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Investigating collagen self-assembly with optical tweezers microrheology NANCY FORDE, Department of Physics, Simon Fraser University, MARJAN SHAYEGAN[1], Department of Chemistry, Simon Fraser University, TUBA ALTINDAL, Department of Physics, Simon Fraser University — Collagen is the fundamental structural protein in vertebrates. Assembled from individual triple-helical proteins to make strong fibres, collagen is a beautiful example of a hierarchical self-assembling system. Using optical tweezers to perform microrheology measurements, we explore the dynamics of interactions between collagens responsible for their self-assembly and examine the development of heterogeneous mechanics during assembly into fibrillar gels. Telopeptides, short non-helical regions that flank the triple helix, have long been known to facilitate fibril self-assembly. We find that their removal not only slows down fibril nucleation but also results in a significant frequency-dependent reduction in the elastic modulus of collagens in solution. We interpret these results in terms of a model in which telopeptides facilitate transient intermolecular interactions, which enhance network connectivity in solution and lead to more rapid assembly in fibril-forming conditions.

[1]Current address: Department of Physics, McGill University

Nancy Forde
Department of Physics, Simon Fraser University

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