Electronic Supplementary Material (ESI) for RSC Advances.

Self-standing carbon nanotube forest electrodes for flexible supercapacitors

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Table S1. Details of various chemicals used in the electroless coating bath.

Chemicals	Concentration (g/l)	Function
Nickel sulphate hexahydrate ($NiSO_4.6H_2O$)	30	Source of Ni
Sodium hypophosphite ($NaH_2PO_2.H_2O$)	12	Reducing agent
Ammonium chloride (NH_4Cl)	45	Complexing agent
Tri-sodium citrate ($Na_3C_6H_5O_7.2H_2O$)	25	Stabilizer
Liquor ammonia	2.5	pH controller

Table S2. Comparison of electrochemical performance of CNT-based supercapacitors.

Ref.	Electrode Material/s	Electrolyte	Cm (F/g)
[S2]	SWNTs	1 M NaCl (aqueous)	25-30
	MWNTs	1 M NaCl (aqueous)	6-10
[S3]	MWNTs	1 M $LiPF_6$ (EC-DEC)	35
[S4]	Normal CNTs	1 M $LiClO_4$ (EC-DEC)	25
	Activated CNTs	1 M $LiClO_4$ (EC-DEC)	50
[S5]	CO_2 oxidized CNTs	--	47
[S6]	MWNTs	6 N KOH	21
[S7]	MWNTs	1 M H_2SO_4	25.4
[S8]	SWNTs	6 M KOH	40
[S9]	Pristine CNTs	Aprotic electrolyte	12.9
	Pristine CNTs	Protic electrolyte	10.9
	Cup-stacked CNTs	Aprotic electrolyte	55.7
	Cup-stacked CNTs	Protic electrolyte	28.4
[S10]	Pristine DWNTs	0.5 M H_2SO_4	22
	Pristine DWNTs	1 M Et4NBF4/PC	34
	DWNT-HNO_3	0.5 M H_2SO_4	54

	DWNT-HNO_3	1 M Et4NBF4/PC	38
[S11]	MWNTs grown on metals	6 M KOH	10.75-21.57
[S12]	CNTs grown on Ni foam	6 M KOH	25
[S13]	SWNT film	1 M $LiClO_4$ (EC-DEC-DMC)	35
Present Work	**CNT forest grown on carbon fibers**	**5 M KOH**	**103**

Method S1. Calculation of ionic conductivity of VACNTF/UCF electrodes.

The ionic conductivity of the supercapacitor electrodes is calculated by using the equation

$$\sigma = \frac{T}{R_b \ X \ A}$$

Where σ is the ionic conductivity in S/cm, T is the total thickness of the supercapacitor cell (in cm), R_b is the bulk electrolyte resistance (in Ω), and A is the geometrical area of electrodes (in cm^2).

Method S2: Calculation of capacitance of VACNTF/UCF supercapacitor.

The capacitance of the supercapacitor is calculated by using equation

$$C_{sc} = \frac{It_{dis}}{\Delta E}$$

Where, C_{sc} is the capacitance of the supercapacitor, I is the charging current, t_{dis} is the discharging time, and ΔE is the operating potential window.

Method S3: Calculation of areal capacitance of VACNTF/UCF supercapacitor.

The areal capacitance of the supercapacitor is calculated by using the equation

$$C_{sc,\,A} = \frac{C_{sc}}{A_{sc}}$$

Where, $C_{sc,\,A}$ is the areal capacitance of the supercapacitor and A_{sc} is the total geometric area of two supercapacitor electrodes (i.e., two times the area of single electrode).

Method S4: Calculation of volumetric capacitance of VACNTF/UCF supercapacitor.

The volumetric capacitance of the supercapacitor is calculated by using the equation

$$C_{sc,\,V} = \frac{C_{sc}}{V_{sc}}$$

Where, $C_{sc,\,V}$ is the volumetric capacitance of the supercapacitor and V_{sc} is the total volume of the supercapacitor (total volume of two supercapacitor electrodes + volume of the separator + volume of electrolyte).

Method S5: Calculation of volume specific capacitance of VACNTF/UCF supercapacitor.

The volume specific capacitance of the supercapacitor is calculated [S1] by using the equation

$$C_{sc,\,sp,\,V} = 4 \text{ X } \frac{C_{sc}}{V_{el}}$$

Where, $C_{sc,\,sp}$ is the volume specific capacitance of the supercapacitor, C_{sc} is the capacitance of the supercapacitor, V_{el} is the total volume of two supercapacitor electrodes (the volumes of separator and electrolyte were not considered).

Method S6: Calculation of volume specific energy density of VACNTF/UCF supercapacitor.

The volume specific energy density of the supercapacitor is calculated by using the equation

$$E_{sc,\ sp,\ V} = \frac{C_{sc,\ sp,\ V}\ X\ (\Delta E)^2}{2\ X\ 3600}$$

Where $E_{sc,\ sp,\ V}$ is the volume specific energy density and all other variables as defined above.

Method S7: Calculation of volume specific power density of VACNTF/UCF supercapacitor.

