Electronic Supplementary Information

Low-temperature synthesized self-supported single-crystalline $LiCoO_2$ nanoflake arrays as advanced 3D cathodes for flexible lithium-ion batteries

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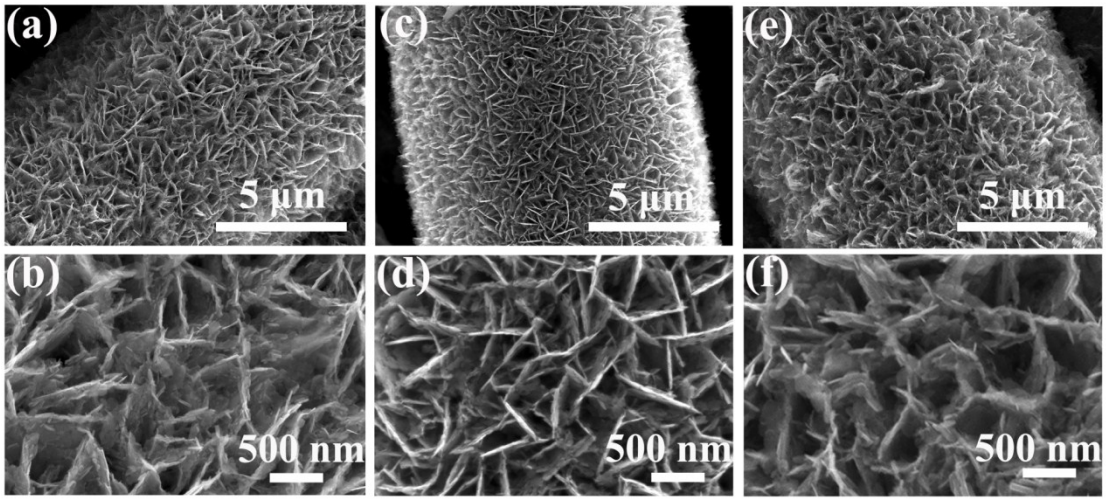

Fig. S1 FESEM images of the final $LiCoO_2$ samples synthesized at (a,b) 100 °C, (c,d) 120 °C, and (h,i) 140 °C.

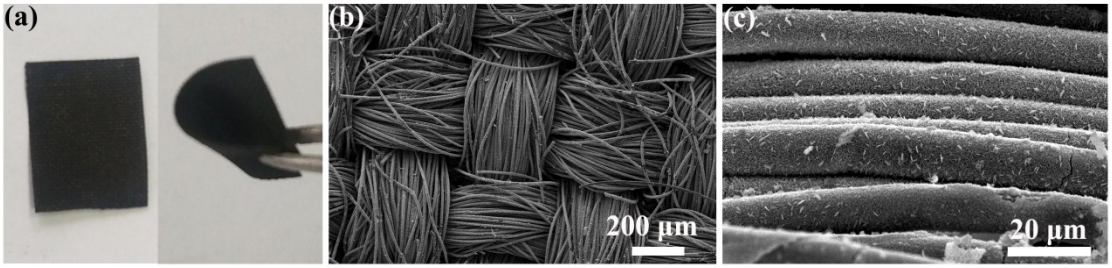

Fig. S2 (a) Digital image and (b,c) Low magnification FESEM images of the carbon fibers of the carbon cloth with high flexibility are uniformly covered with $LiCoO_2$ nanoflake arrays (the final $LiCoO_2$ sample synthesized at 200 °C).

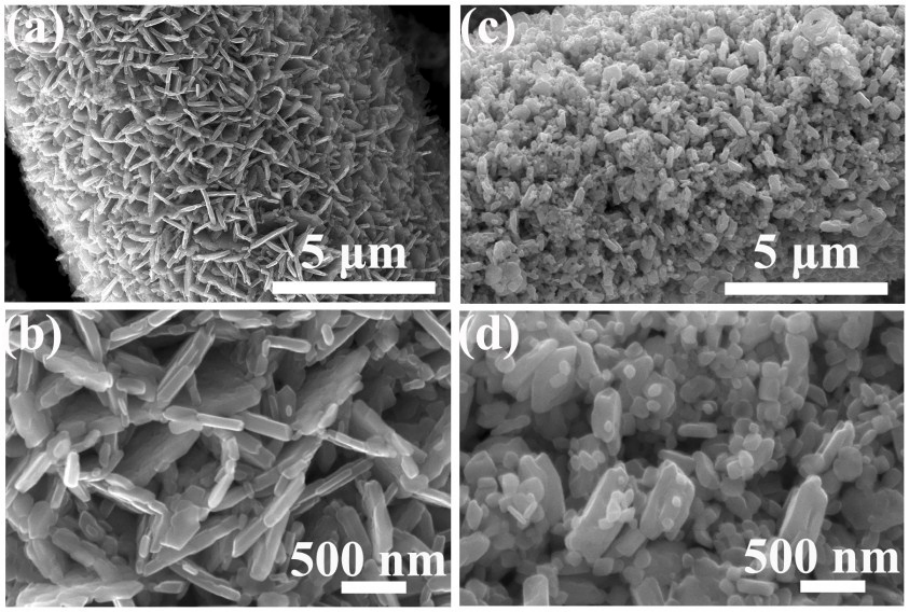

Fig. S3 FESEM images of the final $LiCoO_2$ samples synthesized at (a,b) 220 °C and (c,d) 240 °C.

