

Supplementary Information

Novel flexible phase change composite with electro-driven shape memory, energy conversion/storage and motion sensing properties

Malik Muhammad Umair,^a Yuang Zhang,^a Shufen Zhang,^a Xin Jin^b and Bingtao Tang^{*,a,b}

^aState Key Laboratory of Fine Chemicals, Dalian University of Technology, Dalian 116024, China.

^bEco-chemical Engineering Cooperative Innovation Center of Shandong, Qingdao University of Science and Technology, Qingdao 266042, PR China

* Corresponding author. Tel.: +86 411 84986267

E-mail address: tangbt@dlut.edu.cn (B. Tang).

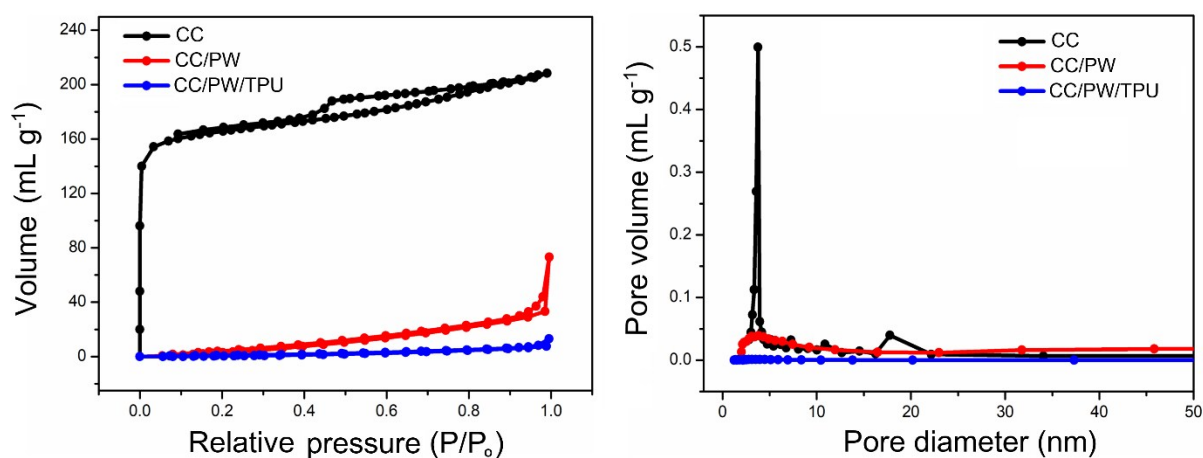


Fig. S1. BET analysis of CC, CC/PW and CC/PW/TPU. (a) N₂ adsorption and desorption isotherms and (b) the corresponding pore size distributions.

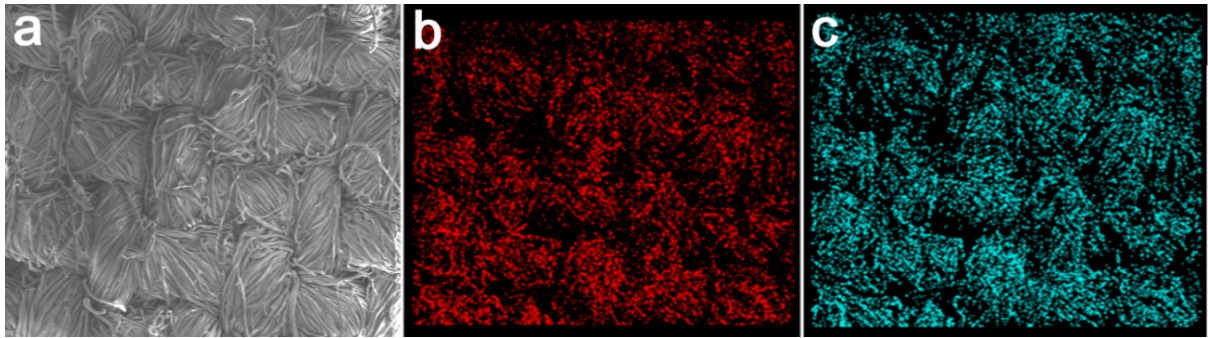


Fig. S2. (a) SEM image of pristine cotton cloth and its elemental mapping showing presence of almost equal composition ratio of (b) C and (c) O elements.

