Electronic Supplementary Information

Large Area Multi-stacked Lithium-ion Batteries for Flexible and Rollable Applications

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[†]Electronic supplementary information (ESI) available: Fig. S1, Fig. S2, Video S1, Video S2

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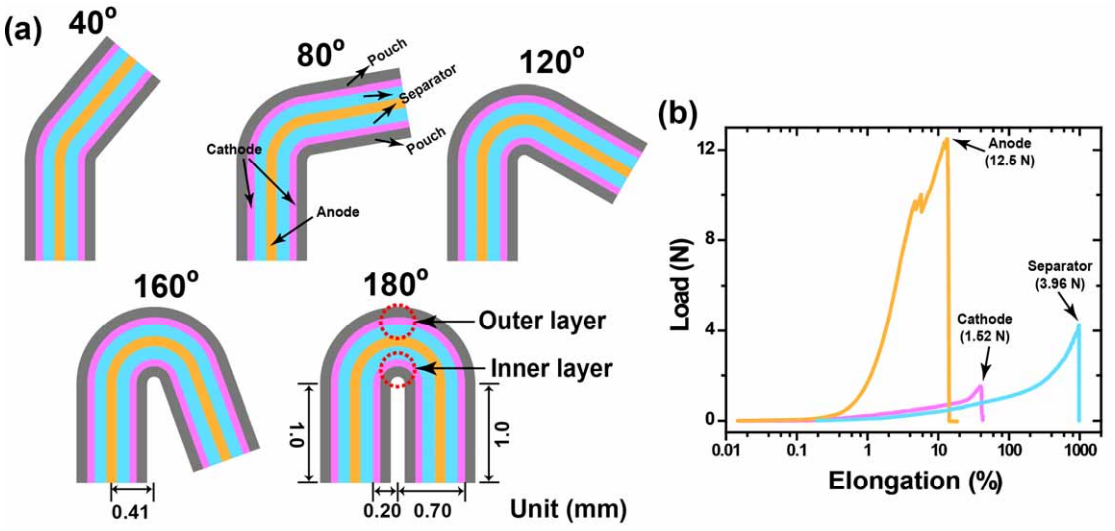

Folding angle (θ)	Shrinked inner layer	Elongated outer layer
40°	6.41%	8.86%
80°	11.4%	15.7%
120°	15.4%	21.2%
160°	18.6%	25.8%
180°	20.1%	27.7%

Fig.S1 (a) Schematic illustrations of the multi-stacked single-cells at different folding angles. The key components and the dimensions critical for calculation of tensile/compressional strains are denoted. (b) Load-elongation curves of the anode, cathode, and separator layers showing that the anode layer requires the highest tensile stress. Based on this observation, the tensile strains of the cathode and separator layers were calculated with respect to the central anode layer in (c). (c) The calculation and its tabulated results on the dimensional changes for the inner and outer layers with respect to the central anode layer. This calculation is based on the following assumptions: i) The original thickness of each cell layer is not changed during folding. ii) The outer separator and cathode layer is capable of being elongated with respect to the central anode layer. iii) The external pouch has no effect.

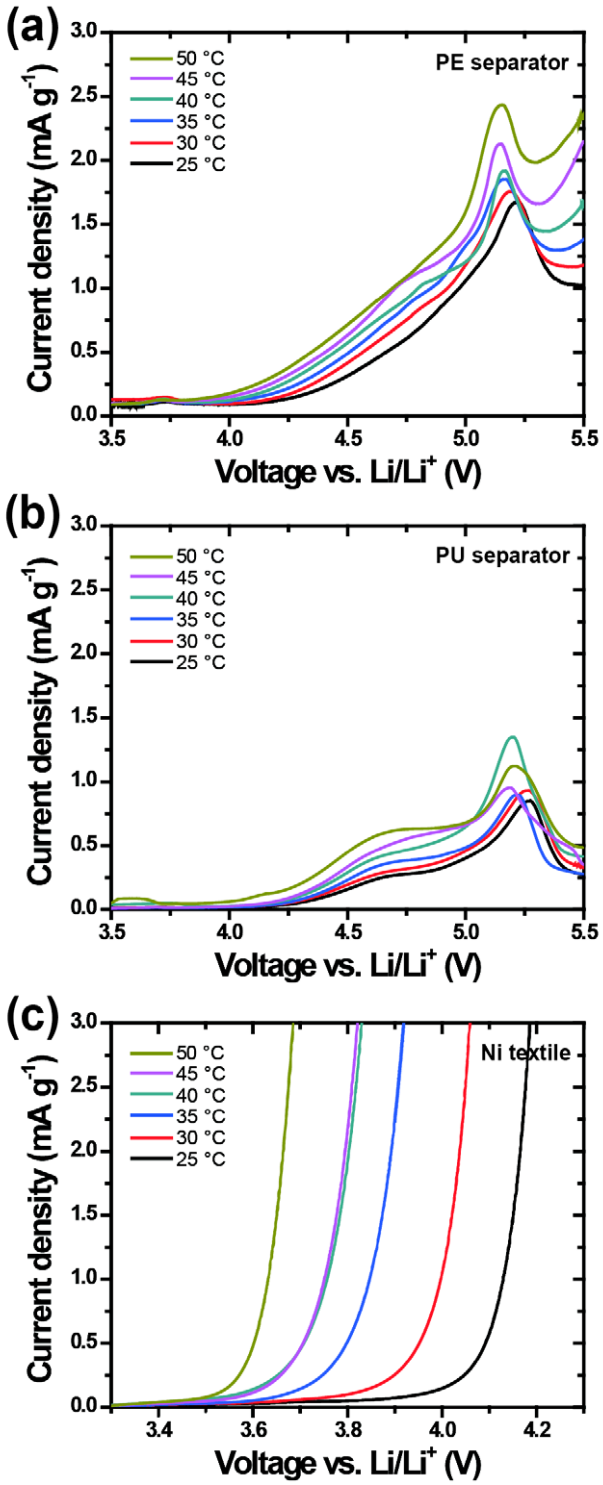

Fig.S2 The electrochemical stability tests of the separators and the Ni-coated textile. Linear sweep voltammetry (LSV) results of the cells with configurations of (a) stainless steel (SUS)/PE separator/Li metal/ stainless steel (SUS), (b) stainless steel (SUS)/PU separator/Li metal/ stainless steel (SUS), and (c) stainless steel (SUS)/Ni-textile/PU separator/Li/ stainless steel (SUS). Both the PE and PU separators show reasonably good stabilities for the current LFP-LTO full-cells operating up to 4.0 V vs. Li/Li^+. But, the Ni-coated textile shows some side reactions, which tend to start at lower potentials with increased temperature. This trend indicates that the cycle lives of the current full-cells could be impaired by overcharging especially at higher temperatures.

Video S1. See attached file entitled "Loosely-woven textile with the electrode composite coated.avi." Optical microscope video at various elongation ratios from 0 to 36%. The loosely-woven textile can release the stress efficiently all the way through the highest elongation.

Video S2. See attached file entitled "Finely-woven textile with the electrode composite coated.avi." Optical microscope video at various elongation ratios from 0 to 36%. The electrode film peeled off in the middle of the elongation.