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Investigation of Natural *Bombyx mori* Silk Fibroin Proteins Using INS CHRISTOPHER CRAIN, NICHOLAS STRANGE, J.Z. LARESE, Univ of Tennessee, Knoxville — The mechanical properties of many protein comprised biomaterials are a direct reflection of non-covalent (i.e. weak) interacting ions such as F-actin in muscles, tubulin in the cytoskeleton of cells, viral capsids, and silk. Porter and Vollrath underscored the two main factors that are critical for understanding the high mechanical strength of silks: the nanoscale semi-crystalline folding structure, which gives it exceptional toughness and strength, and the degree of hydration of the disordered fraction, which acts to modify these properties. Understanding and controlling these two principal factors are the key to the functionality of protein elastomers, and render silk an ideal model protein for (bio)material design. We will describe our investigation of electrospun silk of the *Bombyx mori* (silk worm), using Inelastic Neutron Scattering (INS). These techniques were used to investigate the microscopic dynamics of the dry and hydrated protein.

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