The volume specific power density of the supercapacitor is calculated by using the equation

$$P_{sc,\ sp,\ V} = \frac{E_{sc,\ sp,\ V}\ X\ 3600}{t_{dis}}$$

Where $P_{sc,\ sp,\ V}$ is the volume specific power density and all other variables are defined above.

Method S8: Calculation of mass specific capacitance of VACNTF/UCF supercapacitor.

The mass specific capacitance of the supercapacitor is calculated [S2] by using the equation

$$C_{sc,\ m} = \frac{I\ X\ t_{dis}}{m\ X\ (\Delta E)} = \frac{C_{sc}}{m}$$

Where, m is the total mass of CNTs in the two electrodes of the supercapacitor (excluding the mass of UCFs, separator, and electrolyte), and other variables are discussed above.

Supplementary Figures:

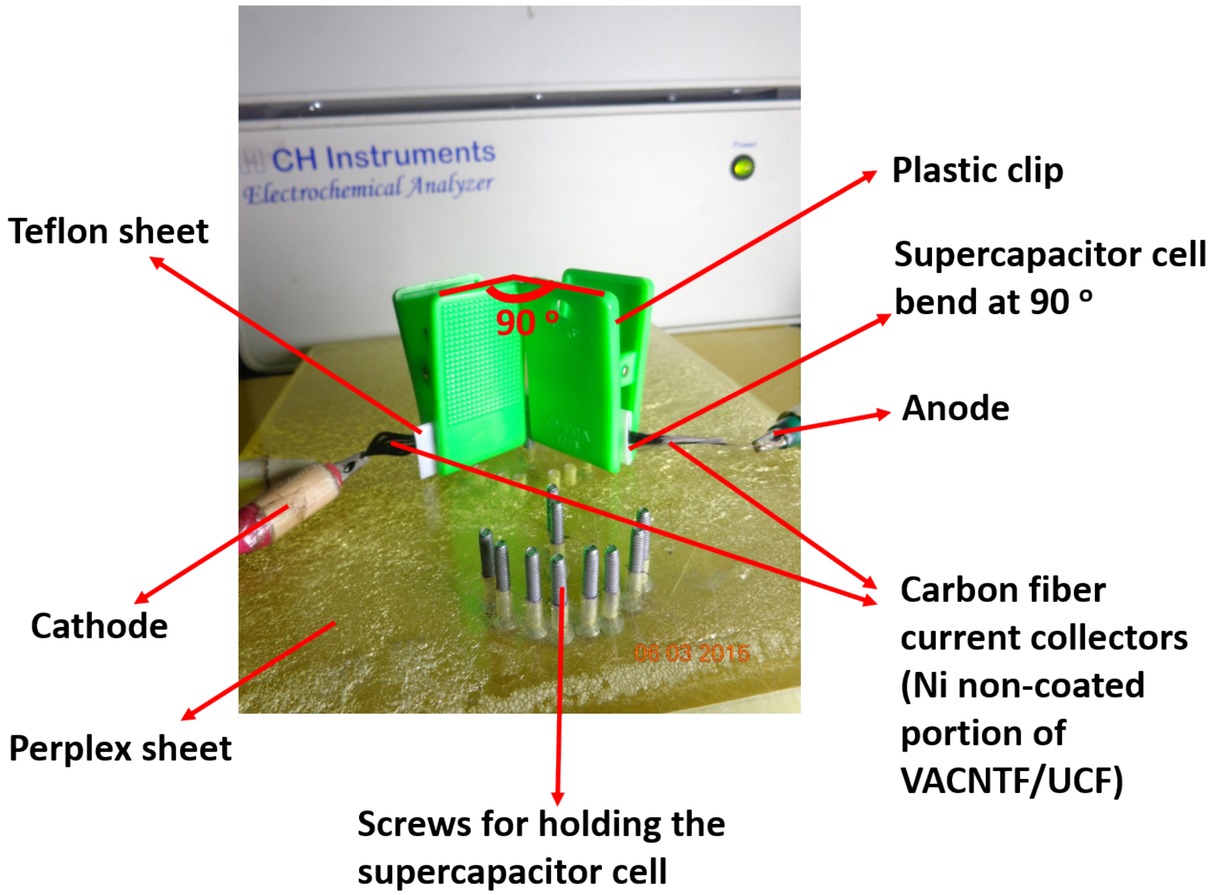

Figure S1. Testing of VACNTF/UCF supercapacitor in a two electrode cell at a bending angle of 90 °.

