

## **Description of Additional Supplementary Files**

**File Name: Supplementary Movie 1**

**Description:** Thin Water Supply within PDA-assembled Microchannel (below LCST).

**File Name: Supplementary Movie 2**

**Description:** Bulk Water Flow and Saturated in the Whole Porous Structure (above LCSTfocused).

**File Name: Supplementary Movie 3**

**Description:** Salt Dissolving and Backflow assisted by thermo-responsive layer.

**File Name: Supplementary Movie 4**

**Description:** Micro-CT Visualization of Water Layer within p-SDWE.