Electronic Supplementary Material (ESI)

A highly torsionable fiber-shaped supercapacitor

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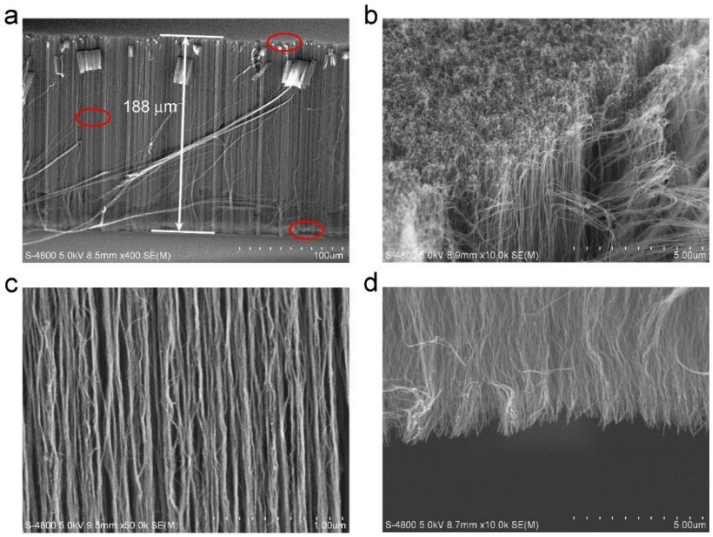

Fig. S1 SEM images of the CNT array: Views from (a) the side, (b) the top, (c) the middle and (d) the bottom. The majority of the CNTs have a length of 188 µm, the same as the height of the array. CNT fibrils intertwined between the vertical CNT bundles can be seen in the top, middle and bottom parts of the array.

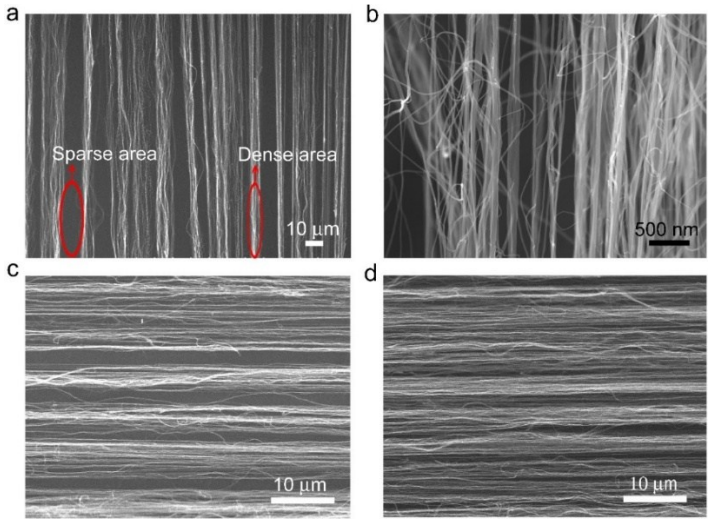

Fig. S2 (a) An SEM image showing the sparse and dense areas of CNT bundles in a single layer ShCNT film and (b) A magnification of the dense area. (c,d) SEM images of 2- and 4-layer ShCNT films.

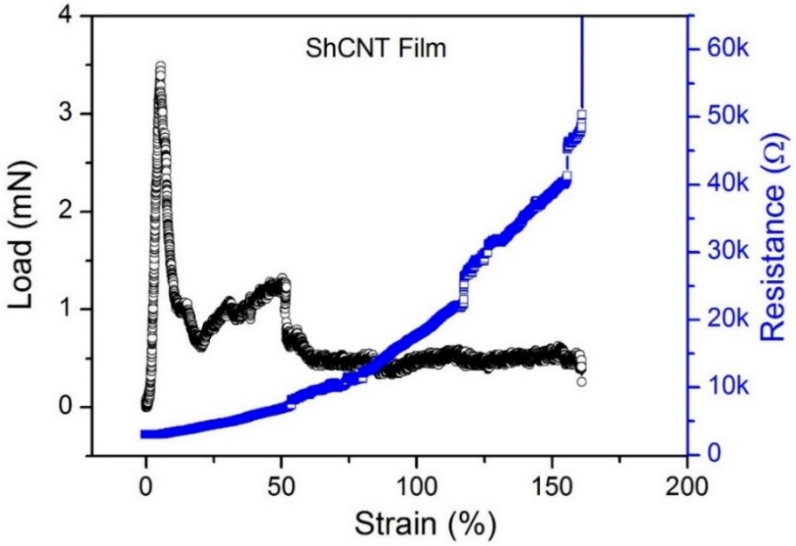

Fig. S3 The tensile and electrical properties of a single-layer ShCNT film. Dimensions: length × width × thickness = 6 mm × 1 mm × 1 μm).