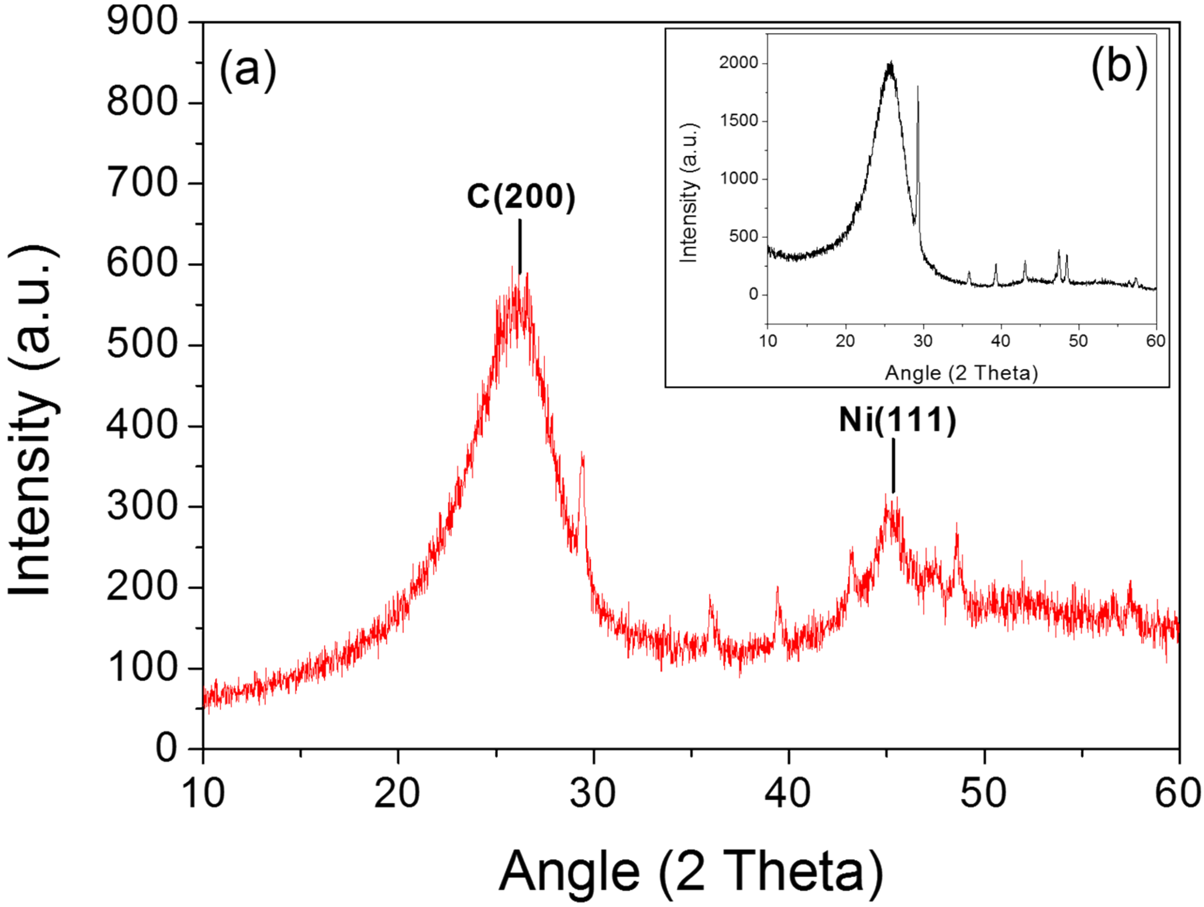

Figure S2. XRD spectra of (a) nickel coated UCFs and (b) as-received UCFs.