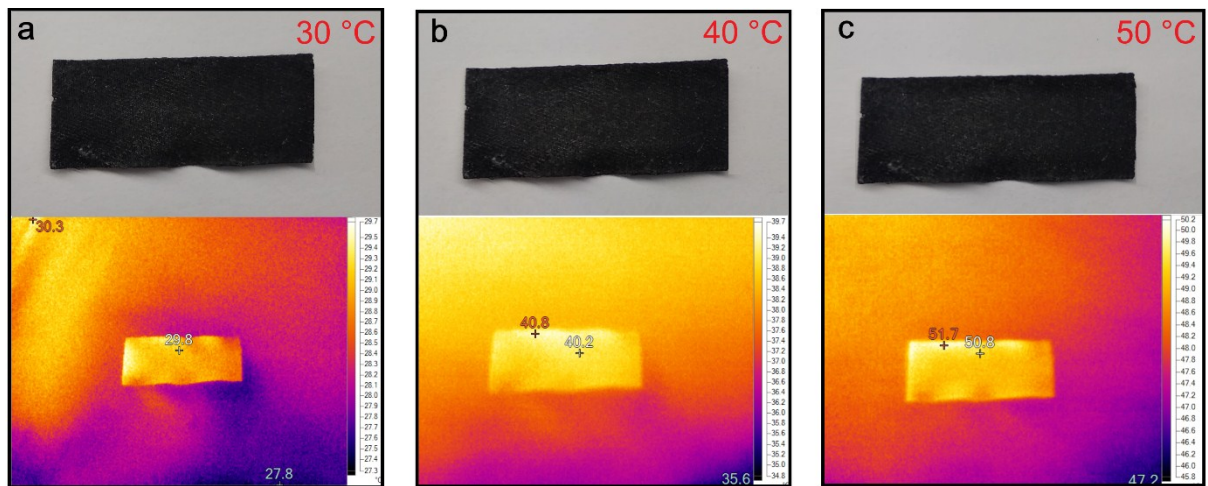


Fig. S3. Form-stability test of CC/PW/TPU performed by heating each time for 15 mins at various temperatures.

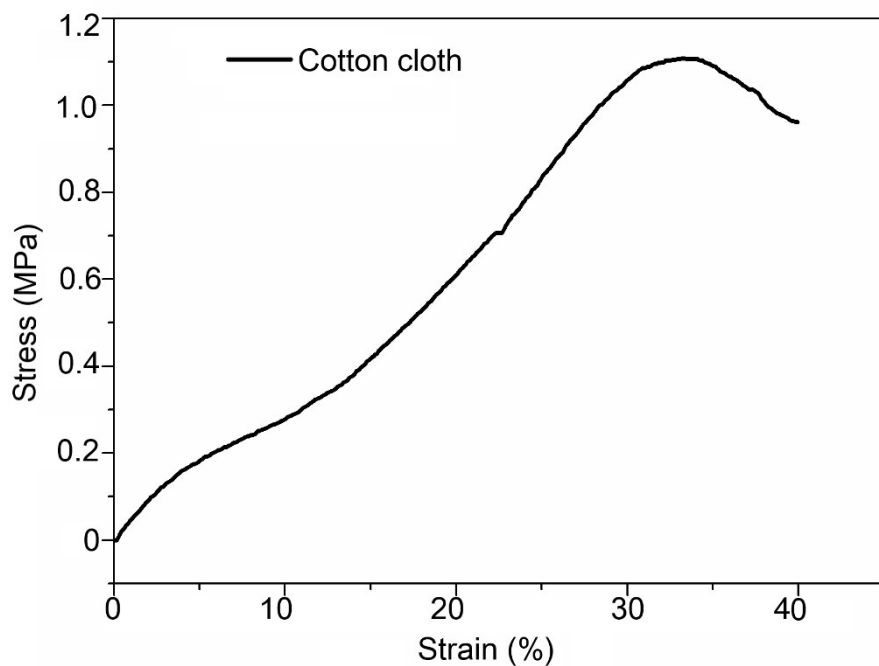


Fig. S4. The stress-strain curves of cotton cloth obtained at a crosshead speed of 10 mm min^{-1} .