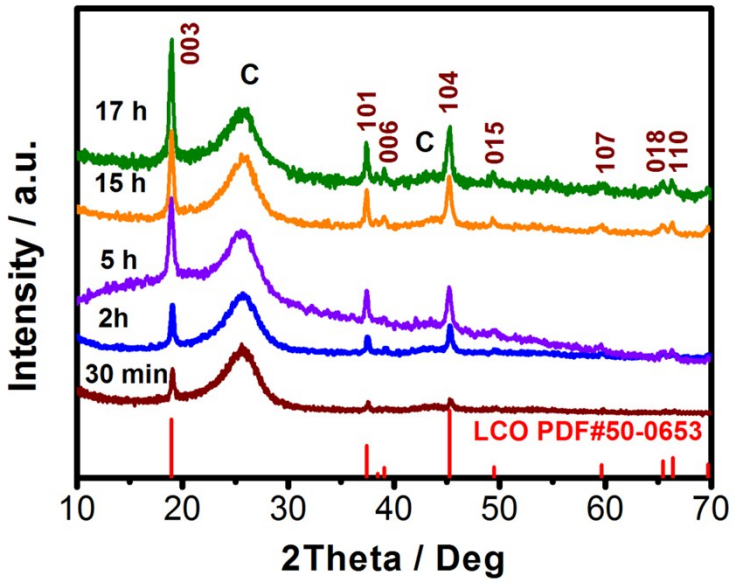

Fig. S4 XRD patterns of the $LiCoO_2$ samples hydrothermally treated at 200°C for different time.

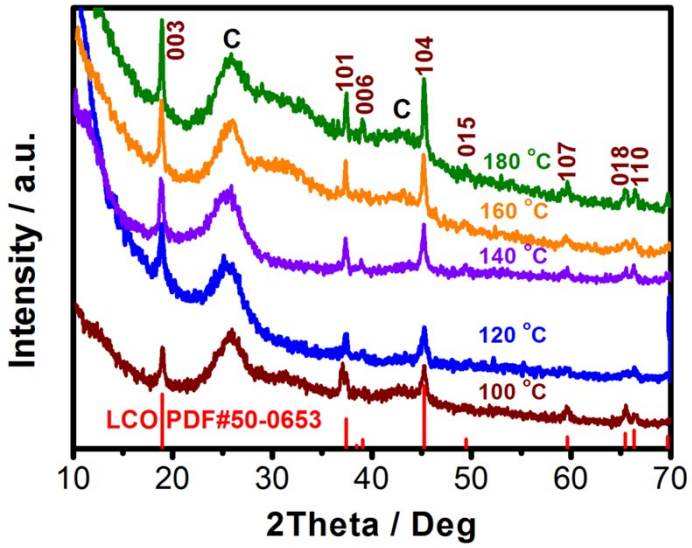

Fig. S5 XRD patterns of the final $LiCoO_2$ samples synthesized at different hydrothermal temperature.

Table S1. The Rietveld refinement results of the final 200 °C synthesized $LiCoO_2$ powder scraped off from the carbon cloth.

Sample	a (Å)	c (Å)	V (Å^3)	Rwp (%)
$LiCoO_2$	2.82038	14.08821	97.05	2.62

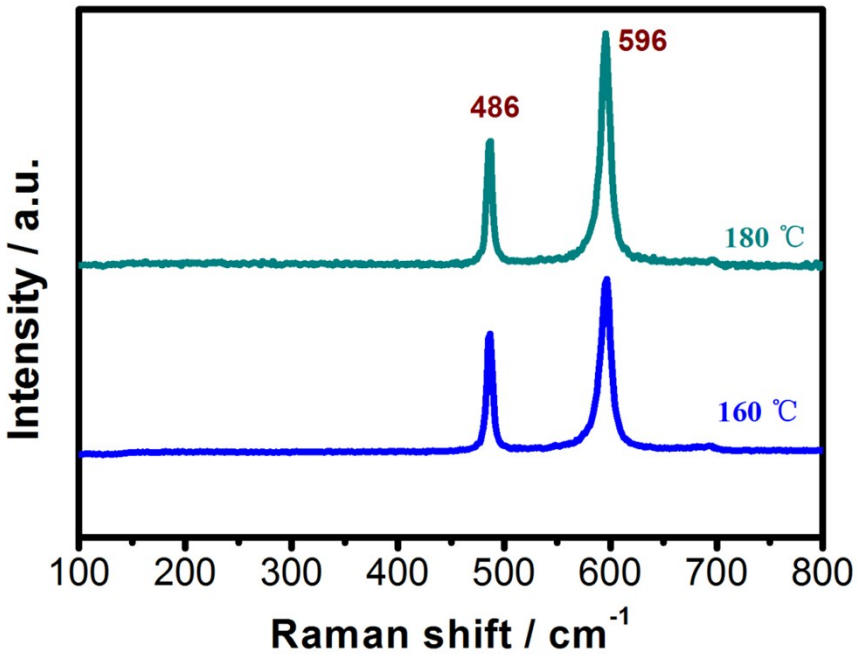

Fig. S6 Raman spectra of the final $LiCoO_2$ samples synthesized at 160 °C and 180 °C.

