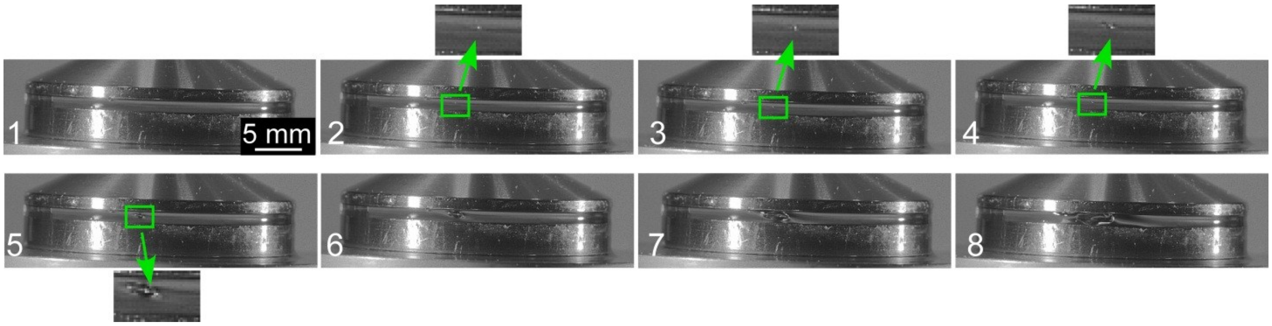

Figure S4: Micrographs of fracture initiation and propagation during the LAOS test, 1) zero strain value, 2) initiation of a defect or localized failure, 3-8) propagation of failure until the ultimate fracture. (ω = 1 rad/s, ϕ = 0.05, T = 22°C)

***Effect of polymer volume fraction on rheological behavior*:** Figure S5 displays storage modulus from LAOS experiments for different polymer volume fraction (ϕ). Increasing polymer concentration results in increasing elastic modulus.

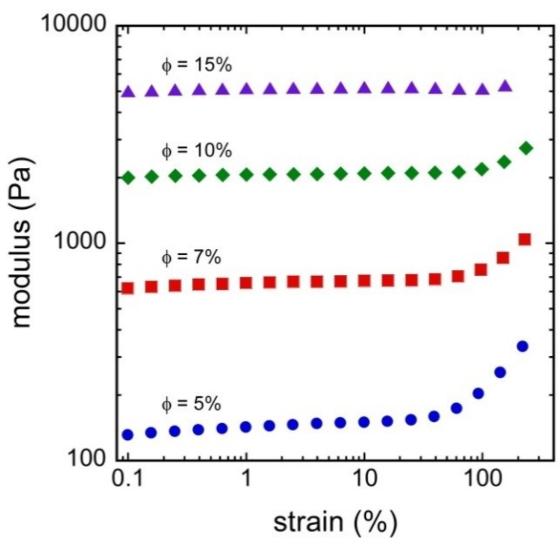

Figure S5: Elastic moduli for different polymer volume fractions (ϕ) at 22 °C and at a frequency of 1 rad/s.

Prediction of elastic modulus using surface energy of solvent: For neo-Hookean gel, $P_c = \frac{5}{6}E + \frac{2\Gamma}{r_{in}}$ (Eq. 17) and considering surface energy of pure solvent (0.026 J/m^2), the estimated Young's modulus ($E_{cavitation}$) is found to be higher than that measured by shear-rheology ($E_{rheology}$) . Figure S6 shows the ratio of Young's modulus estimated from cavitation experimental data using Eq. 17 ($E_{cavitation}$) and that obtained from shear-rheology ($E_{rheology}$) for different temperatures, and compression rates.

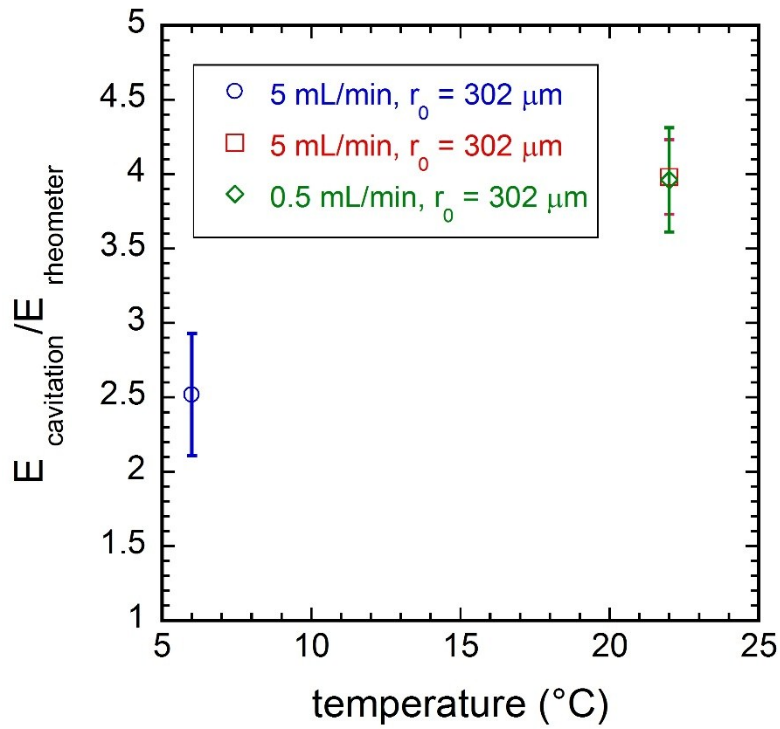

Figure S6: Ratio of shear-moduli estimated from cavitation data with respect to that obtained from shear-rheology for different temperatures, and compression rates. Here, shear modulus $G = E/2(1+ \upsilon)$, where υ is poison ratio, considered to be equal to 0.5. Eq. 17 with Γ = 0.026 J/m^2 (surface energy of pure solvent) was used to estimate $E_{cavitation}$.