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Quantitative study on the performance of CMCS/SA composite fibers by regulating hydrogen bonding proportions

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Thermodynamic properties of CMCS/SA composite fibers

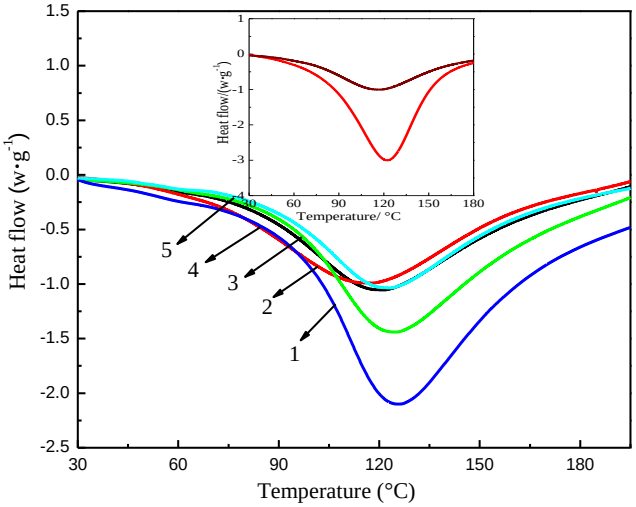

Fig. S1. DSC curves for CMCS/SA composite fibers with different inter-MHB proportions (1-24.8, 2-26.5, 3-27.3, 4-28.8, 5-29.7). DSC curve of pure CMCS and SA fibers is presented in the inset.

Table S1

Thermal performance parameters of composite fibers with different inter-MHB proportions

Sample (intermolecular hydrogen bond proportion)	Melting enthalpy $\triangle H_m$ (J/g)	Melting peak T_m (℃)
CMCS (14.9)	515.5	125. 90
SA (22.3)	309.7	119.39
CMCS/SA (24.8)	487.8	124.89
CMCS/SA (26.5)	434.3	123.95
CMCS/SA (27.3)	386.5	123.65
CMCS/SA (28.8)	351.2	121.97
CMCS/SA (29.7)	311.9	121.84

In order to study the influence of different inter-MHB proportions on the thermal properties of composite fibers, DSC tests were performed on CMCS/SA composite fibers with various inter-MHB proportions. In figure S1, it can be seen that the DSC curves of pure CMCS fibers, pure SA fibers, and CMCS/SA composite fibers all have one endothermic peak, indicating that the composite system has very good compatibility. By the comparison of the endothermic peaks of all DSC curves in Figure S1, it can be found that the endothermic peak of CMCS/SA composite fibers is between pure CMCS and SA, it is dues to the hydrogen bonding between the two macromolecules promoting the compatibility of the composite system. It can be observed in Table S1 that as the inter-MHB proportion increases, the endothermic peak of the composite fibers shifts to the low-temperature direction. It probably resulted from imperfect crystallization contributed by the increasing intermolecular hydrogen bond proportion between CMCS and SA. The data results obtained from the differential scanning heat meter after the TI software analysis can be seen that the hot peaks caused by the composite adsorption of the composite fiber have a certain impact on the hot peak. The main reason is that the polymer molecular chain decomposition generates peak changes. It possibly referring to processes such as the break of electrostatic interactions and decomposition of carboxyl groups and glucosamine units.[1]

References

[1] Morandim-Giannetti A, Wecchi P , PDA Silvério, et al. Attainment and characterization of carboxymethyl chitosan hydrogels by enzymatic cross-linking[J]. J. Therm. Anal. Calorim. 2019, 138(5):3635-3643.