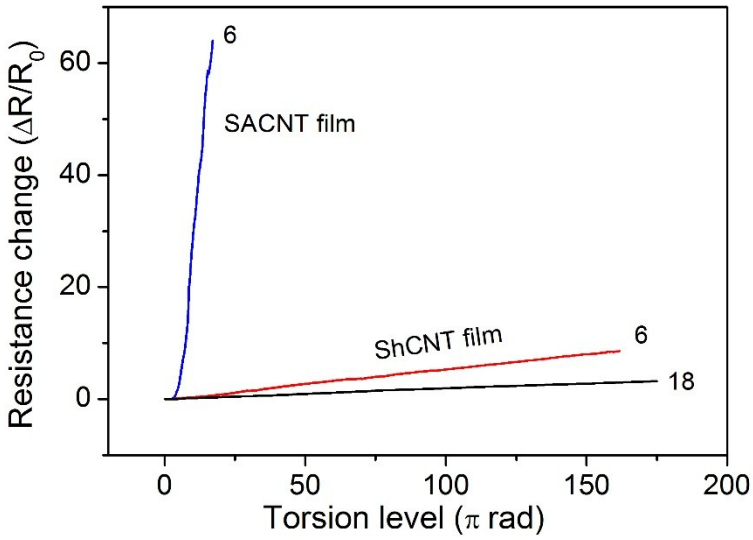

Fig. S4 Resistance change of the conductor based on the ShCNT film (6- and 18- layers) and the SACNT film (6-layer) during torsional loading.

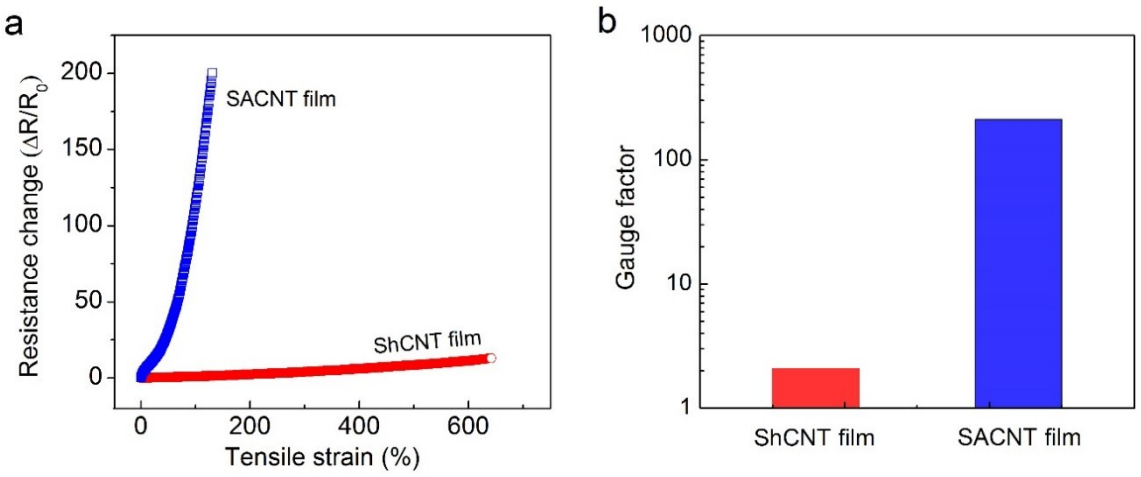

Fig. S5 (a) Resistance change of conductors based on 6-layer ShCNT film and SACNT film during tensile deformation and, (b) the corresponding gauge factors (after the tensile strain >50%).