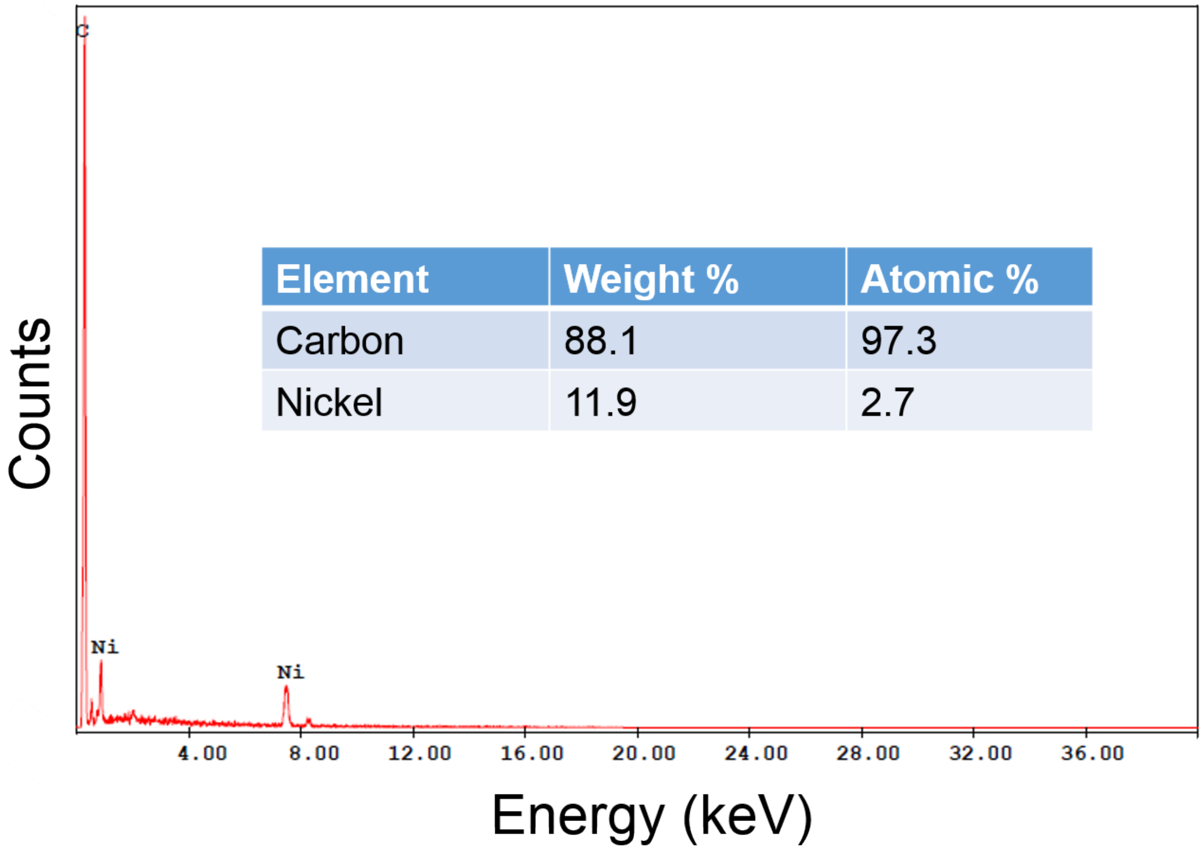

Figure S3. EDAX spectra of nickel coated UCFs.

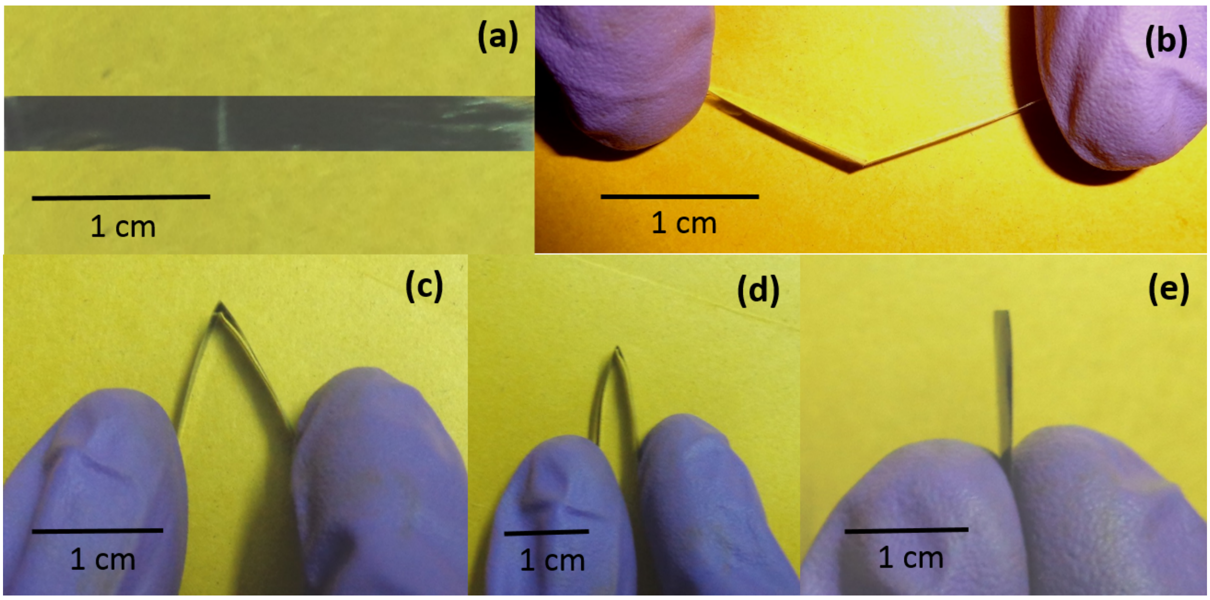

Figure S4. Digital images of VACNTF/UCF supercapacitor cell bend at different angles (a) straight (i.e., 180 º), (b) 150 º, (c) 45 º, (d) 20 º, and (e) 0 º.