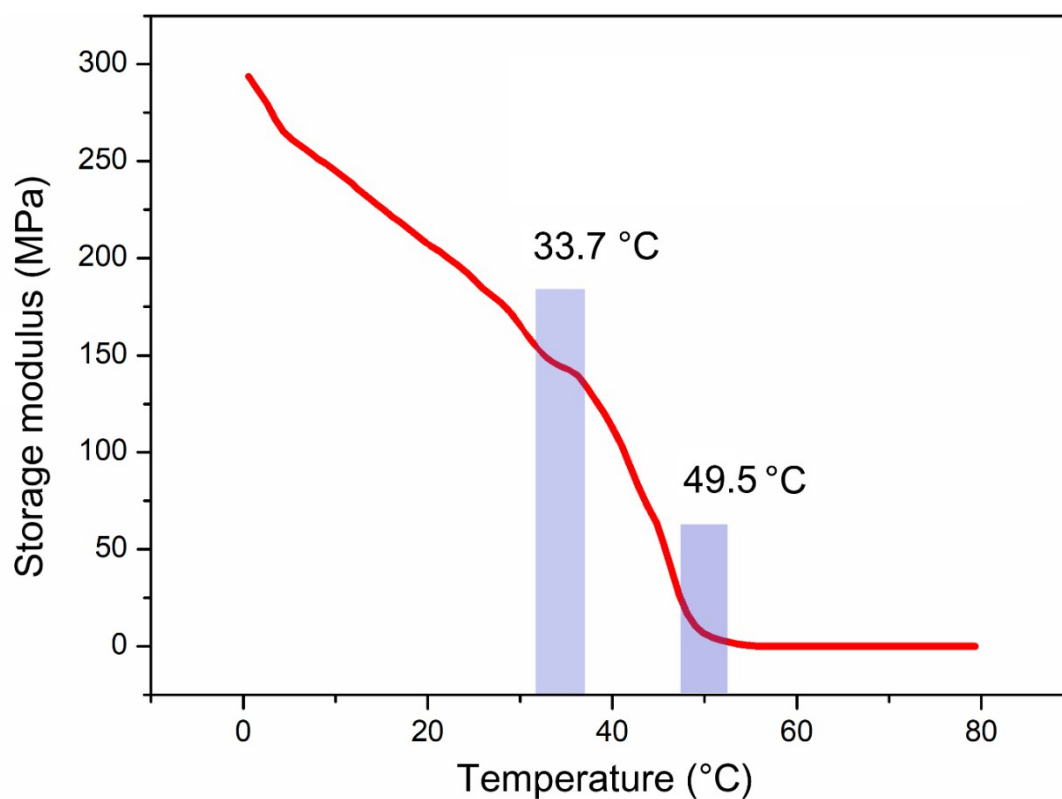


Fig. S5. DMA analysis of CC/PW/TPU showing onset transition temperatures of PW and TPU.

