Supporting Information

Building Thermal-stable Li-ion Batteries Using a Temperature-responsive Cathode

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Table S1. A comparison for the properties of various conducting polymers

Polymer	Dopant	Transition temperature (°C)	PTC intensity (orders of magnitude)	Processability at 25 °C	Solubility in electrolyte solvents at 25 °C
P3HPy	$FeCl_3$	90 -120	4	easy	soluble
PTH	$HClO_4$	160 -170	3	difficult	insoluble
P3MT	$HClO_4$	160 -170	4	difficult	insoluble
P3BT	$Cu(ClO_4)_2$	130 -140	3	easy	insoluble
P3OT	$Cu(ClO_4)_2$	90 -110	3	easy	insoluble
P3DT	$Cu(ClO_4)_2$	80 -100	4	easy	slightly soluble
PEDOT	$HClO_4$	> 220	2	difficult	insoluble

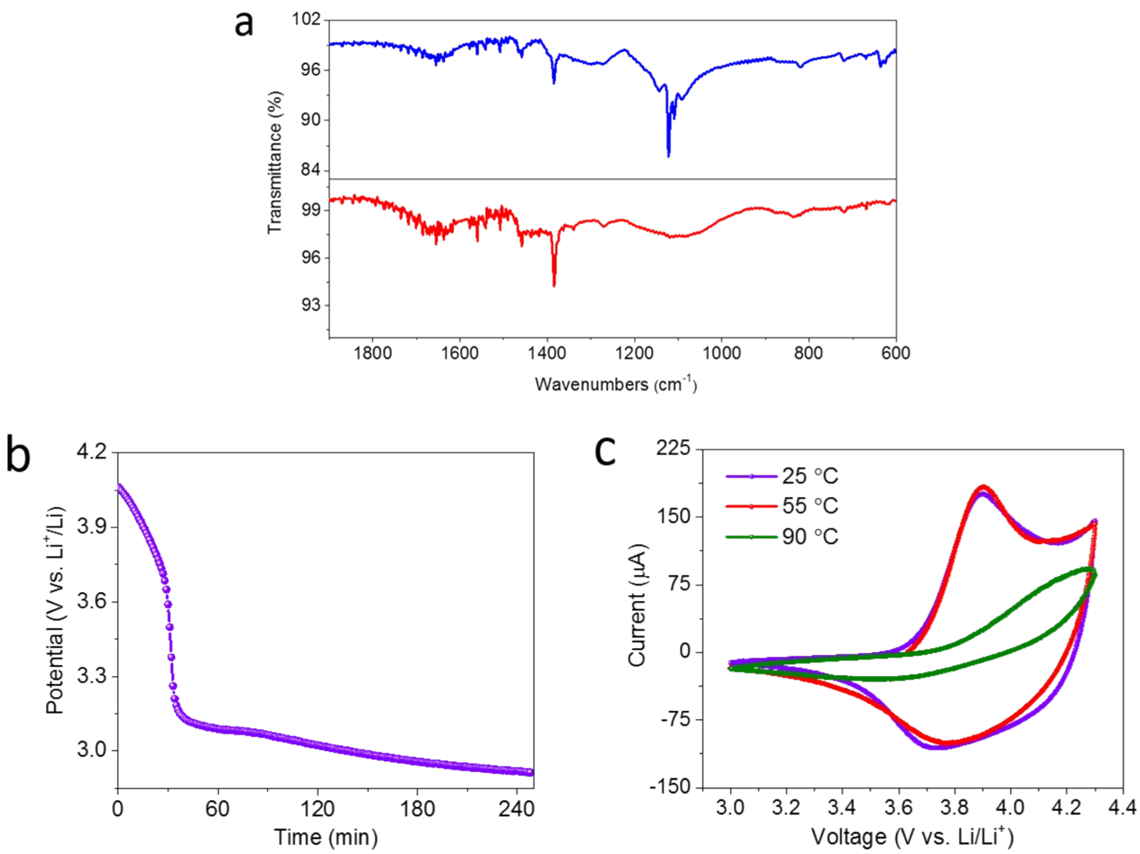

Fig.S1 Thermal de-doping behaviors of p-doped P3OT polymer: a) FT-IR spectra of ClO_4^- anions-doped P3OT polymer before and after thermal treatment at 90 ˚C. b) the time dependence of the open-circuit potential for an electrochemically p-doped P3OT electrode at 90 ˚C. c) CV curves obtained from P3OT-coated Pt microelectrode in 1M $LiPF_6$ /EC+DMC+EMC electrolyte at a scan rate of 10 mV s^{-1} at various temperatures.

