Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting information

The EDS of the control cotton fabric, PU-treated cotton fabric and GNP fabric were shown in Figure S1. Compared with the control cotton fabric, the C content of the GNP fabric was increased.

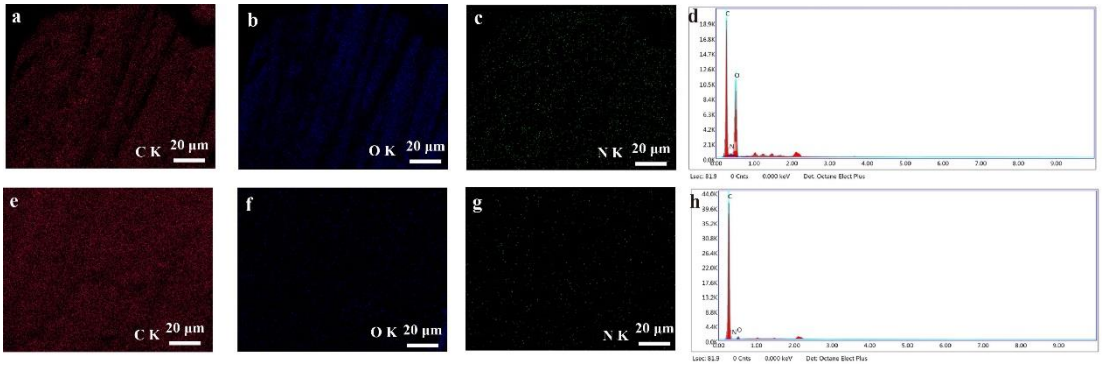
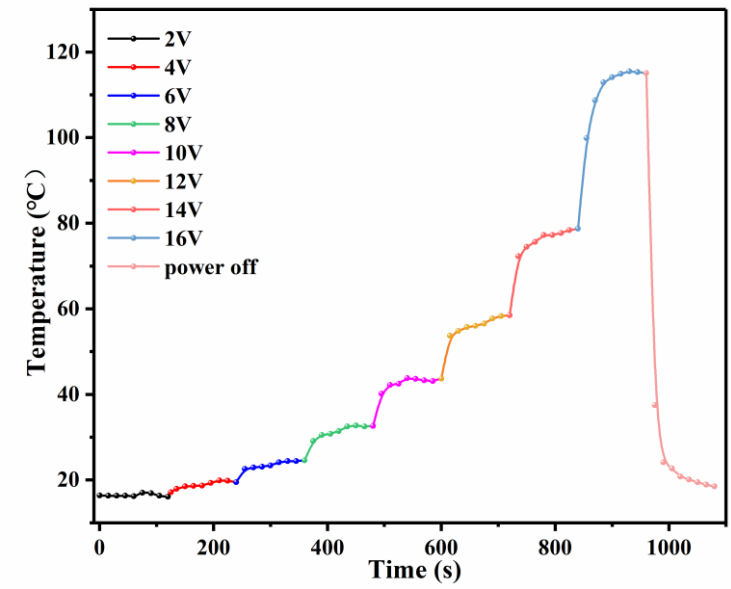


Figure S1 The EDS of control cotton fabric (a~d) and GNP fabric (e~h).

Below 6 V the temperature increased by only 19% from ~ 20 ℃ to ~ 23 ℃. The temperature began to rise significantly when exceeding 8 V. Moreover, the temperature of the GNP fabric rapidly increased to a stable temperature within 1 min and remained stable when the same voltage was applied.



S2. Temperature profiles of the GNP fabric at different voltages.

The infrared images of the conductive fabric were acquired at 12 V applied cross the GNP, with 2 min heating and 1 min cooling for each cycle (100 cycles). The results were shown in Figure S3. the heating/ cooling curve remained almost unchanged after

100 cycles, reaching constantly T ~ 42 ℃ at 12 V for 40s, after several heating and cooling cycles, indicating a good stability and repeatability.

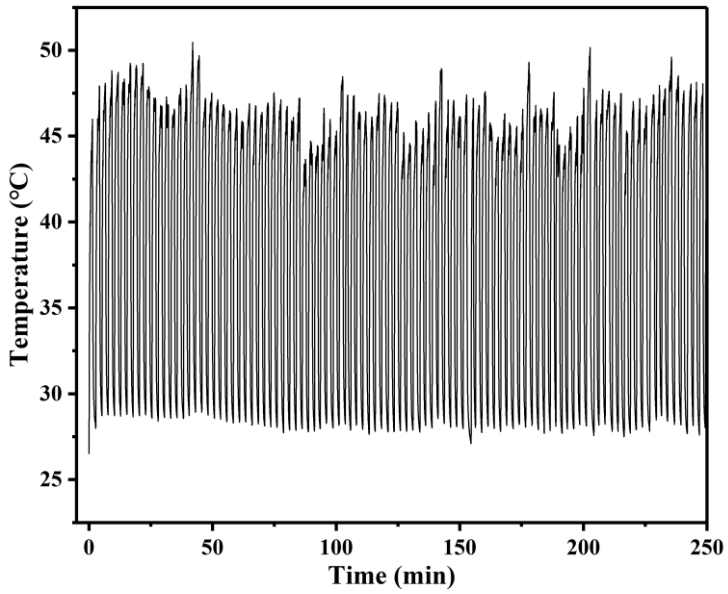


Figure S3 Temperature response of the GNP fabric over 100 cycles at VGNP = 12 V, each cycles is 4 min long.

