

Electronic Supporting Information (ESI)

From Dead Leaves to High Energy Density Supercapacitor

Mandakini Biswal,^a Abhik Banerjee ^a, Meenal Deo ^a and Satishchandra Ogale*,^a

^a *Centre of Excellence in Solar Energy, National Chemical Laboratory (CSIR-NCL), Dr Homi Bhabha Road, Pune, India. Fax: +91 20 2590 2636; Tel: +91 20 2590 2260; E-mail: sb.ogale@ncl.res.in, m.biswal@ncl.res.in ,*

ESI – I

Table S1 (A):Chemical composition of Fresh Neem Leaves

Moisture	59.4 %
Proteins	7.1 %
Fat	1.0 %
Fibre	6.2 %
Carbohydrates	22.9 %
Minerals	3.4 %
Vitamin C	218 Mg/100g
Glutamic acid	73.30 Mg/100g

Figure S1 (A) : a and b) Pore size distribution and N₂ adsorption isotherms of carbon pyrolyzed at different temperature(600°C, 800°C and 1000°C)

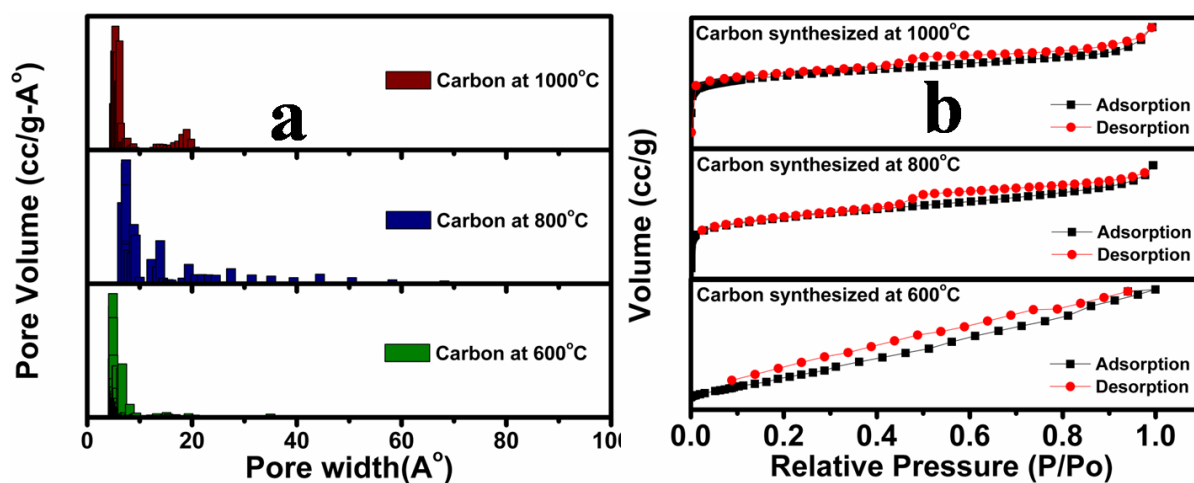


Figure S1 (B) : (a and b) Cyclic Voltammetry and charge discharge curves for Neem leaf derived carbon at 800°C; (c and d) Cyclic Voltammetry and charge discharge curves for Neem leaf derived carbon at 600°C.

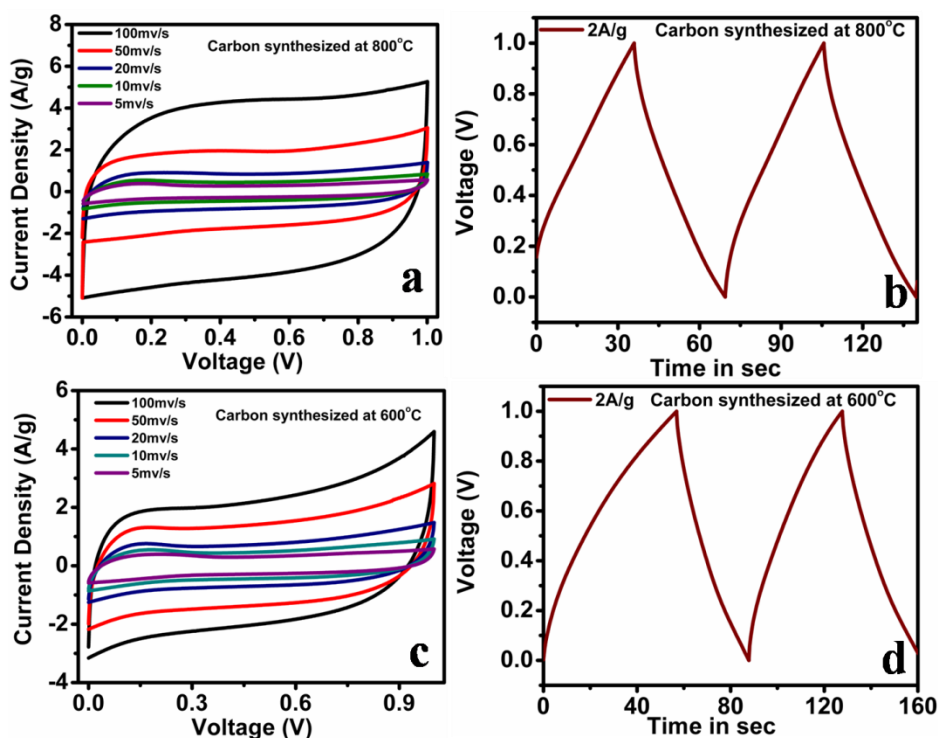


Table S1(B): Comparison of Specific capacitance, Energy density and power density of all the three carbon materials synthesized at 600°C, 800°C and 1000°C

Pyrolysis Temperature (°C)	Specific Capacitance (F/g)	Specific Energy Density WKg-1			Specific Power Density WhKg-1		
		0.5A/g	1A/g	2A/g	0.5A/g	1A/g	2A/g
600	70	10	4	2.5	151	163	257
800	180	25	17	11	523	785	1191
1000	400	55	42	40	569	1191	2526

ESI –II

Figure S2 (A) : It describes the plot of specific capacitance with different current densities which shows even at very high current density(10A/g) the specific capacitance is still high as 290F/g.

