Supplementary material

Supporting Files

Supporting information S1:

The theoretical capacity of F-HCNTs is closely related to its *F*/*C* ratio, and the theoretical capacity is calculated as follows:

$$Q_{\text{th}}(x) = \frac{xF}{3.\ 6(12 + 19x)}$$

Here, 3.6 is the unit conversion constant, x is the *F*/*C* ratio, and F is the Faraday constant with a value of 96,485 C mol^{-1} (Tables S1–S3).

Table S1: The relative contents of these C–C, C═C and C–F_x (x = 1, 2, 3) chemical bonds of F-HCNT-300 are obtained according to the XPS fitting results

Name	Atomic content					
Bonds	C–C (284.8 eV)	C═C (285.8 eV)	Semi-ionic C–F (288.4 eV)	Covalent C–F (290.0 eV)	C–F_2 (290.9 eV)	C–F_3 (292.0 eV)
F-HCNT-300	7.95%	5.00%	14.28%	34.45%	29.22%	9.10%

Table S2: The list of electrochemical properties including specific capacity and energy density of F-HCNTs at 0.01 C–1 C discharge rates with a cut-off voltage of 1.0 V

CF_x	Discharge rate (C)	Specific capacity (mAh/g)	Energy density (Wh/kg)
F-HCNT-250	0.01	877.38	2169.1
	0.05	842.86	1882.38
	0.1	817.51	1727.26
	0.5	652.91	1214.16
	1	525.64	898.18
F-HCNT-300	0.01	949.66	2302.64
	0.05	917.11	2175.90
	0.1	928.71	2141.63
	0.5	861.95	1864.67
	1	762.29	1562.02
F-HCNT-350	0.01	876.20	2152.94
	0.05	956.40	2131.39
	0.1	934.72	2049.40
	0.5	835.53	1744.24
	1	807.87	1542.25
F-HCNT-400	0.01	950.69	2194.10
	0.05	840.81	1981.03
	0.1	949.08	2070.16
	0.5	864.05	1808.66
	1	816.52	1688.86

Table S3: The list of electrochemical properties including specific capacity and energy density of F-HCNTs at 0.01 C–1 C discharge rates with a cut-off voltage of 1.5 V

CF_x	Discharge rate (C)	Specific capacity (mAh/g)	Energy density (Wh/kg)
F-HCNT-250	0.01	728.37	1974.01
	0.05	654.55	1652.31
	0.1	628.47	1500.43
	0.5	526.56	1060.35
	1	404.36	741.19
F-HCNT-300	0.01	794.42	2133.13
	0.05	766.45	1992.62
	0.1	745.62	1923.49
	0.5	736.90	1712.77
	1	633.13	1439.91
F-HCNT-350	0.01	807.06	2059.14
	0.05	793.40	1934.79
	0.1	786.46	1871.79
	0.5	735.18	1623.31
	1	713.85	1424.55
F-HCNT-400	0.01	816.12	2029.35
	0.05	810.19	1937.38
	0.1	780.75	1868.76
	0.5	744.55	1666.80
	1	729.39	1582.97