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Temperature Effect on Water Sorption: from Nanoconfined Water in SWNTs to the Hydration Water of Proteins[1] HAI-JING WANG, XUE-KUI XI, ALFRED KLEINHAMMES, YUE WU, University of North Carolina at Chapel Hill — The properties of water under nanoconfinement and at interfaces of biomolecules play a pivotal role in a variety of important phenomena such as the protein folding and functions. Water inside single-walled carbon nanotubes (SWNTs) can provide an ideal system for investigating nanoconfined interfacial water on hydrophobic surfaces, provided that the SWNTs can be opened without introducing excess defects. Here, we report a hydrophobic-hydrophilic transition upon cooling from 22 $^\circ$C to 8 $^\circ$C via the observation of water adsorption isotherms in SWNTs measured by nuclear magnetic resonance. A considerable slowdown in molecular reorientation of such adsorbed water was detected. The thermodynamics of protein hydration was also studied by water sorption. The temperature effect on the isotherms could reveal the mechanism of protein hydration. These observations demonstrate that the structure and dynamics of interfacial water could depend sensitively on temperature, which could lead to intriguing temperature dependences involving interfacial water.

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