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Effect of Salt and Temperature on Viscoelasticity of Gelatin Hydrogels

S. CHATTERJEE and H. B. BOHIDAR*

Polymer and Biophysics Laboratory, School of Physical Sciences, Jawaharlal Nehru University, New Delhi 110067, India.

Abstract — Rheology studies, on aqueous gelatin gels, were performed below gelation temperature ($T_g \approx 28^\circ\text{C}$) in the temperature range, $T = 5\text{--}25^\circ\text{C}$ as a function of NaCl concentration (0.01–0.1M). In the low frequency domain and at a given temperature, both the storage (G') and loss (G'') moduli exhibited power-law frequency dependence, $G' \sim \omega^{0.02 \pm 0.005}$ and $G'' \sim \omega^{0.8 \pm 0.2}$. The network size, ξ estimated from low-frequency relaxation modulus, $G_0 \approx k_B T / \xi^3$ increased three fold as the temperature was increased from 5 to 25°C indicating thermal swelling of the network. The strain peaks were observed to shift to higher frequency as the temperature was lowered. Higher salt concentration had the same effect on the gel as higher temperature.