Supporting Information for

Facile Fabrication of Robust and Stretchable Cellulose Nanofibers/Polyurethane Hybrid Aerogels

Yating Wang†,‡, Xiang Li†,‡, Huan Cheng†,‡, Bijia Wang†,‡, Xueling Feng†,‡, Zhiping Mao†,‡, Xiaofeng Sui†,‡*

† Key Lab of Science and Technology of Eco-Textile, Ministry of Education, College of Chemistry, Chemical Engineering and Biotechnology, Donghua University, No. 2999 North Renmin Road, Shanghai, 201620, People's Republic of China

‡ Innovation Center for Textile Science and Technology of DHU, Donghua University, No. 2999 North Renmin Road, Shanghai, 201620, People's Republic of China

*Corresponding authors: Tel.: +86 21 67792605. Fax: +86 21 67792707.

E-mail: suixf@dhu.edu.cn (Xiaofeng Sui)

Supporting information consists of 5 pages, 4 Tables, 5 Figures and 2 Videos.

Table S1. The compositions of the CNF/PU hybrid aerogels

Samples	CNF aerogel (wt%)	PU (wt%)	Density (g/cm^{3})
CNF aerogel	100	0	0.03
CNF/PU-48	52	48	0.06
CNF/PU-66	34	66	0.09
CNF/PU-75	25	75	0.12

Table S2. Thermal parameters of the CNF/PU/octadecane composites

Samples	PCM content (wt%)	ΔH_m (J/g)	ΔH_c (J/g)
CNF/PU-48/octadecane	92.5	223.3	222.8
CNF/PU-66/octadecane	87.1	207.6	207.8

Table S3. Thermal conductivity of octadecane and CNF/PU/octadecane composites

Samples	Thermal conductivity ($Wm^{-1}K^{-1}$)
octadecane	0.32±0.01
CNF/PU-48/octadecane	0.23±0.02
CNF/PU-66/octadecane	0.25±0.06
CNF/PU-75/octadecane	0.23±0.03

Table S4. Thermal parameters of CNF/PU-75/octadecane after different thermal cycling numbers

Cycling numbers	T_m (℃)	T_c (℃)	ΔH_m (J/g)	ΔH_c (J/g)
1^{th}	37.6	16.6	190.0	189.7
25^{th}	36.6	18.1	190.1	188.9
50^{th}	36.6	17.9	189.0	188.7
75^{th}	36.6	18.4	188.3	187.4
100^{th}	36.6	18.4	187.1	186.2

T_m: melting temperature, T_c: crystallization temperature, ΔH_m: melting enthalpy, ΔH_c: crystallization enthalpy.

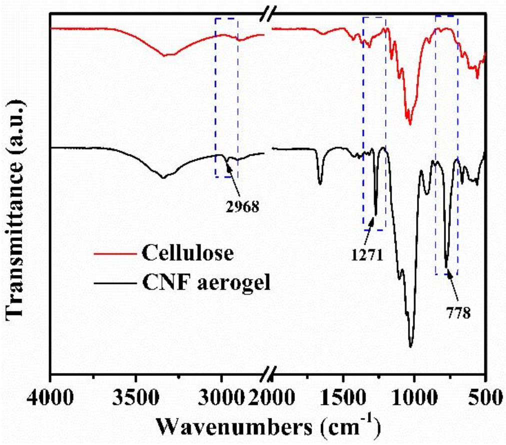

Fig.S1. FTIR spectra of the cellulose and the CNF aerogel

The FTIR spectra of the cellulose and CNF aerogel are compared in Fig.S1. The new peaks at 778 cm^{-1} in the CNF aerogel spectrum is assigned to C-Si asymmetric stretching vibration. The peak at 1100 cm^{-1}-1130 cm^{-1} was belonged to the stretching absorption peaks of the Si-O-Si bonds, overlapping with the peaks of the C–O bonds of cellulose. The new peak at 1271 cm^{-1} and 2968 cm^{-1} correspond to the stretching and bending vibration of -CH_3 in the siloxane compounds. The above results confirmed the successful occurrence of polysiloxane reaction between cellulose and methyl-trimethoxy silane.