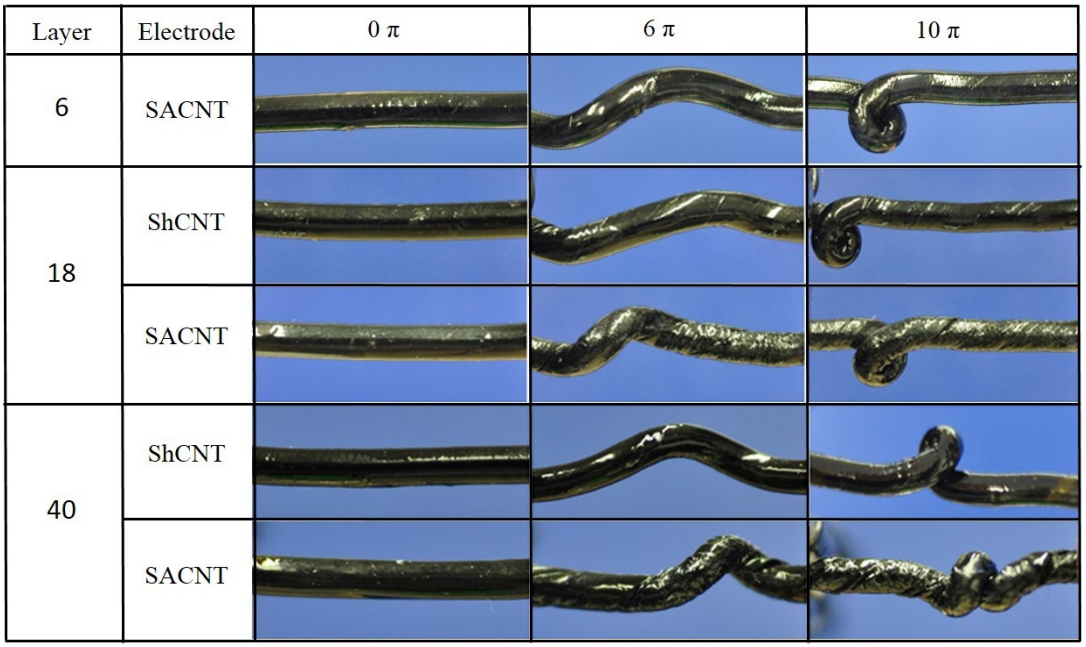

Fig. S6 Digital photos showing the supercapacitors based on 6-, 18- and 40-layer ShCNT film and SACNT film electrodes subjected to different torsion levels.

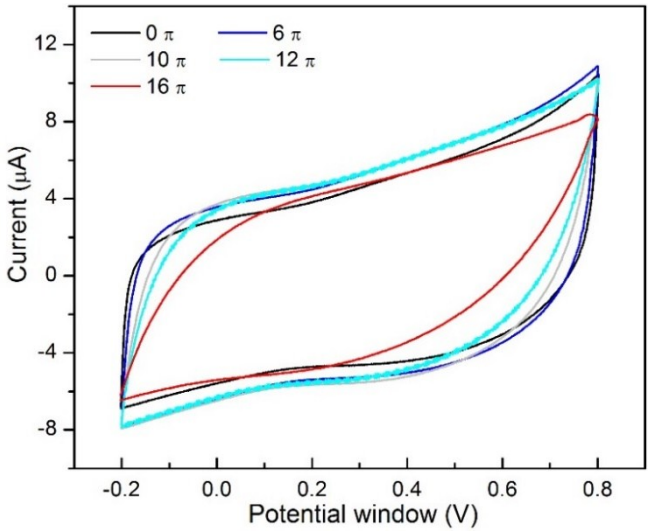

Fig. S7 CV curves of a SACNT-film based supercapacitor at different torsion levels.