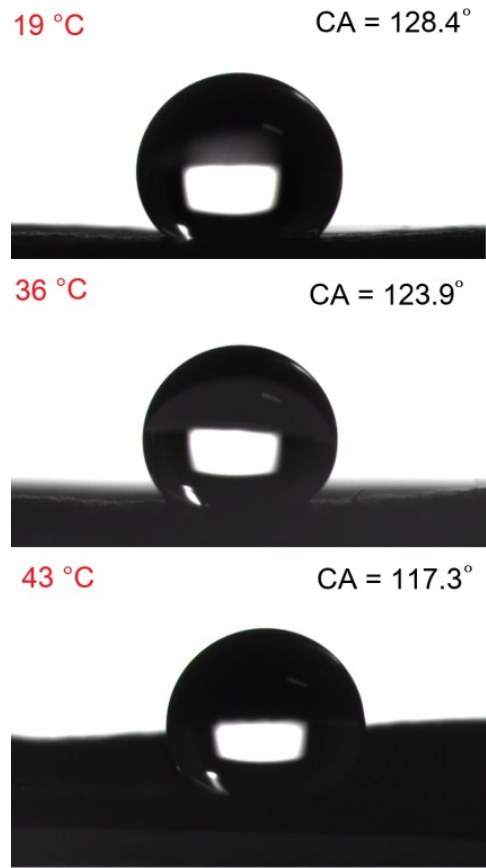


Fig. S6. Contact angle measurements of CC/TPU at different temperatures.

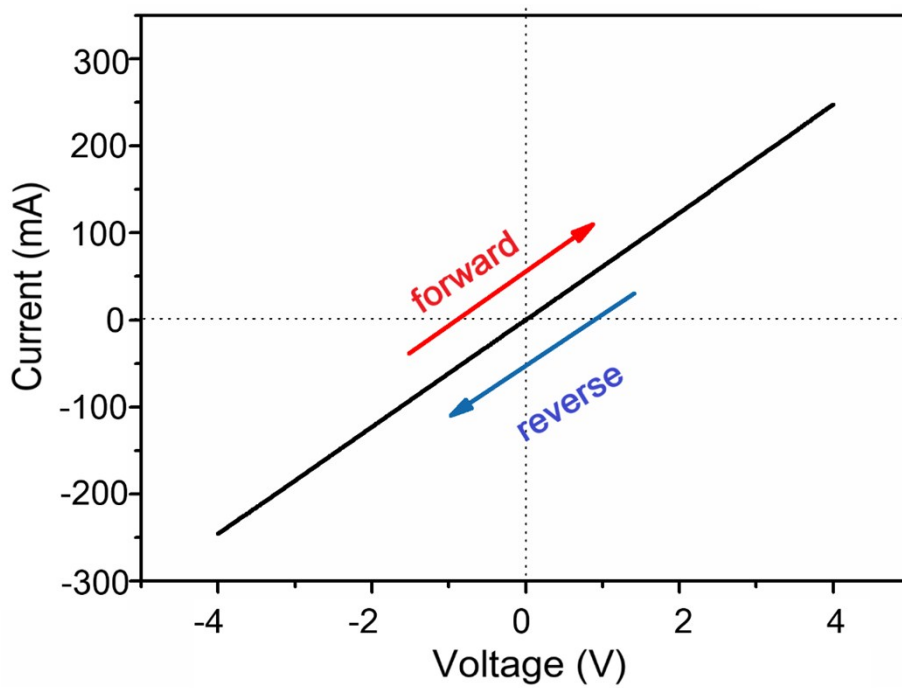


Fig. S7. I-V curves of CC.

