Abstract Submitted
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Flow Behavior near the Liquid-to-Solid Transition H. HENNING WINTER, University of Massachusetts Amherst — Amorphous materials are studied experimentally in search for viscosity/elasticity properties in the approach of the liquid-to-solid transition from the liquid side (LSTLS). Two vastly different processes are considered, gelation and glass transition. While viscoelasticity in incipient gels is dominated by the shorter relaxation modes, expressed in a decaying relaxation time spectrum, it is the opposite in a glass forming liquid near LSTLS which exhibits an advancing. For both classes of amorphous materials, the relaxation time spectrum broadens significantly near LSTLS and it shares the same powerlaw format. Still, the relaxation behavior differs fundamentally for the two material classes since the powerlaw exponent is positive for the glass transition and negative for gelation, i.e. the relaxation patterns of gelling fluids and glass formers are inverse near LSTLS. The entire study is founded in Boltzmann's constitutive equation of linear viscoelasticity; the stress is caused by a wide range of modes where, as argued here, short modes dominate gelation and long modes dominate the glass transition. Several examples are shown for each class of materials in order to test the proposed transition behavior for glasses (colloidal and molecular) on the one side and chemical/physical gels on the other. One of the results of this experimental study is that it provides a decisive criterion that distinguishes the glass transition from gelation.

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