Thermochromic polyurethane was synthesized via an acetone process. Isophorone diisocyanate(IPDI) and polyethylene glycol 1000(PEG1000) were added into a three-necked flask equipped with a magnetic stirrer and a reflux condenser and the isocyanate-terminated prepolymer was obtained at 70 °C for 2 h to ensure all the hydroxyl group had been terminated by diisocyanate. Then butanone oxime(BDO) as the chain extender was poured into the system to further react with the isocyanate group (−NCO) at 65 °C for 2 h and dibutyltin dilaurate(DBTDL) catalyst was added for chain extension. During the reaction, the anhydrous acetone was added depending on the viscosity of the system to prevent agglomerating. The reaction mixture was then cooled to 45 °C followed by Rhodamine b derivative adding as part of blocking agent and reacted 2 h. Then the system was heated to 65 °C and methyl ethyl ketoxime (MEKO) was added and reacted at this temperature for additional 2 h to obtain the thermochromic polyurethane.

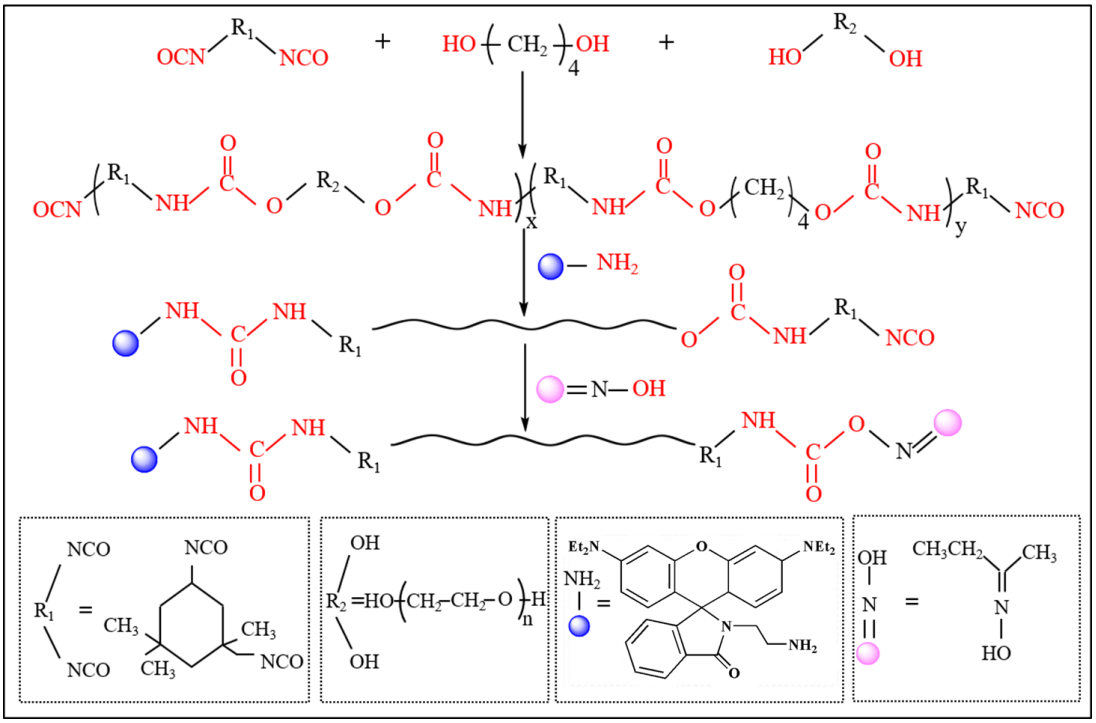


Figure S4. The synthetic route of thermochromic polyurethane.

References

Xiao J., Wan Z., Fang G., Chao W., Yun Y., Kun C.. Thermochromic behavior analysis of terminated polyurethane functionalized with rhodamine B derivative [J]. Progress in organic coatings, 2019, 02.022.

The △E of the ET as a function of V_{GNP} was shown in Table S1. It can be seen the △E increased significantly when the voltage V_{GNP} was 12V.

Table S1 The △E of the ET as a function of V_{GNP}

Voltage(V)	0	2	4	6	8	10	12	14	16
△E	0.00	0.87	2.30	3.48	6.67	15.46	33.10	38.65	40.28