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Scaling of non-linear viscoelastic transitions in soft colloidal glasses MATTHEW HELGESON, NORMAN WAGNER, Center for Mol. and Eng. Thermodynamics, Dept. of Chemical Engineering, Univ. of Delaware, Newark, DE 19711, DIMITRIS VLASSOPOULOS, FORTH, Inst. of Electronic Structure and Laser, Gr-71110, Heraklion, Crete, Greece — Soft colloidal particles undergo a transition to a glass-like state at sufficient concentration, due to kinetic trapping, similar to the glass transition in hard sphere systems. In this work we explore the use of rheological measurements as a tool to probe the mechanisms that lead to structure formation and breakage under shear in the glassy state for a monodisperse solution of multi-arm star polymers in an athermal solvent. Maxima in the loss moduli are observed with increasing strain amplitude at the onset of shear melting. We show that the transition to non-linear viscoelastic behavior and the onset of flow follow a systematic, rate-dependent trend. Specifically the critical strain increases with frequency. We discuss this trend in terms of phenomenological understanding of the kinetic trapping of soft colloids in the glassy state, leading to characterization of the softness of the colloidal glass as well as mechanisms of shear melting.

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