

Electronic Supplementary Information:

Cellulose Nanofibers/Polyurethane Shape Memory Composites with Fast Water-Responsivity

Yongzhen Wang,^a Zhongjun Cheng,^{b*} Zhenguo Liu,^a Hongjun Kang^a and Yuyan Liu^{a*}

a MIT Key Laboratory of Critical Materials Technology for New Energy Conversion and Storage, School of Chemistry and Chemical Engineering, Harbin Institute of Technology, Harbin 150001, PR China. *E-mail: liuyy@hit.edu.cn.

b Natural Science Research Center, Academy of Fundamental and Interdisciplinary Sciences, Harbin Institute of Technology, Harbin 150001, PR China. *E-mail: chengzhongjun@iccas.ac.cn.

Contents:

1. Supplementary figures (Fig. S1-S4)
2. Supplementary table (Table. S1)

Table. S1 The comparison of water-responsive shape recovery speed for PU/CNF composites here and other polymer-cellulose shape memory composites reported.

Shape memory materials	Thickness (mm)	Responsive temperature	Responsive time	Re
Polyurethane (88T90)-cellulose nanofibers composites	0.1-0.2	RT	1 min	here
Poly(glycerol sebacate urethane)-cellulose composites	0.15-0.25	37°C、22°C	30 min	31
Polyurethane-cellulose composites (PU/CNW)	0.2-0.3	37°C	within 24 h	42
Polycaprolactone-polyethylene glycol-CNC nanocomposites	0.15	37	5 min	28
Poly(D,L-lactide)/microcrystalline cellulose composites	0.15	37°C	within 60 min	32
Cellulose/elastomer nano-composites	0.1-0.2	RT	10 min	33
Poly(propylene carbonate)-microfibrillated cellulose	0.5	30°C	60 min	29,30

RT-Room Temperature

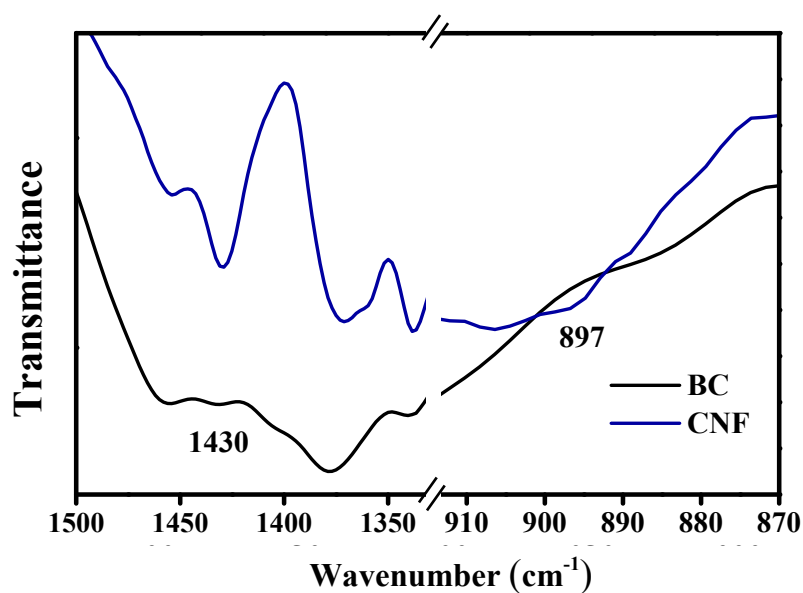


Fig. S1 The IR spectra of characteristic peaks at 1430 cm⁻¹ and 897 cm⁻¹ for BC and CNF

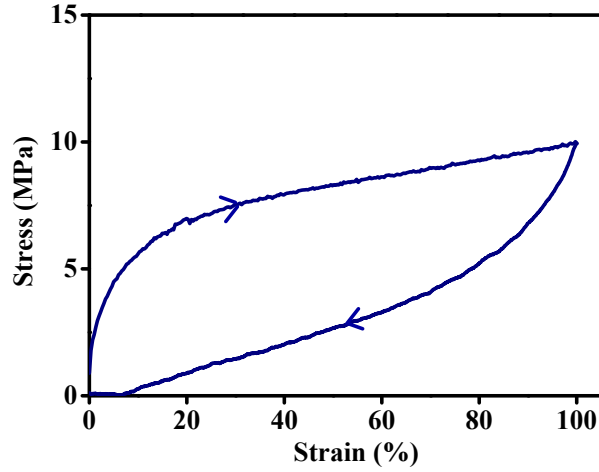


Fig. S2 The cycle stress-strain curves of PU/CNF-30 wetting film.

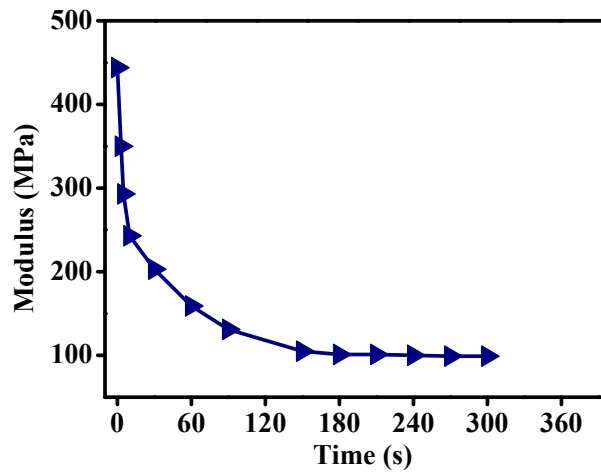


Fig. S3. Storage modulus of PU/CNF-30 nanocomposite films as a function of immersion time in water.

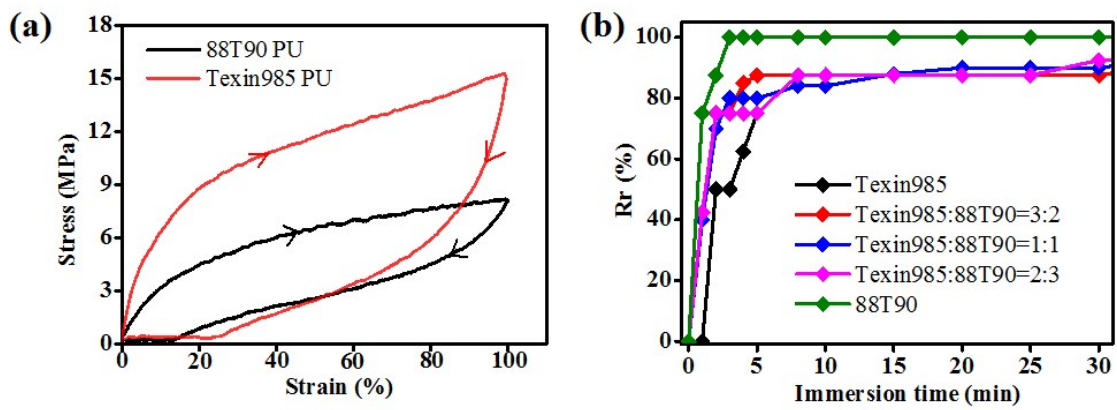


Fig. S4 The cycle stress-strain curves of Texin985 PU film and 88T90 PU film (a). The shape recovery ratio (R_r) of PU/CNF composited films with different polymer matrix compositions including pure Texin985 polyurethane, pure 88T90 polyurethane and composited film with Texin985:88T90 = 3:2, 1:1, 2:3.