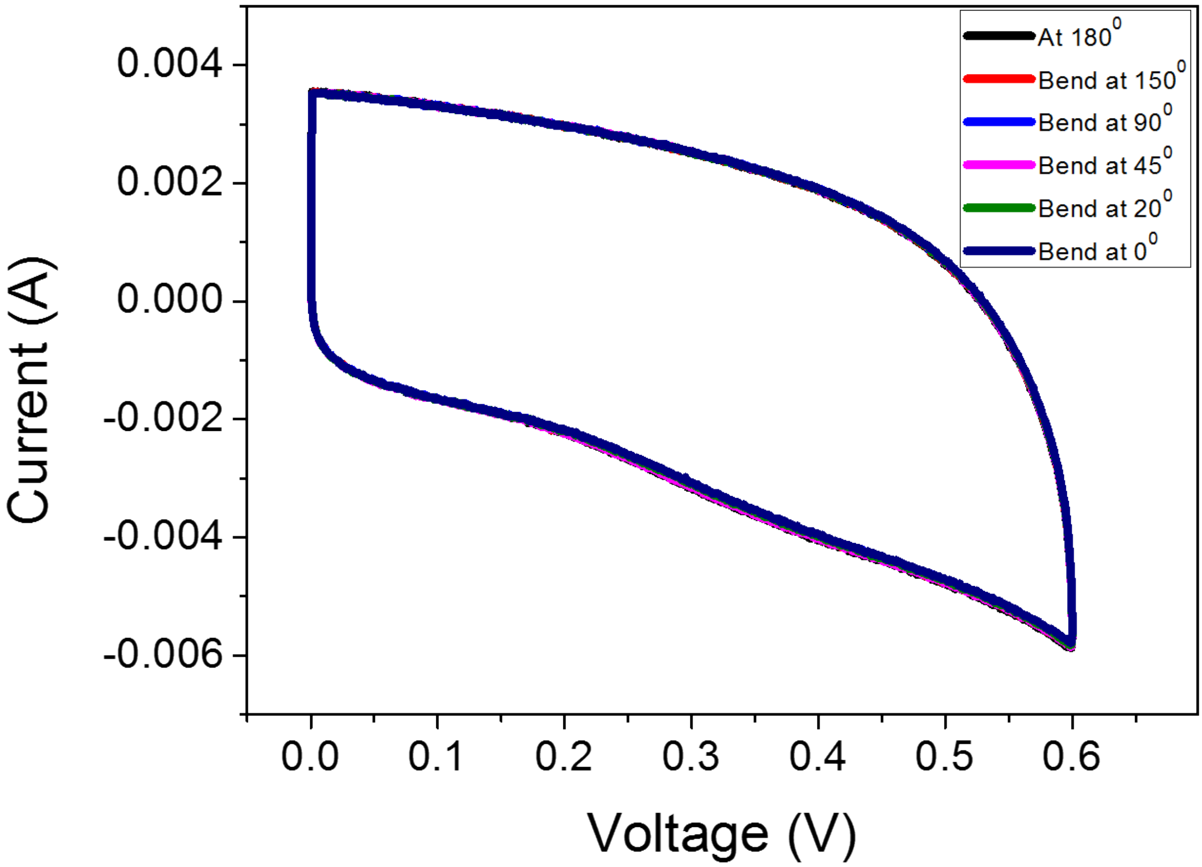

Figure S5. CV curves of VACNTF/UCF supercapacitor at various bending angles (scan rate: 300 mV s^{-1}).

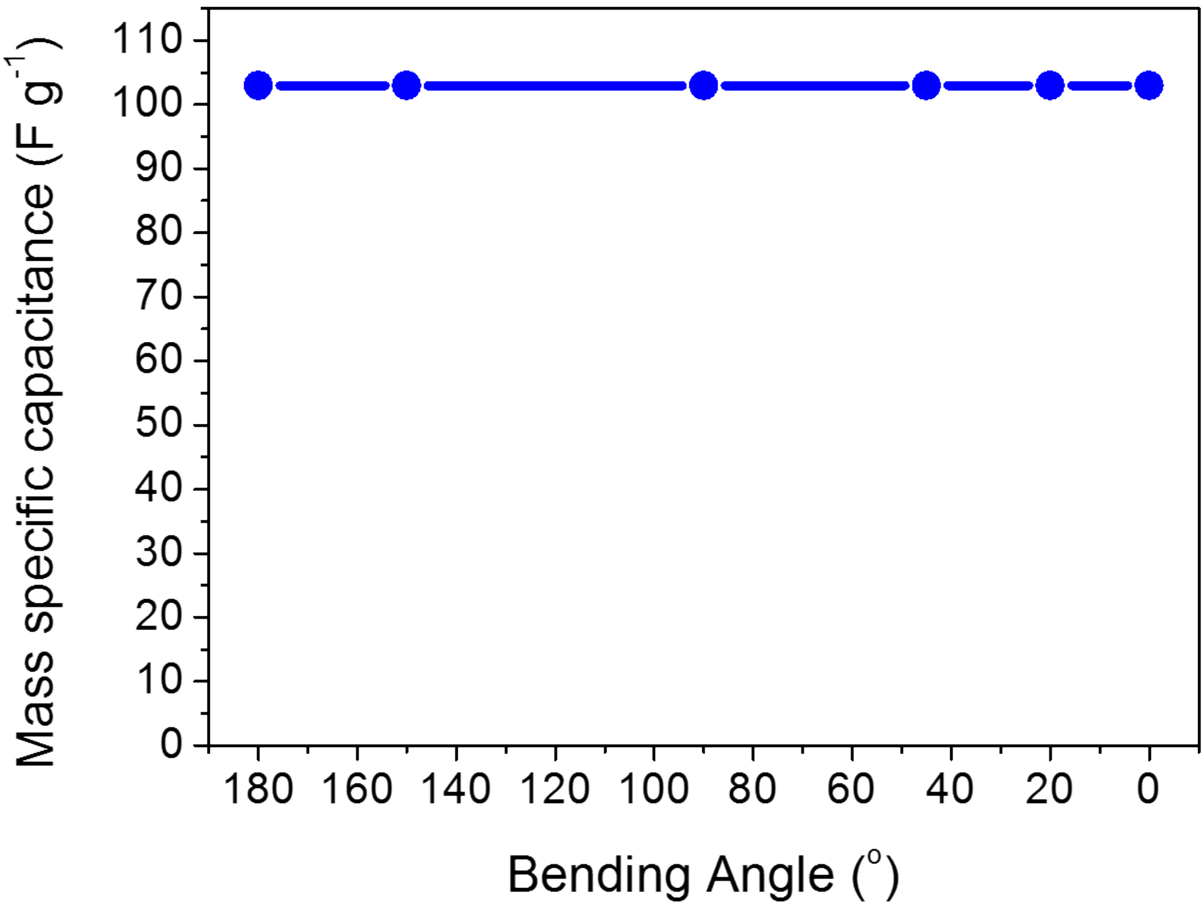

Figure S6. Plot of variation in the mass specific capacitance of VACNTF/UCF supercapacitor at various bending angles.