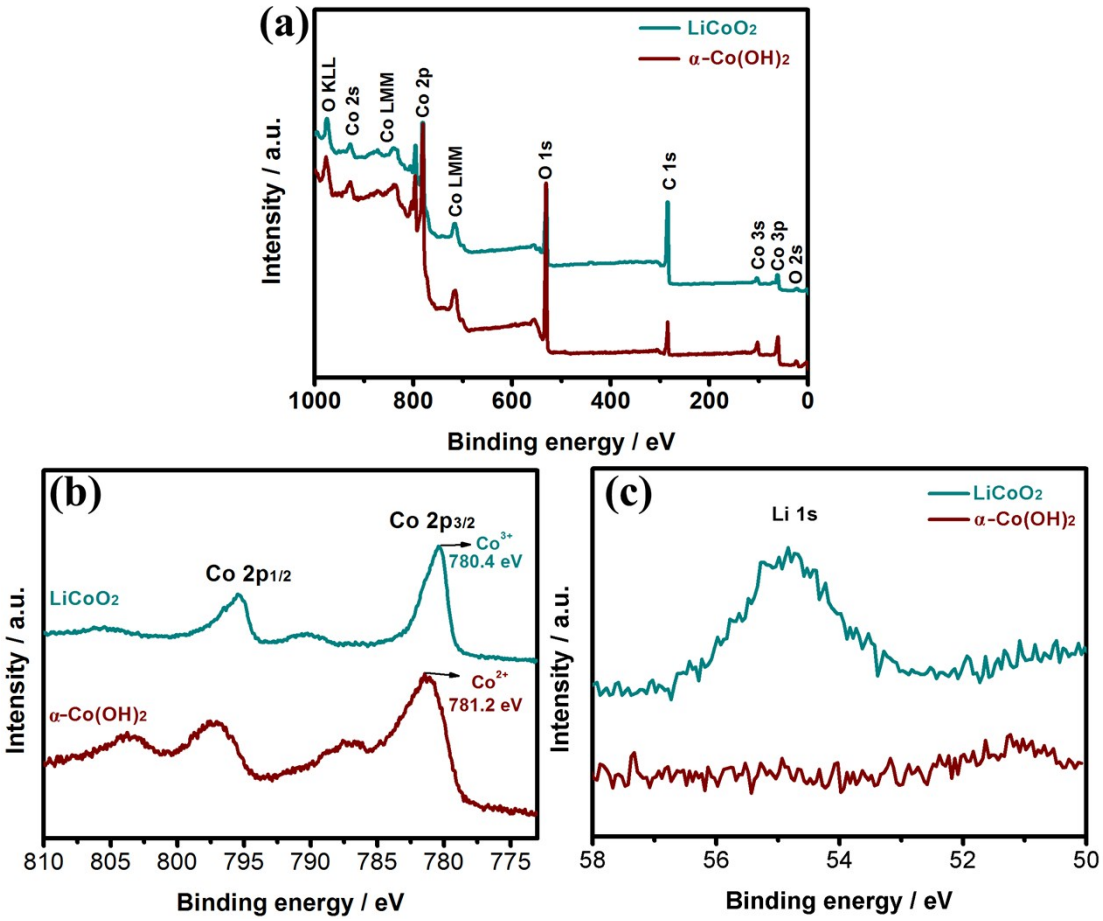

Fig. S7 (a) Survey-scan XPS spectra, (b) Co 2p core-level XPS spectra, and (c) Li 1s core-level XPS spectra of the as-prepared α-$Co(OH)_2$ sample and the final 200 °C synthesized $LiCoO_2$ sample.

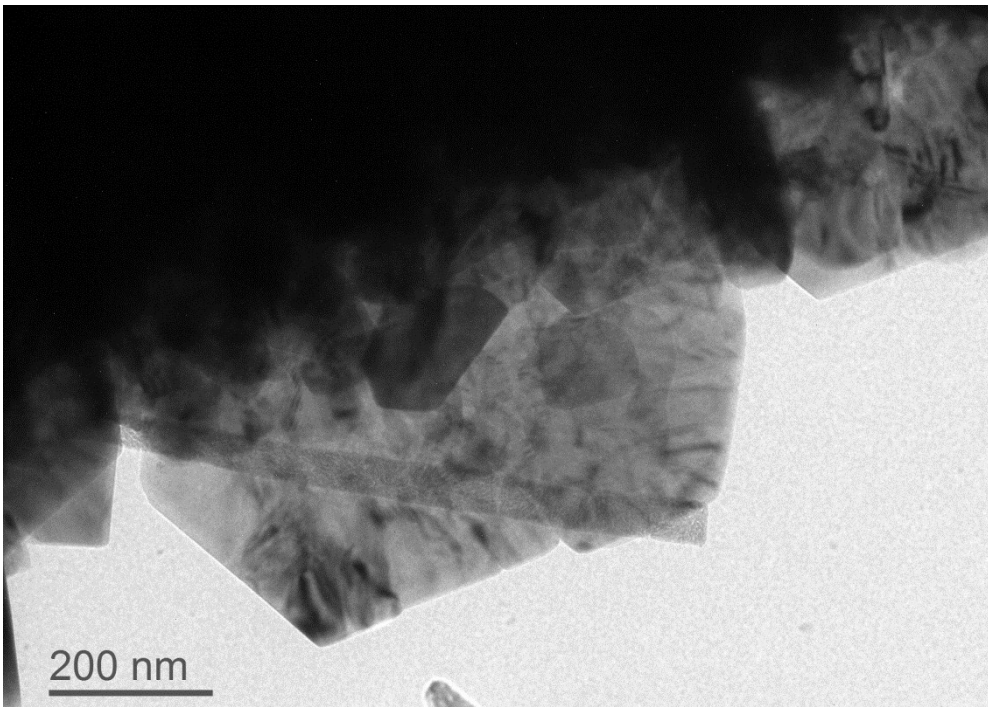

Fig. S8 TEM image of the final 200 °C synthesized $LiCoO_2$ nanoflake on carbon cloth.