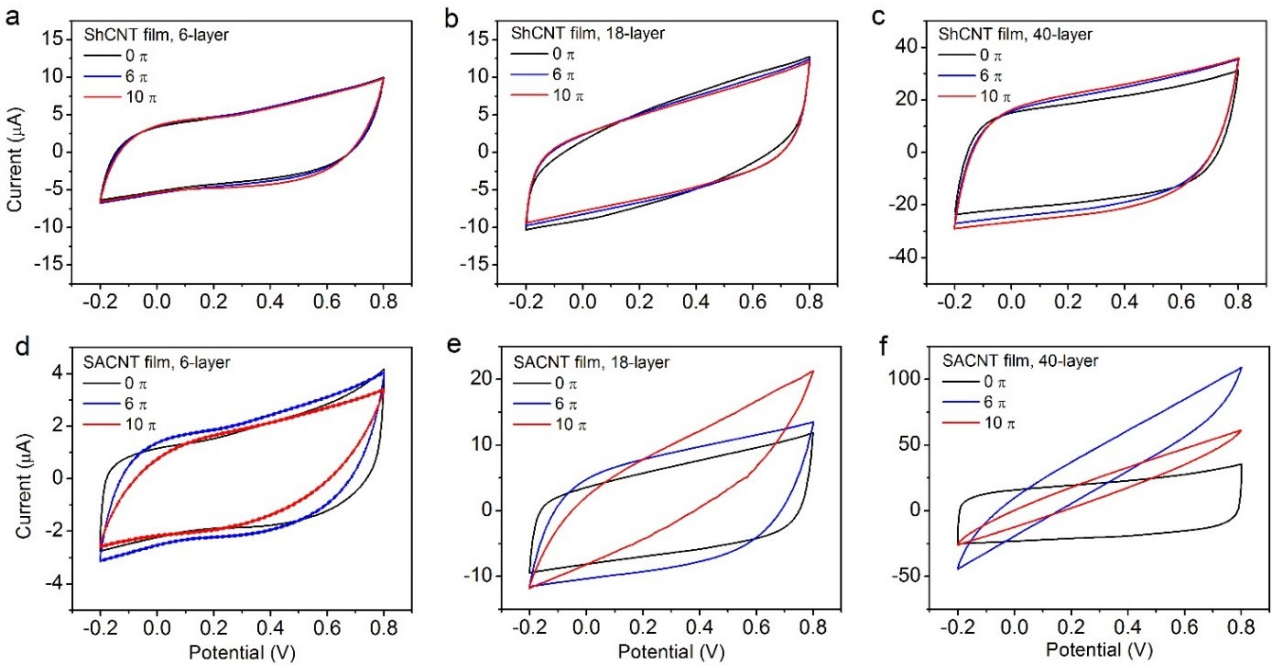

Fig. S8 CV curves of the supercapacitors with ShCNT-film electrodes (a-c) and SACNT-film electrodes (d-f) at various torsion levels.

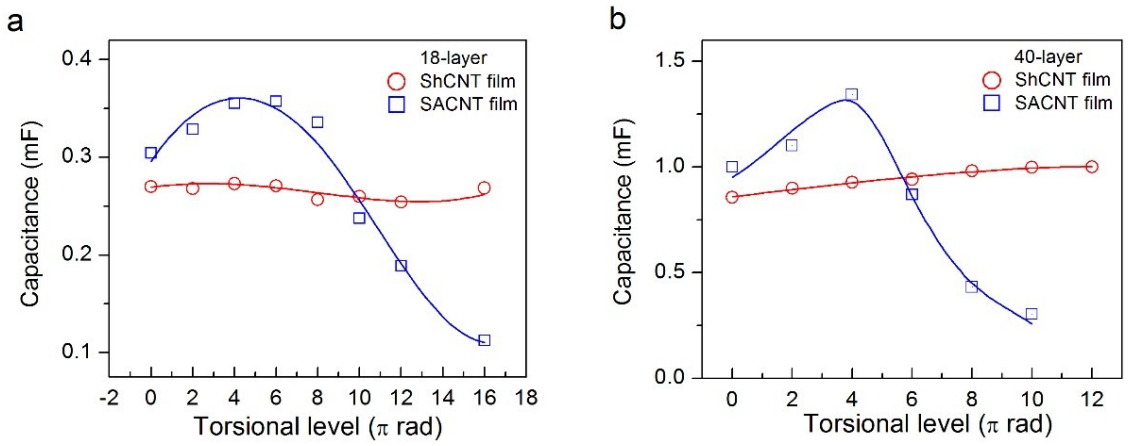

Fig. S9 The capacitances comparison between ShCNT-film based supercapacitors and SACNT-film based supercapacitors made of 18 layers of CNTs (a) and 40 layers of CNTs (b).

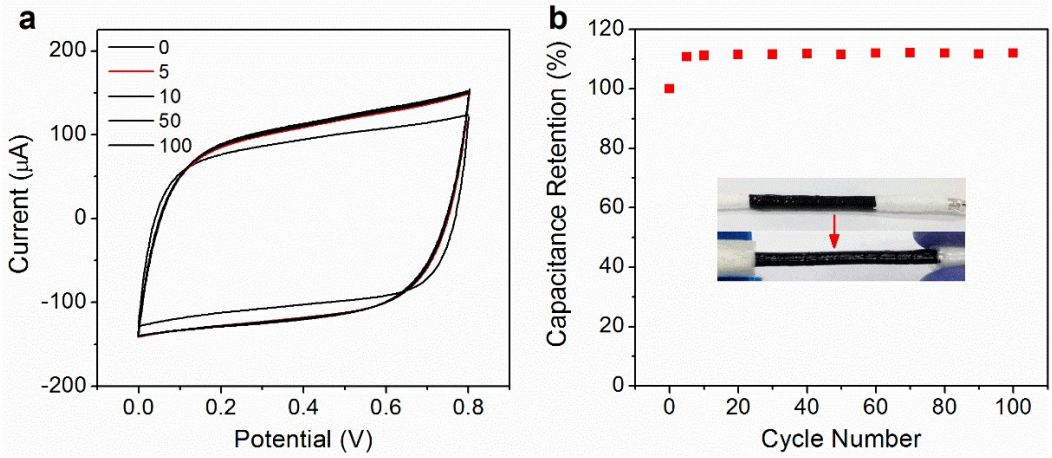

Fig. S10 The capacitive performance of the torsionable supercapacitor (150 layer) under repeated stretching (50% strain) and release cycles. (a) CV curves at various cycles. (b) Capacitance retention calculated from the CV curves. The inset shows a supercapacitor being stretched.