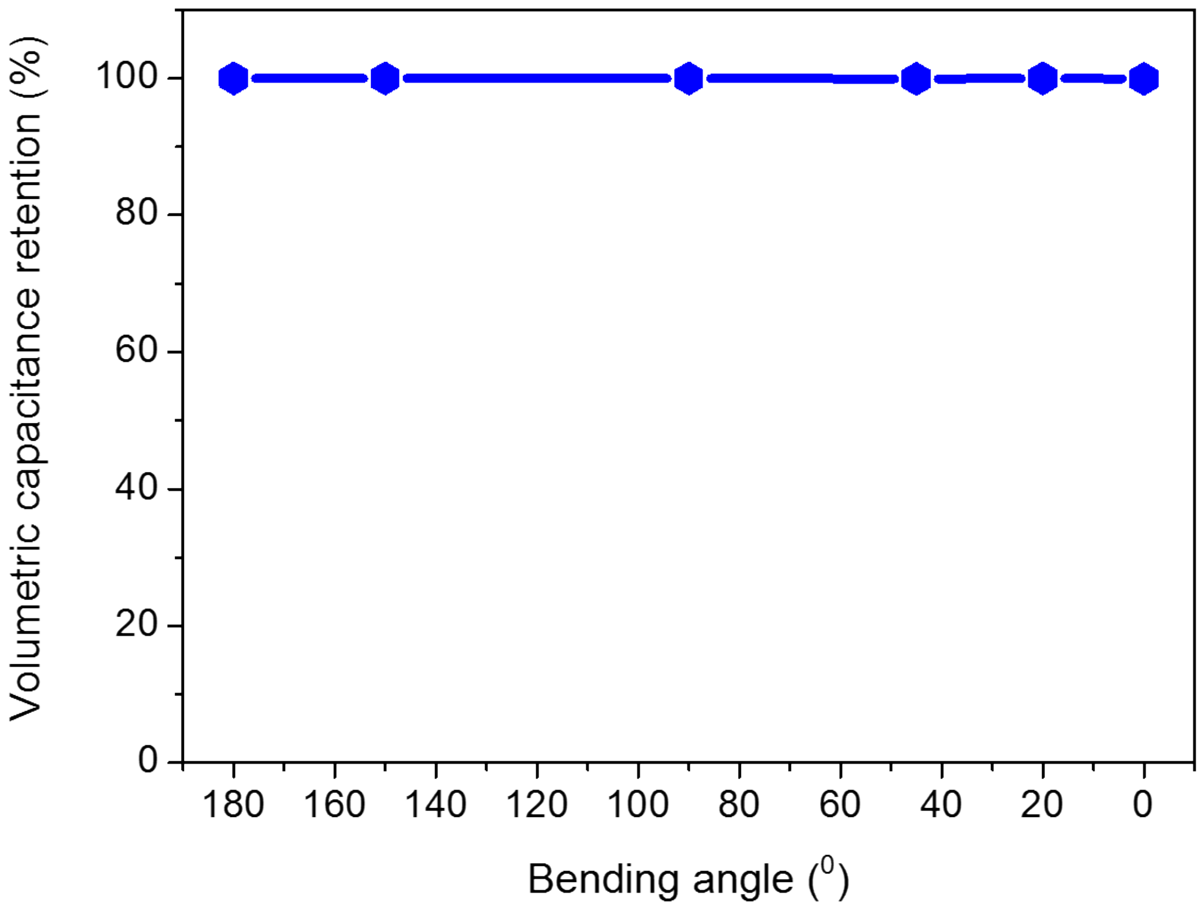

Figure S7. Plot of percentage retention in the volumetric capacitance of VACNTF/UCF supercapacitor at various bending angles.

