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Polymer Structure and Water States in Salt-Containing Polyampholyte Hydrogels XINDA LI, Univ of Alberta, JANET A.W. ELLIOTT, Department of Chemical and Materials Engineering, University of Alberta, Edmonton, Alberta, T6G 2V4, Canada, BYEONGDU LEE, Advanced Photon Source, Argonne National Laboratory, Argonne, Illinois 60439, U.S.A., HYUN-JOONG CHUNG, Department of Chemical and Materials Engineering, University of Alberta, Edmonton, Alberta, T6G 2V4, Canada — The phase behavior of water in hydrogels has broad impact on various applications, such as lubrication, adhesion, and electrical conductivity, as well as the hydrogel's low temperature properties. The status of the water molecules is correlated to the structure of the polymer chains in the hydrogel. In this study, the structure and water status of a model charge-balanced polyampholyte poly(4-vinylbenzenesulfonate-co-[3-(methacryloylamino) propyl] trimethylammonium chloride), were investigated by using differential scanning calorimetry (DSC) and small-angle x-ray scattering (SAXS). A globular network structure suggested by SAXS results dictated the depression of the freezing point of water in the hydrogel, as supported by the DSC results. The polyampholyte chains undergo an irreversible collapse during dialysis in deionized water. Such collapsed hydrogels are not able to prevent freezing of water molecules. The results of both synthesis condition and post-synthesis treatments for polyampholyte hydrogels provide us insights to design optimal polyampholyte hydrogels for low temperature applications.

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