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Heat Capacity of the Silk-Water System Based on Vibrational-Motions of Poly(amino acid)s and Water. MAREK PYDA, Rzeszow University of Technology, XIAO HU, PEGGY CEBE, Tufts University — The experimental heat capacities of *B. Mori* silk-water system are presented based on measurements by standard differential scanning calorimetry. Effect of plasticizing of silk by molecules of water leads to lowering of T_g of amorphous silk fibroin in the presence of water. The calculated heat capacities of silk fibroin with water were determined based on the vibrational motions of poly(amino acid)s and water, using the Advanced Thermal Analysis System (ATHAS) Data Bank. The heat capacities, C_p, of silk-water were linked to their vibrational spectra based on the group and skeletal vibration contributions. The heat capacity of the solid silk-water system, below T_g, was estimated from a sum of linear combinations of the molar fractions of the vibrational heat capacities of dry silk and glassy water. The vibration heat capacity of dry silk was constructed using a sum of vibrational heat capacity of poly(amino acid)s components. Calculations are compared to experimental data obtained from calorimetric methods, using hermetic and non-hermetic pans. The approach presented allows one to predict the low temperature vibrational heat capacity for the silk-water system down to zero kelvin, and, together with an extension to higher temperatures, above T_g. This can be used as a reference baseline for quantitative thermal analysis of this biomaterial with water.

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