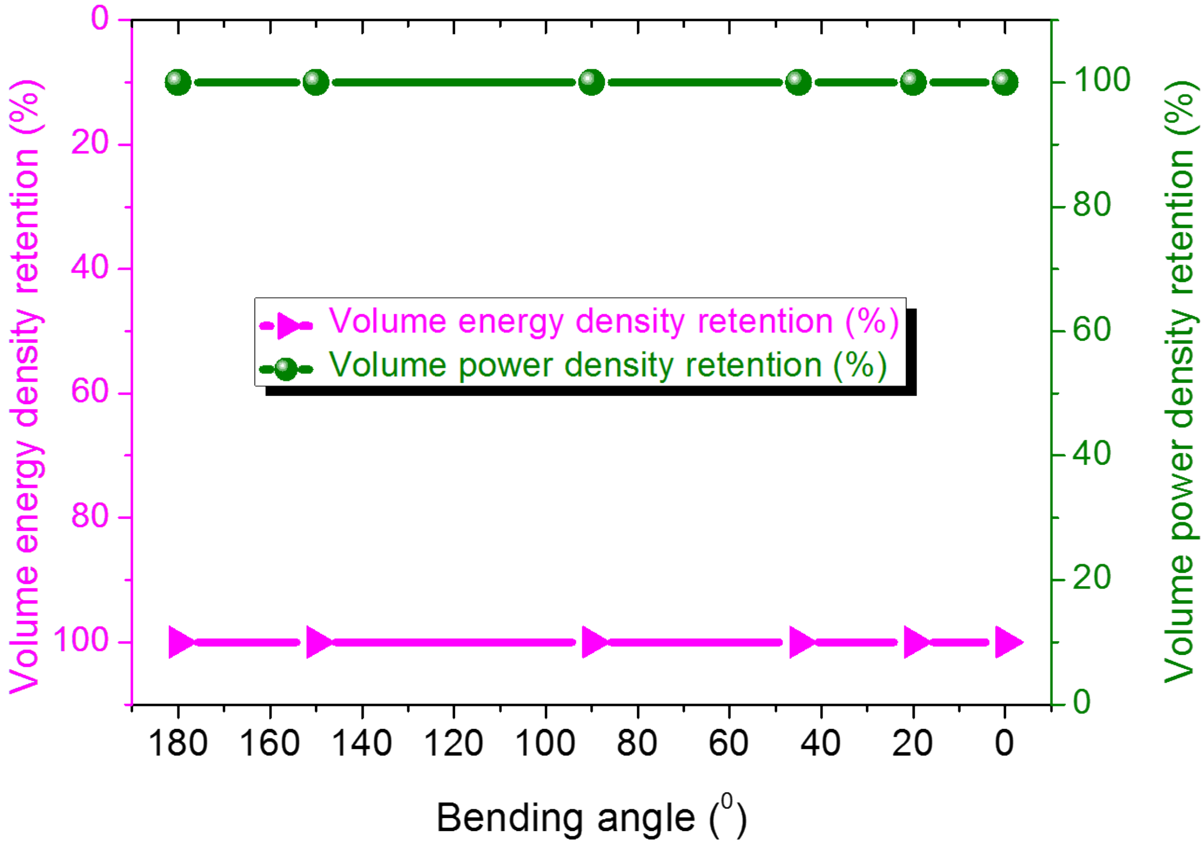

Figure S8. Plot of percentage retention in the volumetric energy density and volumetric power density of VACNTF/UCF supercapacitor at various bending angles.

