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Stretching Networks of Helical Polymers GUSTAVO A. CARRI, RICHARD BATMAN, Department of Polymer Science, The University of Akron, Akron, OH 44325-3909 — We present a computational study of the stress-strain behavior of a network of helical polymers. For this study, we employ a combination of Monte Carlo simulations based on the Wang-Landau algorithm and the traditional three-chain model of polymer networks. The helical polymers are described with a recently developed model (V. Varshney *et. al.*, *Macromolecules* **2004**, 37, 8794) that has proven to capture the configurational, conformational and thermodynamic properties of single helical polymers correctly. In this talk, we will focus on the mechanical and thermodynamic properties of the network as a whole together with the conformational and configurational characteristics of a single chain in the network. We find that the mechanical response of the network is strongly dependent on temperature. For example, for the same amount of strain the network is stiffer at temperatures below the helix-coil transition temperature than at temperatures above it. In addition, we find that the stress-strain curve is *non-monotonic*, indicating that the network *softens* at high enough elongations due to the *force-induced melting* of the helical structures.

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