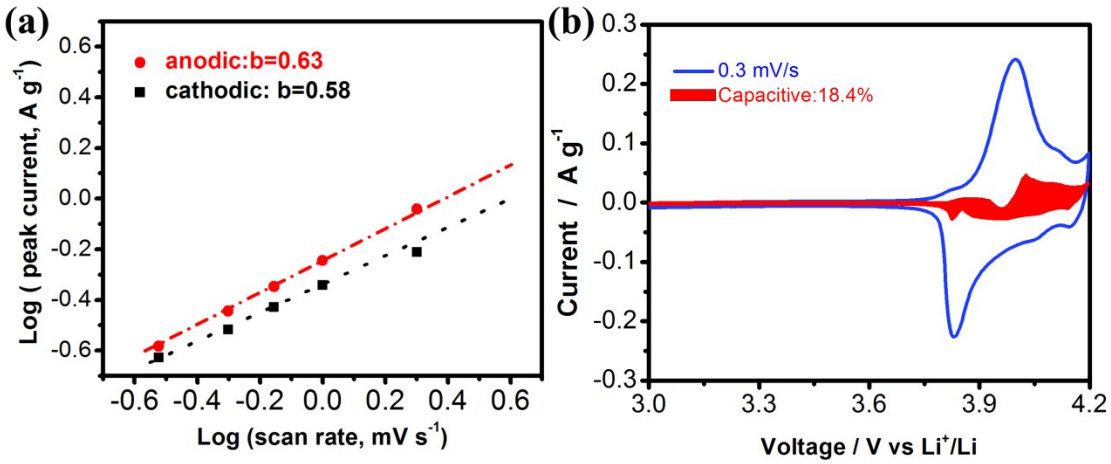

Fig. S9 (a) Log i (peak current) vs. log v (scan rate) plots for both cathodic and anodic scans of the LCO-200 electrode. (b) CV curve at a scan rate of 0.3 mV s^{-1} of the LCO-200 electrode with red area representing the surface capacitive contribution.

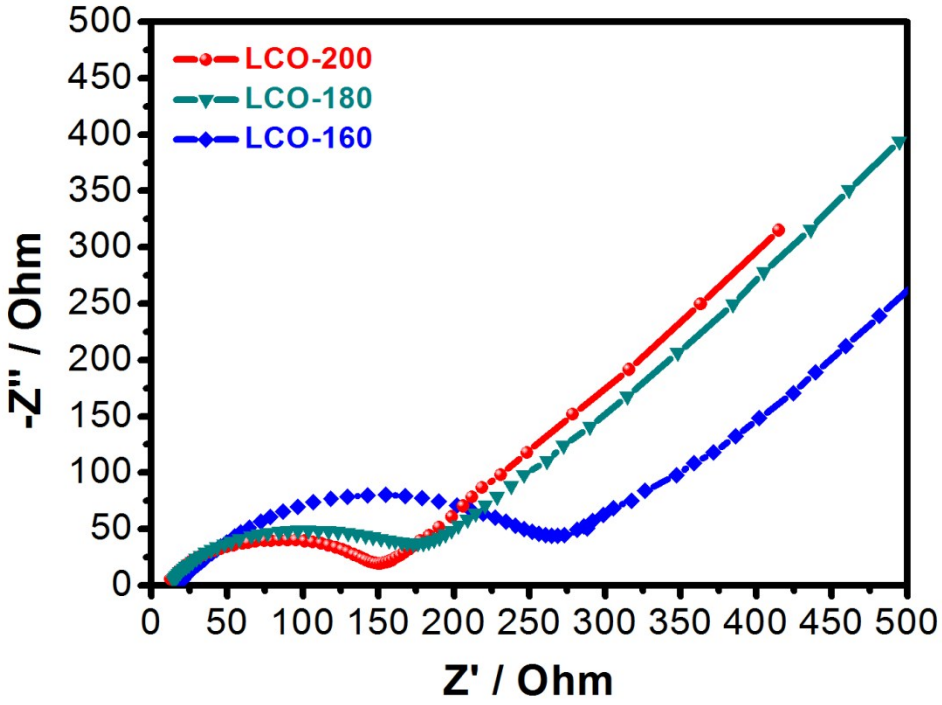

Fig. S10 Nyquist plots of the LCO-200, LCO-180 and LCO-160 electrodes.

