Supplementary Information (SI)

Assessment of Ecologically Prepared Carbon-Nano-Sphere for Fabrication of Flexible and Durable Supercell Device

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XPS analysis of O-1s: The presence of oxygen-contain functional groups in Carbon-Nano-Sphere (CNS) is confirmed by the O-1s spectrum shown in Fig. S1. The peaks at 531.0, 532.4, 533.9 and 547.9 eV are ascribed to the carbonyl (10 %), hydroxyl (33 %), etheric oxygen (25 %) and carboxyl (37 %), respectively. Among them the presence of carbonyl oxygen is relatively low compared to others. It may be possible that, carboxyl and hydroxyl moieties may participate in charge and discharge process, readily over other oxygen impurities in CNS.[1]

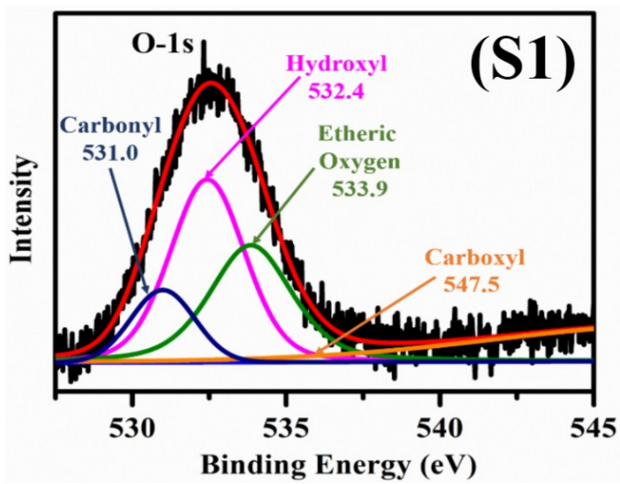

Fig. S1 Recorded O-1s spectrum for CNS.

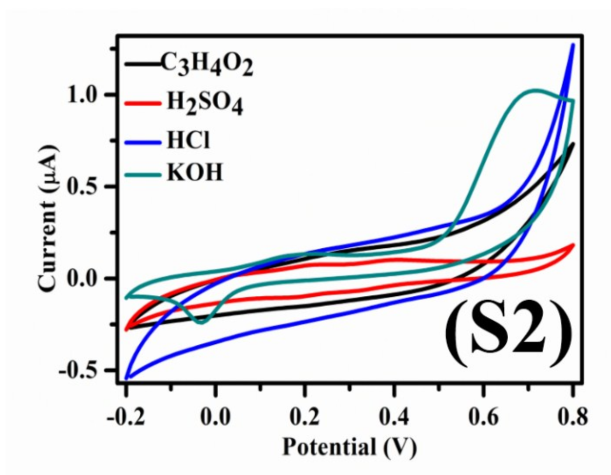

Fig. S2 Two electrode cyclic voltammetry (CV) curves, at 10 mVs^{-1} for different electrolytes.

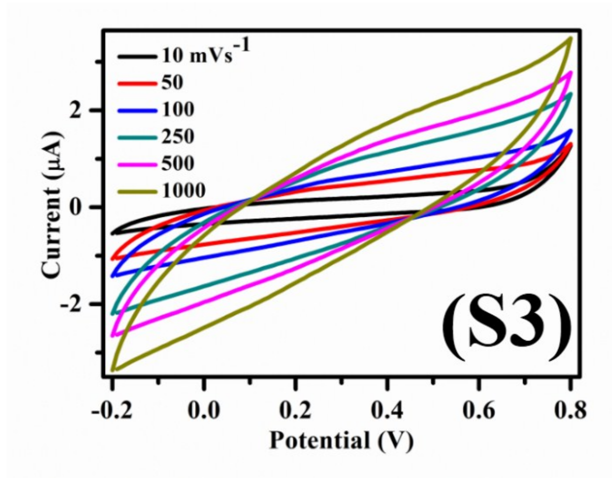

Fig. S3 Two electrode CV curves, at different scan rates, for 1 M HCl.

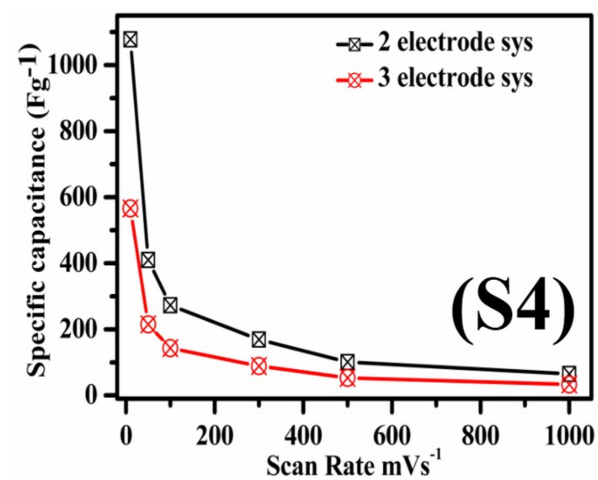

Fig. S4 Specific Capacitance (C_{SP}) vs scan rate for both electrode systems, in 1 M HCl.