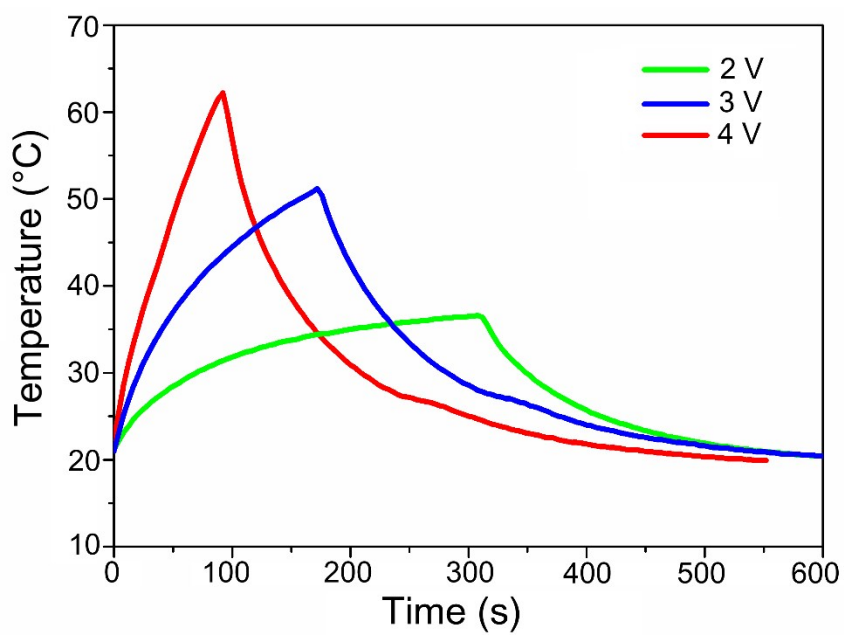


Fig. S8. Electrothermal conversion curves of CC at applied voltage of 2 V, 3 V and 4 V.

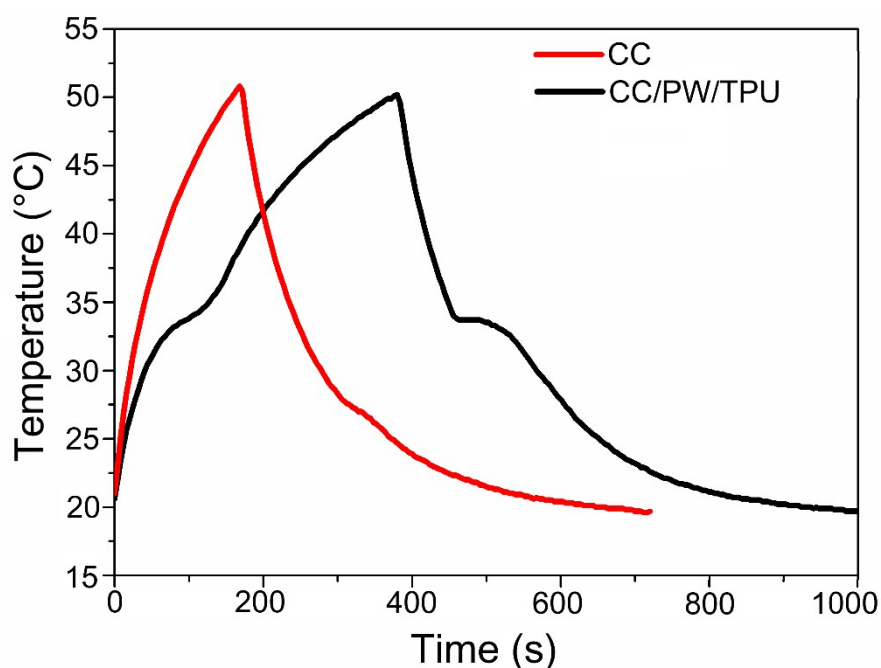


Fig. S9. Comparison of electrothermal conversion performance of CC and CC/PW/TPU samples under applied voltage of 3 V. After electro heating the samples to 50 °C, the applied voltage was removed and sample cooled down to ambient temperature (20°C).

Table S1. BET analysis of the samples.

Samples	BET surface area (m ² g ⁻¹)	Pore volume (mL g ⁻¹)
CC	503.8	0.32
CC/PW	44.2	0.11
CC/PW/TPU	0	0

Table S2. DSC data of the samples

Samples	ΔH_m (J g ⁻¹)	T_m (°C)	ΔH_f (J g ⁻¹)	T_f (°C)
PW	196.3	34.02	196.1	31.72
TPU	3.9, 13.6	41.3, 49.5	42.33	19.20
PW/CC/TPU	93.56	34.1	82.44	31.46