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Experimental Timescales of Fracture-Healing Rheological Behavior of Thermoreversible Gels TRAVIS L. THORNELL, KRITHIKA SUBRAMANIAM , KENDRA A. ERK, School of Materials Engineering, Purdue University — Acrylic thermoreversible physical gels were used as a model soft material system to investigate fracture-healing behavior by shear rheometry. By using shear start-up experiments, gels at various concentrations and temperatures were measured to determine shear stress responses, and fracture was indicated by a decrease in shear stress (confirmed with rheophysical flow visualization experiments). Fractured gels were allowed to recover in the rheometer for set periods of time and were tested again using the same shear start-up procedure to evaluate the recovery kinetics of network strength. Relationships between the network recovery and the normalized ratio of the resting times and characteristic relaxation times of the gels were determined. It was found that resting times for fully healed networks needed to be 2 or 3 orders of magnitude greater than the relaxation times. The extent of fracture was also investigated. Gels that were deformed to smaller total strain magnitudes were suspected to have incomplete (or partial) fracture as results showed various responses for given resting times.

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