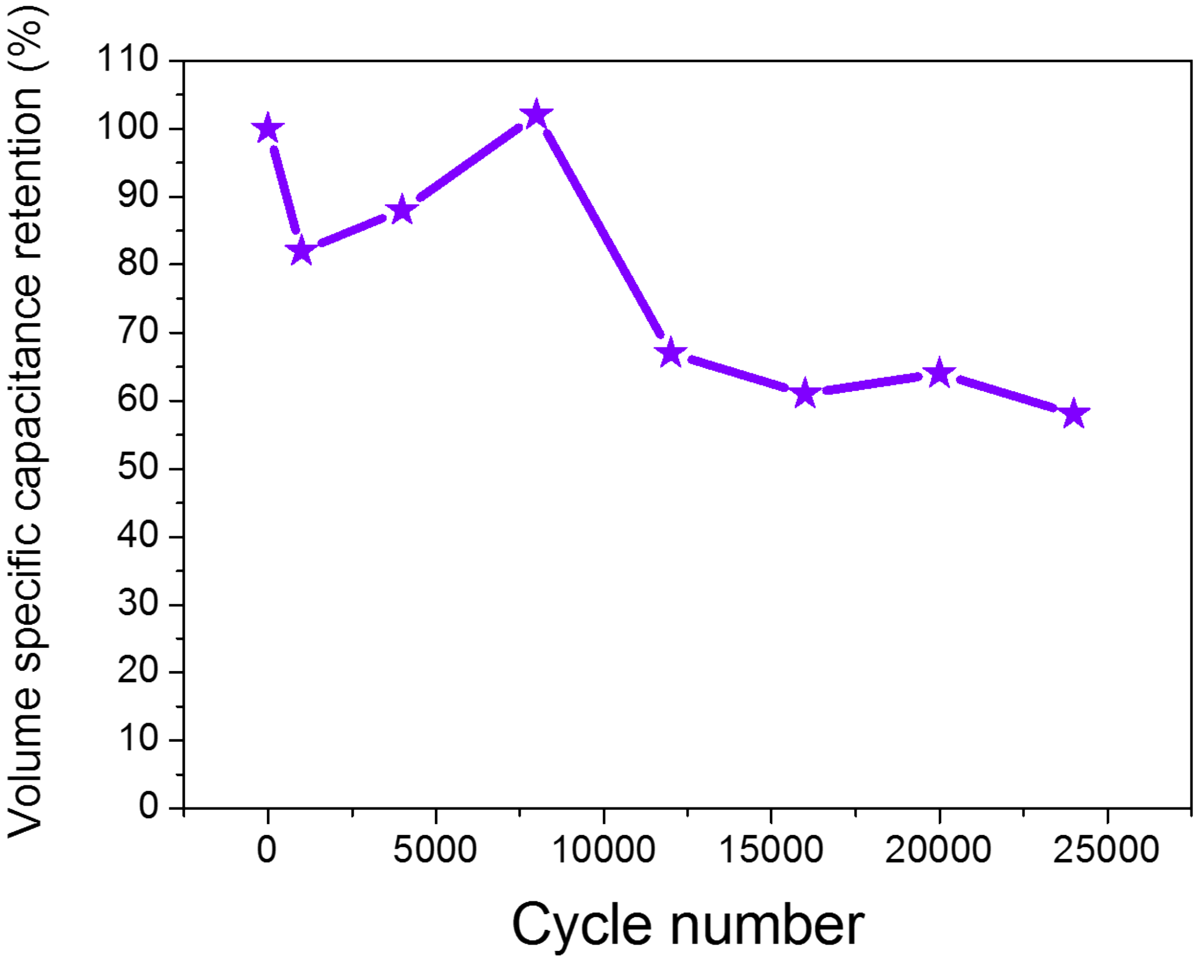

Figure S9. Plot of percentage retention in the volume specific capacitance of VACNTF/UCF supercapacitor at various cycle numbers.

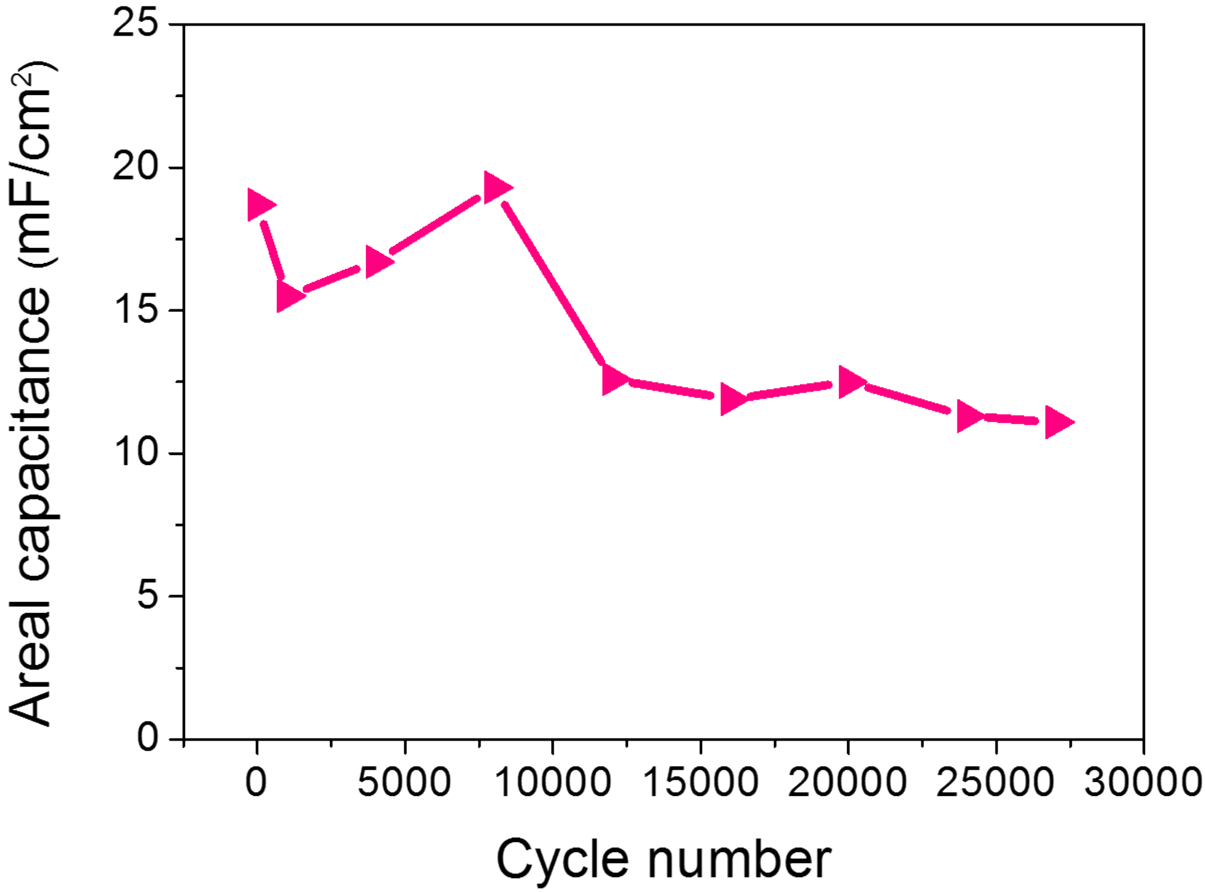

Figure S10. Plot of variations in the areal capacitance of VACNTF/UCF supercapacitor at various cycle numbers.

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