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Protein gelation kinetics near the overlap concentration PASHA TABATABAI, Georgetown University, BENJAMIN PARTLOW, DAVID KAPLAN, Tufts University, DANIEL BLAIR, Georgetown University — Proteins can be crosslinked to form gel networks either as a tool to study biological problems or as a method for creating novel materials. The bulk mechanical properties of protein gels in steady state are a manifestation of the gel structure, but the polymerization kinetics are often disregarded. Using the gelation of an aqueous denatured silk protein solution as a model polymer system, we probe the gelation kinetics (modulus vs. time) and find two regimes that depend on whether the initial protein concentration (c) is near or below the overlap concentration ($c*$). We find that systems with $c/c* \sim 1$ exhibit immediate and single-mode modulus growth until the completion of polymerization that can be scaled onto a characteristic polymerization curve. However, systems with $c/c* < 1$ display delayed modulus development followed by two-stage modulus growth that can be normalized onto a separate distinctive polymerization curve. These two regimes are probed by changing both the initial concentration and the overlap concentration separately, emphasizing the importance of the overlap concentration on the assembly of polymeric/complex fluids.

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