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Fluid Mechanical Properties of Silkworm Fibroin Solutions AKIRA MATSUMOTO, AMIL LINDSAY, DAVID KAPLAN, BEHROUZ ABE-DIAN, School of Engineering, Tufts University — The aqueous solution behavior of silk fibroin is of interest due to the assembly and processing of this protein related to the spinning of protein fibers that exhibit remarkable mechanical properties. To gain insight into the origins of this functional feature, it is desired to determine how the protein behaves under a range of solution conditions. Pure fibroin at different concentrations in water was studied for surface tension, as a measure of surfactancy. In addition, shear induced changes on these solutions in terms of structure and morphology was also determined. Fibroin solutions exhibited shear rate-sensitive viscosity changes and precipitated at a critical shear rate where a dramatic increase of 75-150% of the initial value was observed along with a decrease in viscosity. In surface tension measurements, critical micelle concentrations were in the range of 3-4% w/v. The influence of additional factors, such as sericin protein, divalent and monovalent cations, and pH on the solution behavior in relation to structural and morphological features will also be described.

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