

Description of Additional Supplementary Files

File Name: **Supplementary Movie 1**

Description: Molecular dynamics simulates thermodynamic processes.

File Name: **Supplementary Movie 2**

Description: Water absorption process of CNF-III aerogel (captured by a microscope).

File Name: **Supplementary Movie 3**

Description: Water absorption process of CNF- I aerogel (captured by a microscope).

File Name: **Supplementary Movie 4**

Description: The aerogel was compressed and rebounded on a 200 °C hot plate (captured by an infrared camera).

File Name: **Supplementary Movie 5**

Description: CNF-III @Si aerogel rebounding a steel ball (captured by a high-speed camera).