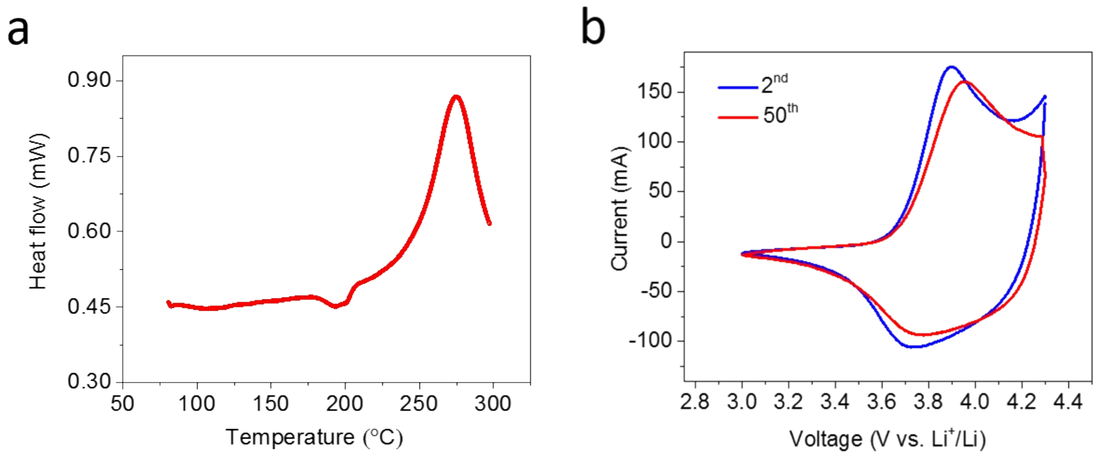

Fig.S2 Thermal and electrochemical stability of P3OT polymer: a) DSC curves of P3OT polymer in a temperature range of 80 – 300˚C at a scan rate of 10 ˚C min^{-1} under N_2 atmosphere. b) CV curves obtained from P3OT-coated Pt microelectrode in 1M $LiPF_6$ /EC+DMC+EMC electrolyte at a scan rate of 10 mV s^{-1} at room temperature.