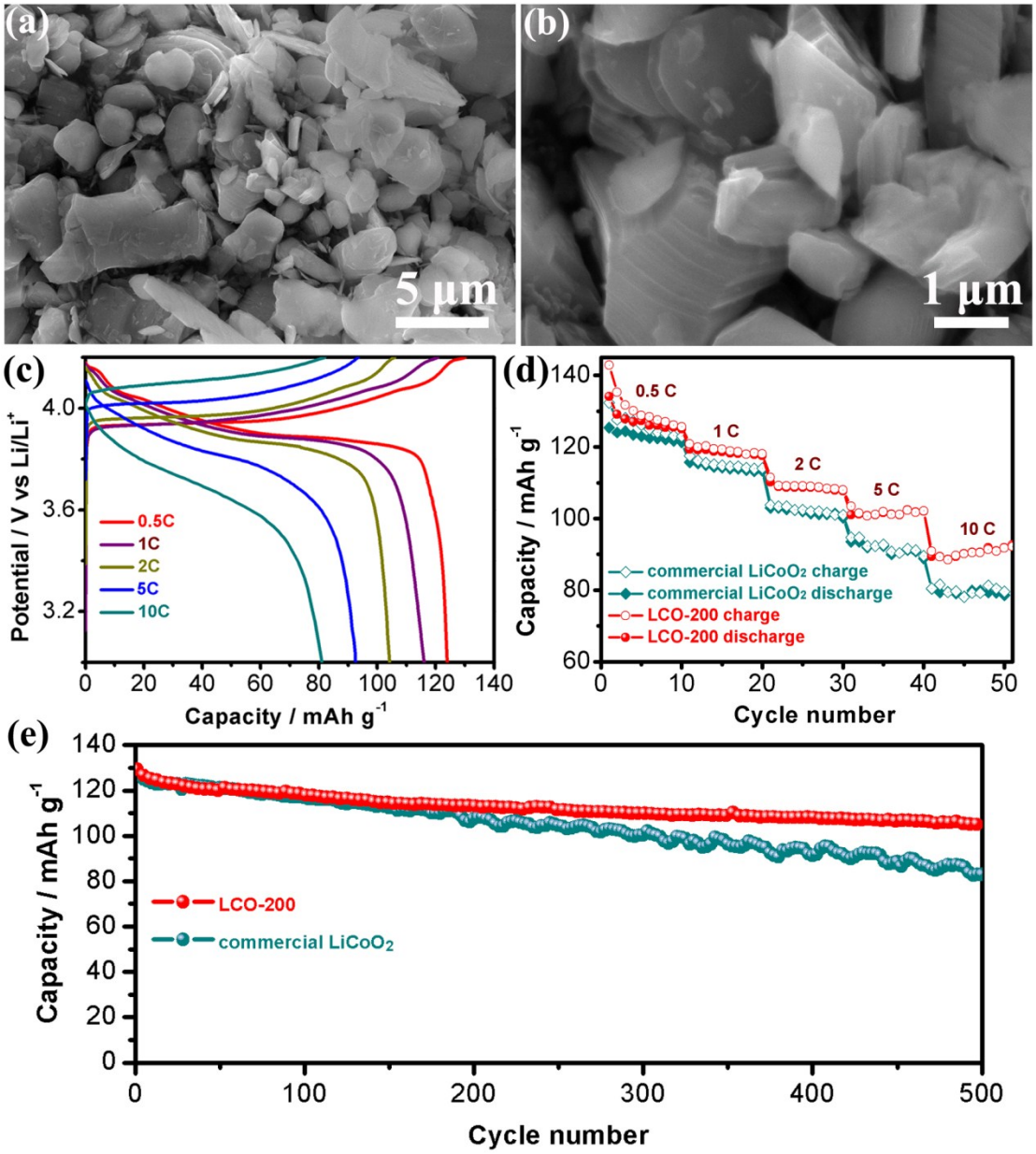

Fig. S11 (a,b) FESEM images of the commercial $LiCoO_2$ powder. (c). Charge and discharge curves of the commercial $LiCoO_2$ electrode at different current rates. (d) Rate performances and (e) cycle performance of the LCO-200 and the commercial $LiCoO_2$ powder electrodes.

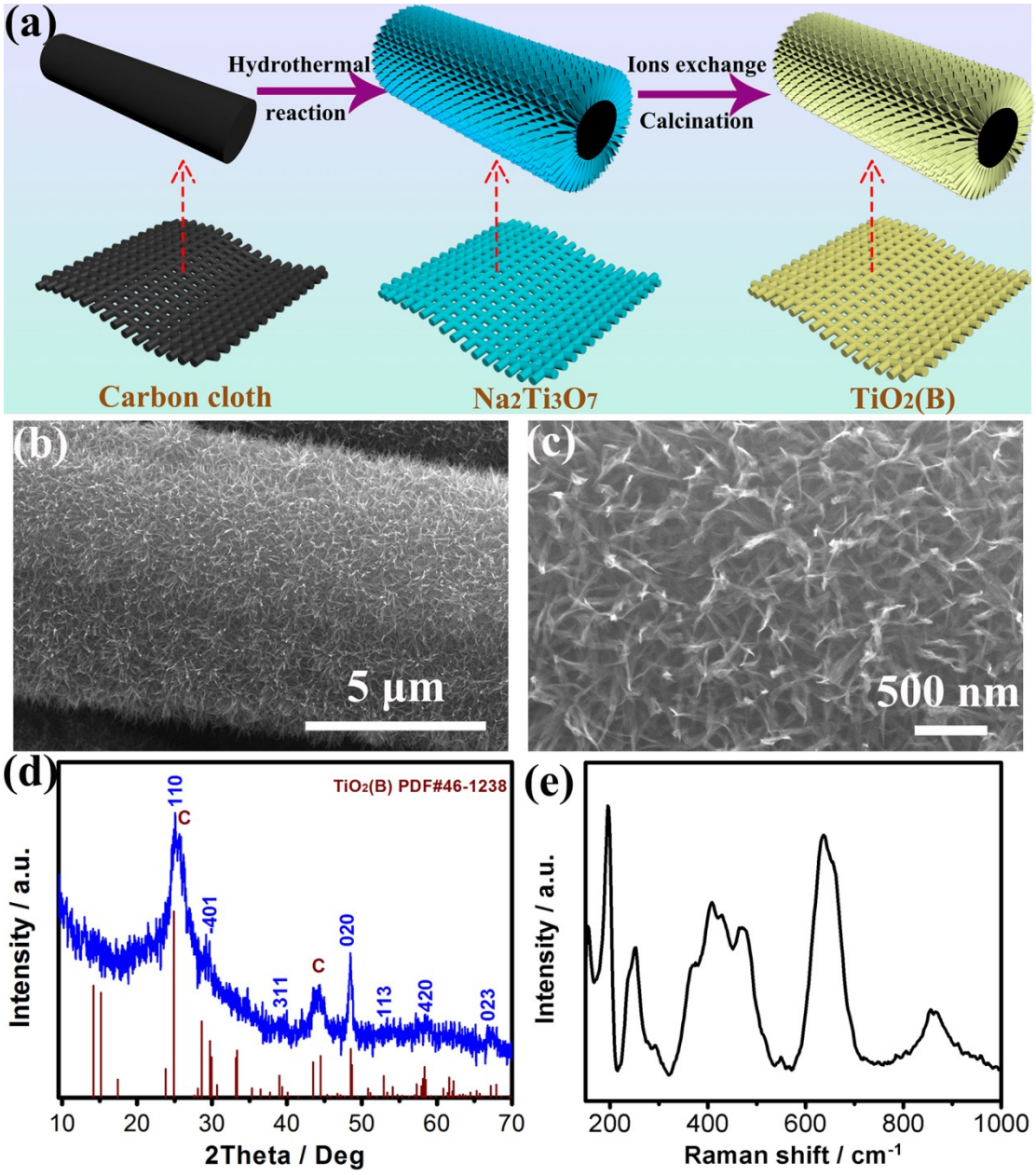

Fig. S12 (a) Schematic illustration of fabrication procedure of the 3D TiO_2(B) nanosheet arrays on carbon cloth. (b,c) FESEM images, (d) XRD pattern, and (e) Raman spectrum of the TiO_2(B) nanosheet arrays.