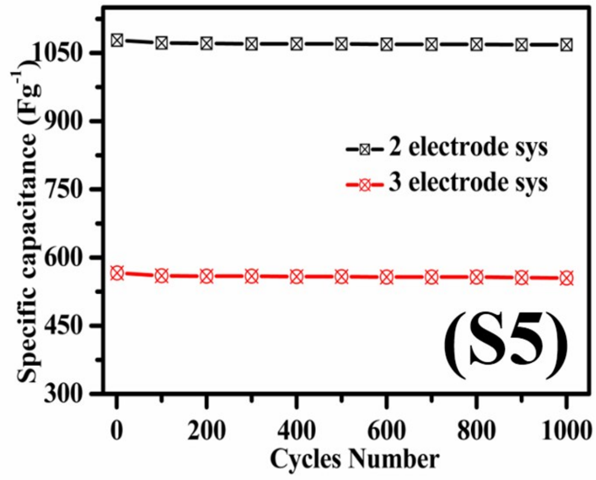

Fig. S5 Stability curve for both electrode systems, @ 10 mVs^{-1}, in 1 M HCl.

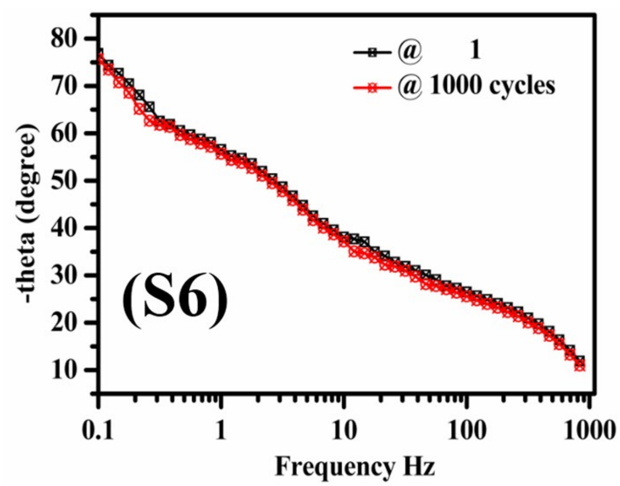

Fig. S6 Bode phase angle with frequency, recorded after 1 and 1000 cycles, over 1 kHz to 100 mHz.

Table S1: The glancing view of the surveyed literature providing electrochemical parameters including E_D and P_D.

Additives and treatments	S_A (m^2g^{-1})	C_{sp} (Fg^{-1})	E_D ($Whkg^{-1}$)	P_D ($kWkg^{-1}$)	Cyclic stability	Measurements done at	Electrolyte	Ref no.
Graphene nano sheet/MWCNTs	169.2	274.0	86.4	0.7	93% (10000)	1 A g^{-1}	1 M Et4NBF4	[2]
Activated with KOH	79.6	77.0	1.4	0. 6	100,000	1 $mAcm^{-2}$	0.1 M H2SO4	[3]
Methanol, NiO	106.0	1950.0	83.0	75.0	85–90 %	100 mVs^{-1}	1m NaOH	[4]

nanowires					(2000)			
MnO_2 powder, Methanol	40.0	450.0	26.0	6.0	88% (1000)	0.5 mA	0.1 M KOH	[5]
MnO_2 nanowires, titanium foils	50.0	483.0	96.0	32.0	10000	1 mA	0.1 M KOH	[6]
Methanol, lithium titanate spinel (LTO)	--	200.0	0.3	2.8	4000	0.5 mA	1 M LiPF6	[7]
Current work	790.0	560.0	100.0	0.1	86% (20000)	10mVs^{-1}	1 M HCl	

Table S2: Elemental composition of CNS.

Orbital	Binding Energy (eV)	Peak Area (Counts-eV/sec)	Sensitivity Factor	Atomic Concentration (Atomic %)
C-1s	284.4	15562.0	0.296	88.0
sp^2	282.9	04248.0		~ 27.3*
sp^3	284.6	07146.0		~ 45.9*
Oxidized Carbon (C=O)	287.1	02111.0		~ 13.6*
Oxidized Carbon (C(O)O)	289.6	01184.0		~ 07.6*
π-π* transition	292.5	00873.0		~ 05.6*
O-1s	532.3	05055.0	0.711	12.0
Carbonyl	531.0	00513.0		~ 10*
Hydroxyl	532.4	01670.0		~ 33*
Etheric Oxygen	533.9	01277.0		~ 25*
Carboxyl	547.9	01595.0		~ 37*

** Indicate estimated % of sub-components in intensity weighted fractions.*

Table S3: Performance characteristic of CNS in aqueous and non-aqueous electrolytes, estimated from CV curves.

Electrolyte (1 M)	C_{SP} Fg^{-1} @ 10 mVs^{-1}	
	Two electrode	Three electrode
$C_3H_4O_2$*	772.0	400.0
H_2SO_4	338.0	178.0
KOH	832.0	437.0
HCl	1080.0	570.0

*Acrylic acid is reported for the first time in camphoric-nano-carbon electrodes

References

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