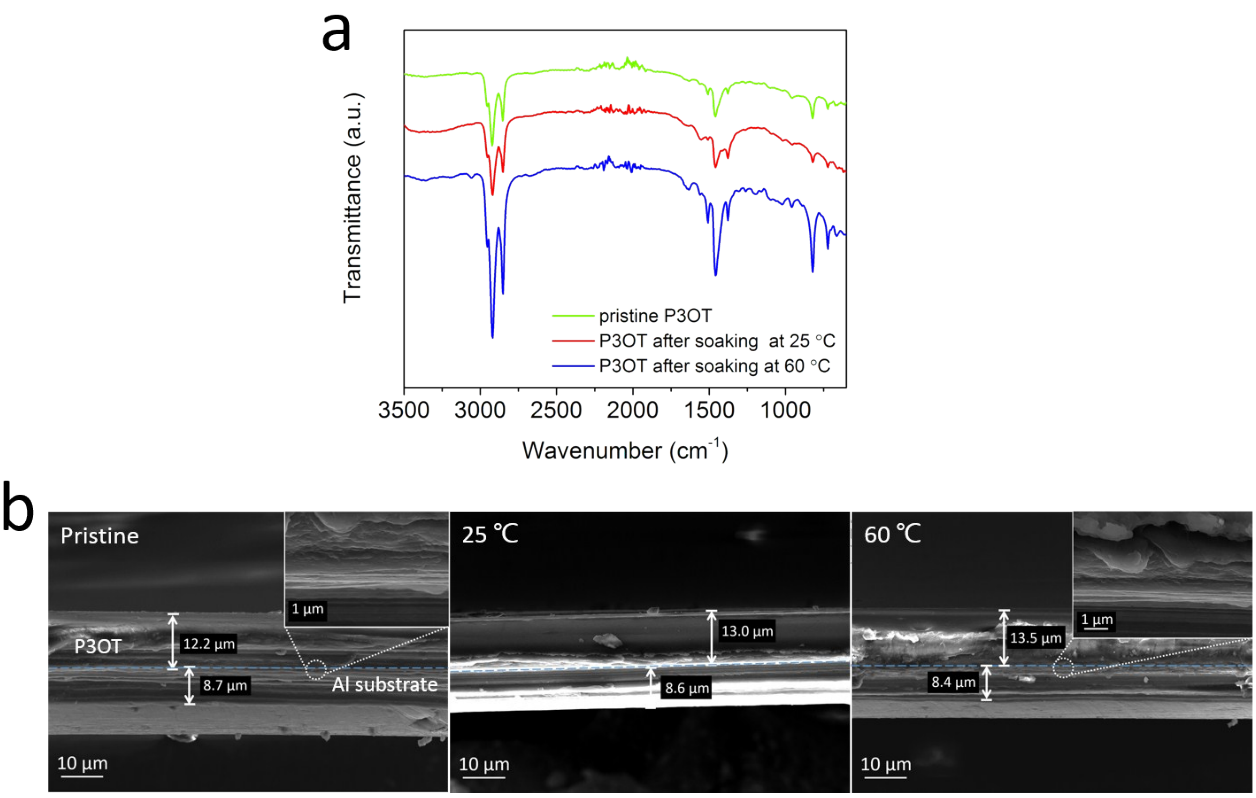

Fig.S3. Structural and chemical stability characterization for P3OT layer under the presence of liquid electrolyte. a) FT-IR spectra and b) the cross-sectional SEM images of P3OT layer before and after soaking in 1M $LiPF_6$/EC+DMC+EMC electrolyte solution for a week at 25 ˚C and 60 ˚C, respectively.

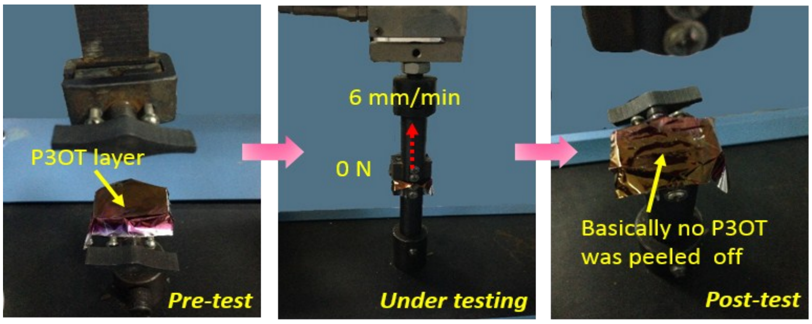

Fig.S4. The photo illustration for the interfacial adhesion measurements.

Table S2. Results of interfacial adhesion tests

	PTC layer toward Al substrate	LCO layer toward Al substrate	LCO layer toward PTC layer
Adhesion force ($N\ cm^{-2}$)	> 38.3	27.3	27.1
The corresponding electrode	Al/P3OTelectrode	Al/LCO electrode	Al/P3OT/LCO electrode

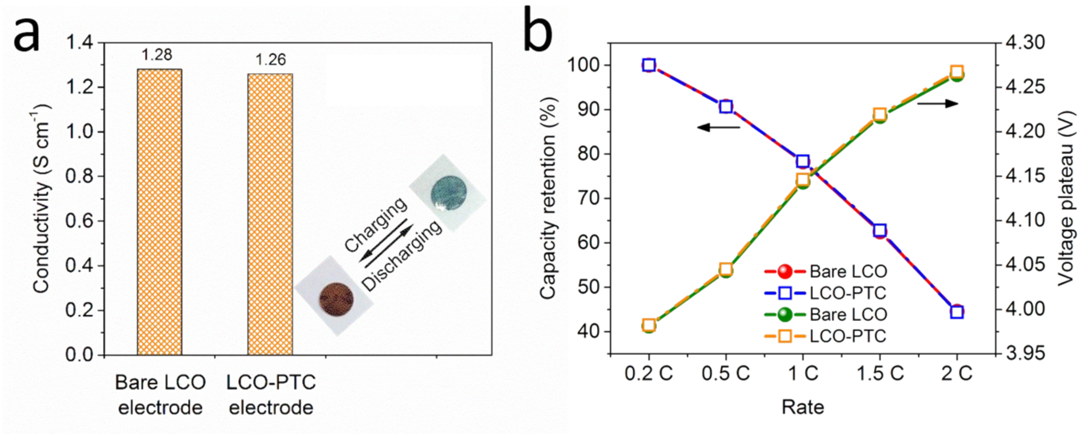

Fig.S5. DC conductivity and the rate capability tests: a) The DC conductivities of bare LCO electrode and LCO-PTC electrode after fully charged, the inset shows the color changes of P3OT electrode before and after electrochemical p-doping. b) Rate performance of pouch full cells with the LCO-PTC and conventional LCO cathode at 25 ˚C.