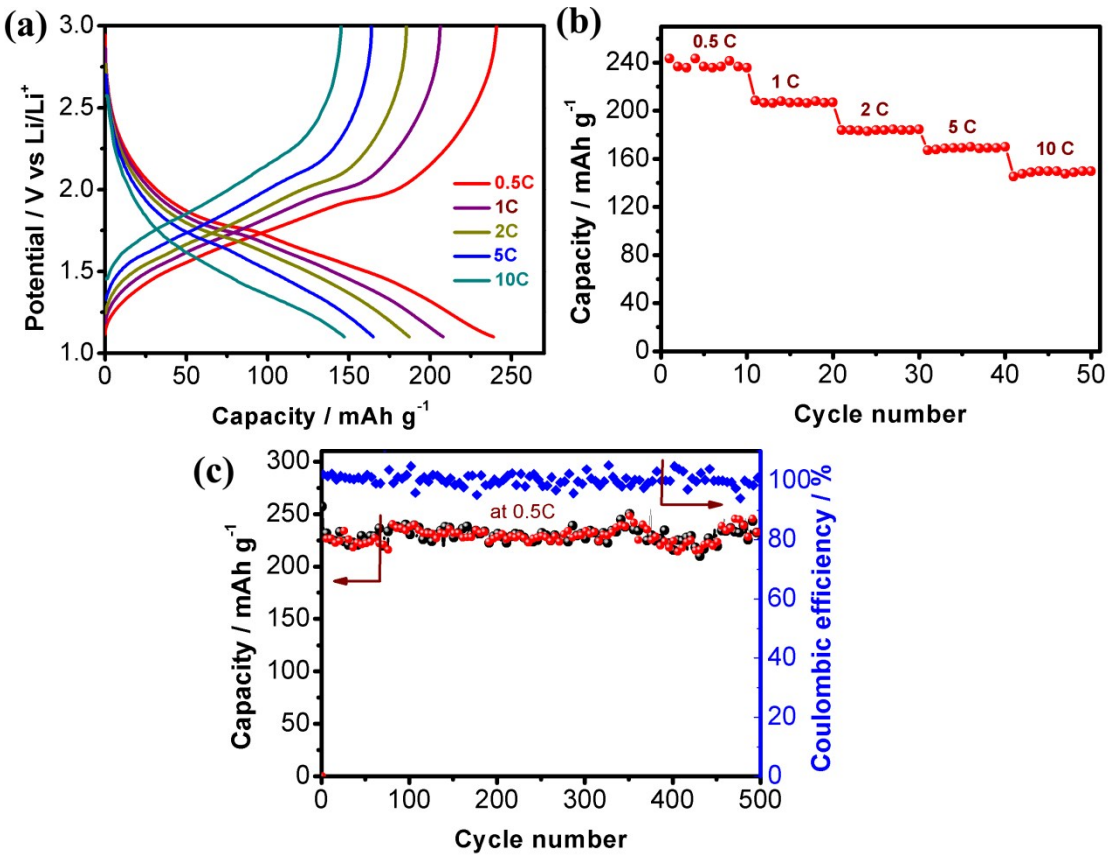

Fig. S13 (a) Charge and discharge curves at different current rate, (b) Rate performance, and (c) cycle performance at 0.5 C of the 3D TiO_2(B) electrode.