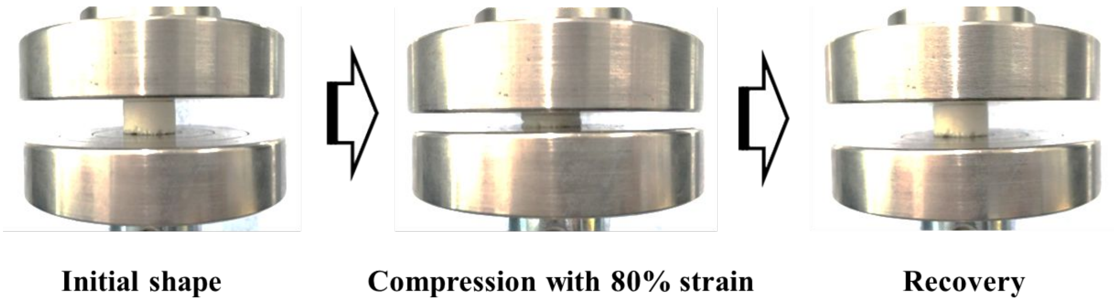

Fig.S2. Shape recovery process of CNF/PU-75

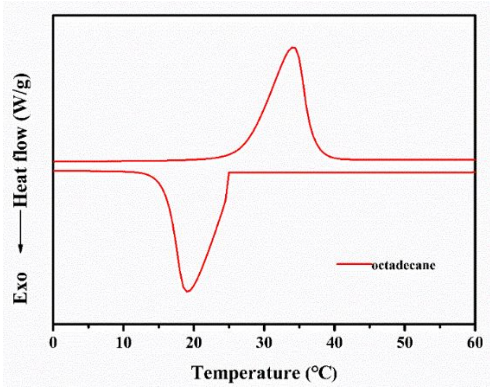

Fig.S3. DSC curves of octadecane

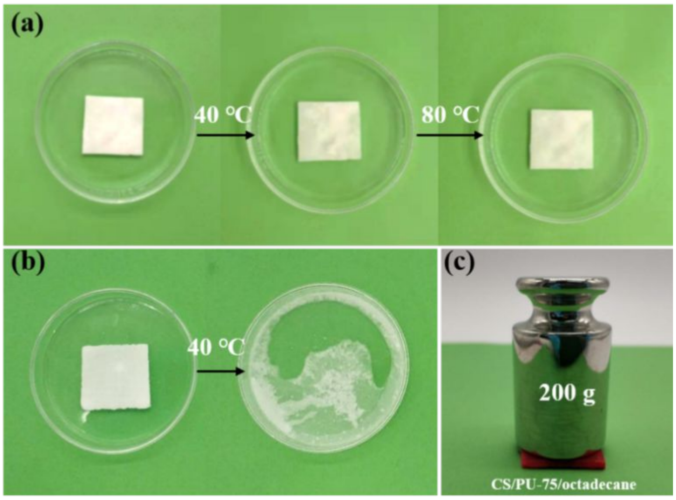

Fig.S4. Shape stability of (a) CNF/PU-75/octadecane and (b) octadecane with increasing temperature. (c) The mechanical stability of CNF/PU-75/octadecane at 40 °C.

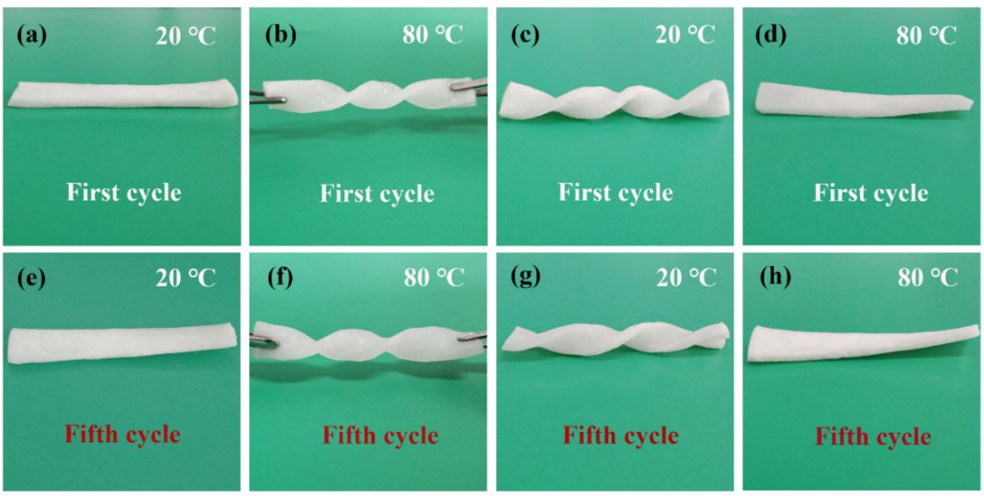

Fig.S5. Shape memory behavior of the CNF/PU-75/octadecane at 80 ℃. a-d Images showed the shape memory process of the CNF/PU-75/octadecane. e-h Images showed the CNF/PU-75/octadecane recovered its permanent shape after five cycles.