



FRONTIERS IN MICRORHEOLOGY



Microrheology of the liquid-solid transition using microrheology

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Abstract: The viscoelastic properties of both physical and chemical polymer gels are characterized through the liquid-solid transition using multiple particle tracking microrheology. The mean-squared displacements of embedded probe particles are calculated at various extents of gelation, and time-cure superposition is performed to shift the data onto master curves before and after the gel point. By analyzing the shift factors on the basis of scaling relationships near the liquid-solid transition, we determine both the gel point and critical exponents. The gel point provides a key reference from which to define the kinetics of gelation, while the critical exponents provide insight into the gel connectivity. Both experimental systems exhibit a critical relaxation exponent $n \approx 0.6$, where $G' \sim G'' \sim \omega^n$ for the incipient gel, consistent with the Rouse model of dynamic scaling in the percolation universality class. Microrheology provides a robust means for characterizing the critical gelation behavior of emerging and scarce materials.



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