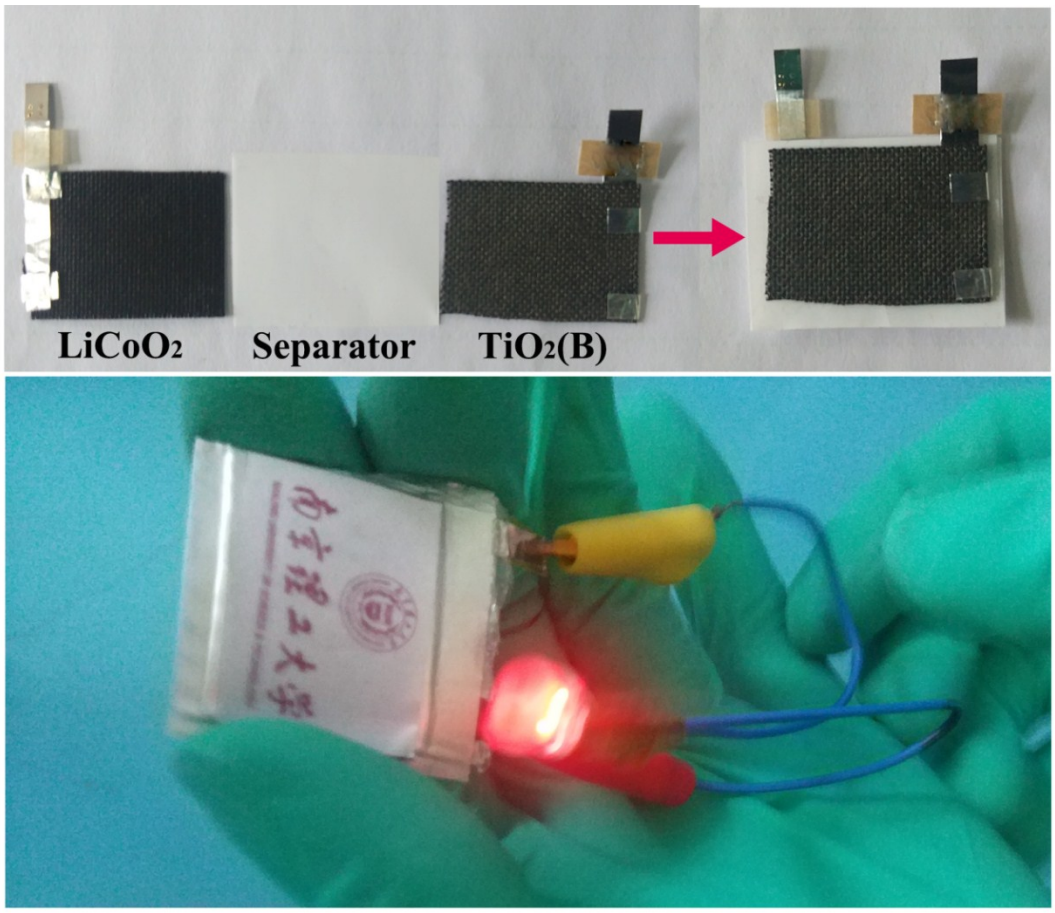

Fig. S14 Optical images of the all-nanoarrays-based flexible LIBs using carbon cloth supported $LiCoO_2$ nanoflake arrays as cathode and carbon cloth supported TiO_2(B) nanosheet arrays as anode.

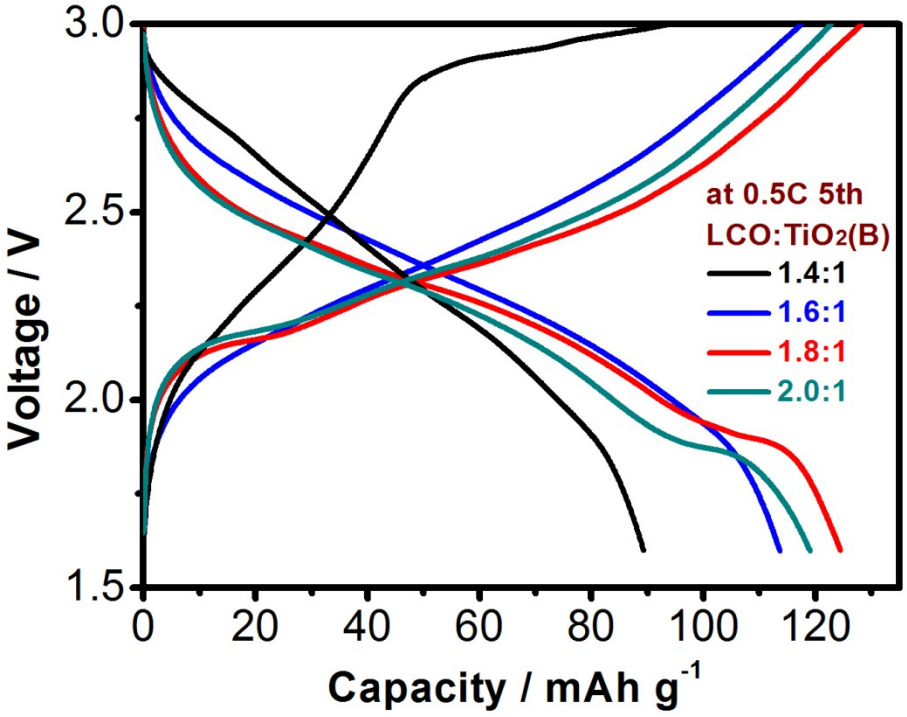

Fig. S15 The charge/discharge curves of the 5th cycle at 0.5 C (the current rate is based on the cathode) of the LCO/TiO_2(B) full cells with different cathode to anode ratios from 1.4:1 to 2.0:1.

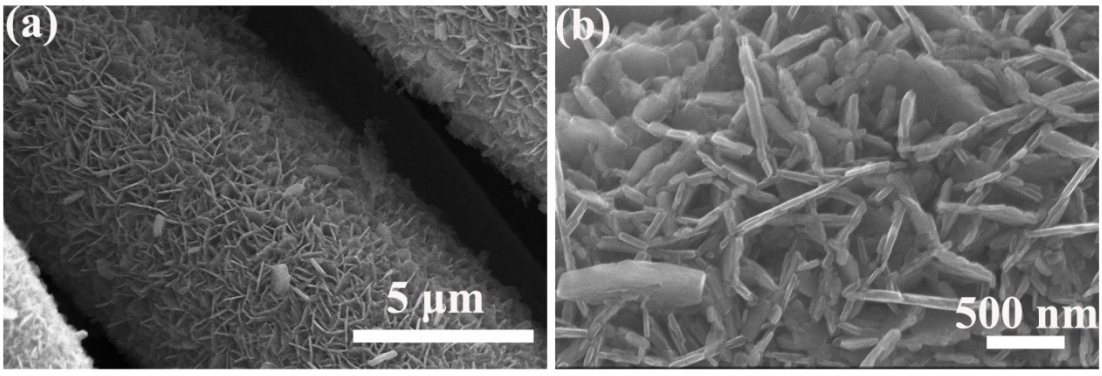

Fig. S16 FESEM images of the LCO-200 electrode after 500 charge/discharge cycles at a current rate of 0.5 C.

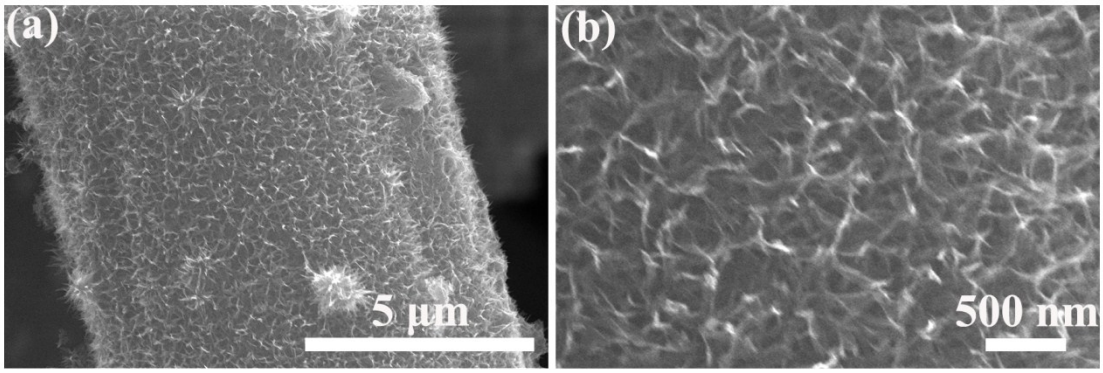

Fig. S17 FESEM images of the TiO_2(B) electrode after 500 charge/discharge cycles at a current rate of 0.5 C.

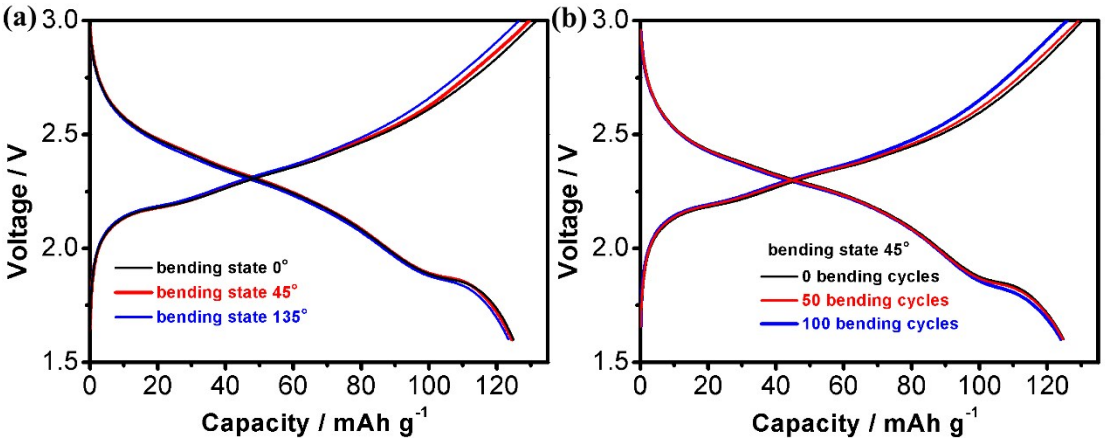

Fig. S18 Charge/discharge curves of the flexible LCO//TiO_2(B) full cell at (a) different bending states at 0.5C, and (b) different bending cycles at 45° bending state at 0.5C .

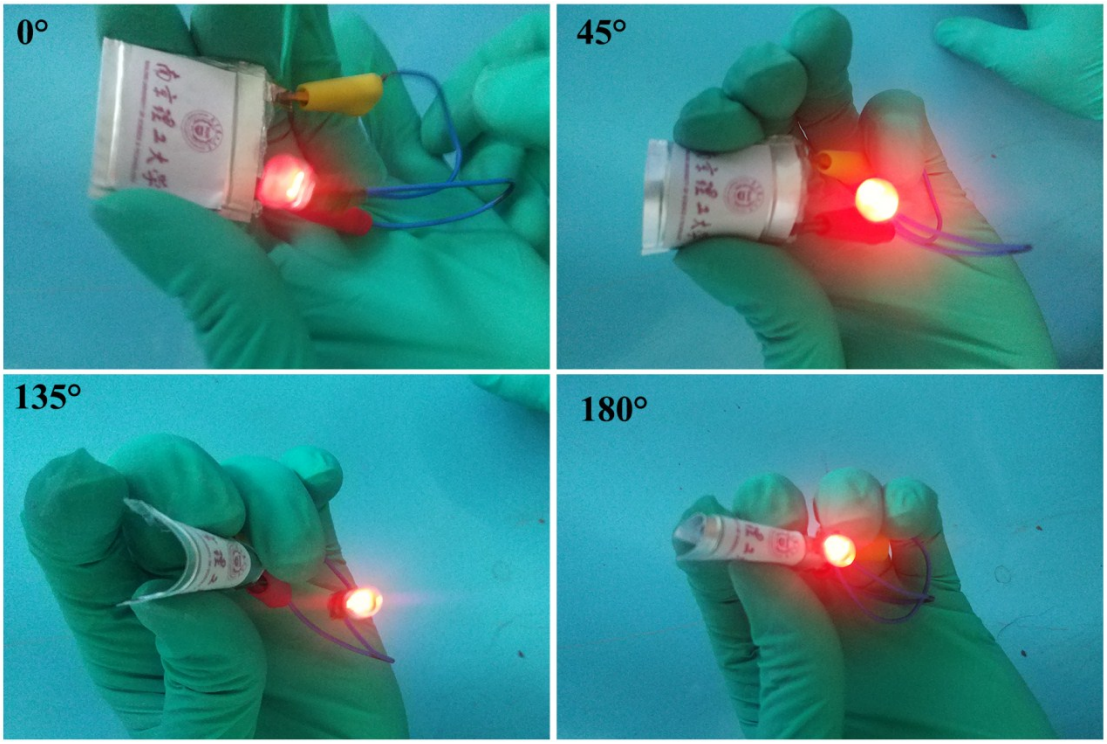

Fig. S19 Optical images of the flexible LCO//TiO_2(B) full cell lighting a LED at different bending states.