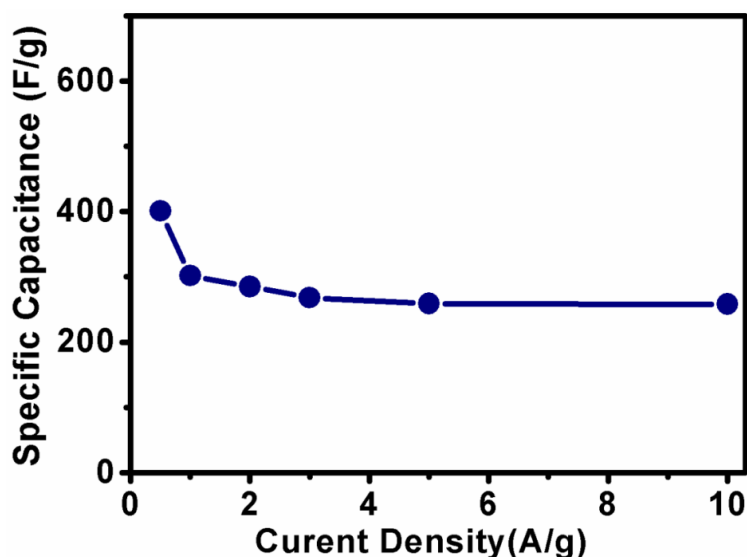


Figure S2 (B) : Charge Discharge curve of Ashoka leaf derived carbon at 1A/g and 0.5A/g with 1M H₂SO₄. From the charge discharge curve the specific capacitance of Ashoka leaf derived carbon was calculated to be 250F/g at a current density of 0.5A/g which is lower than the Neem leaf carbon.

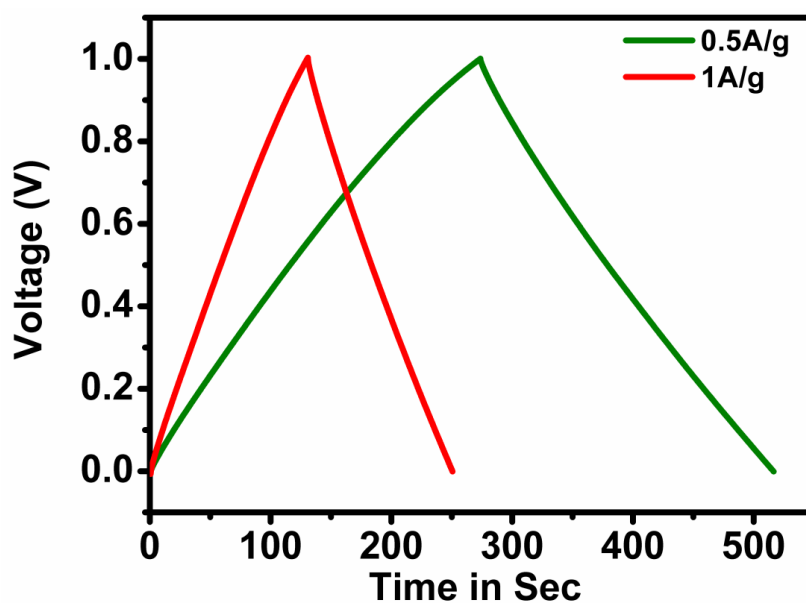


Figure S2 (C) : It shows the CV curve for the carbon synthesized from fresh green leaves which shows a specific capacitance of 195F/g at a scan rate of 20mv/s. This value is lower than the carbon synthesized from the Neem dead leaves

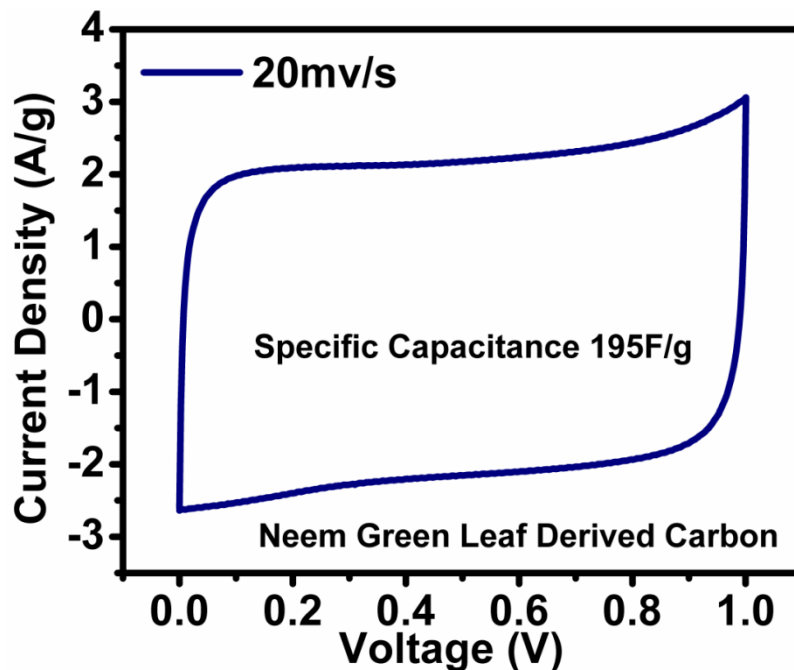
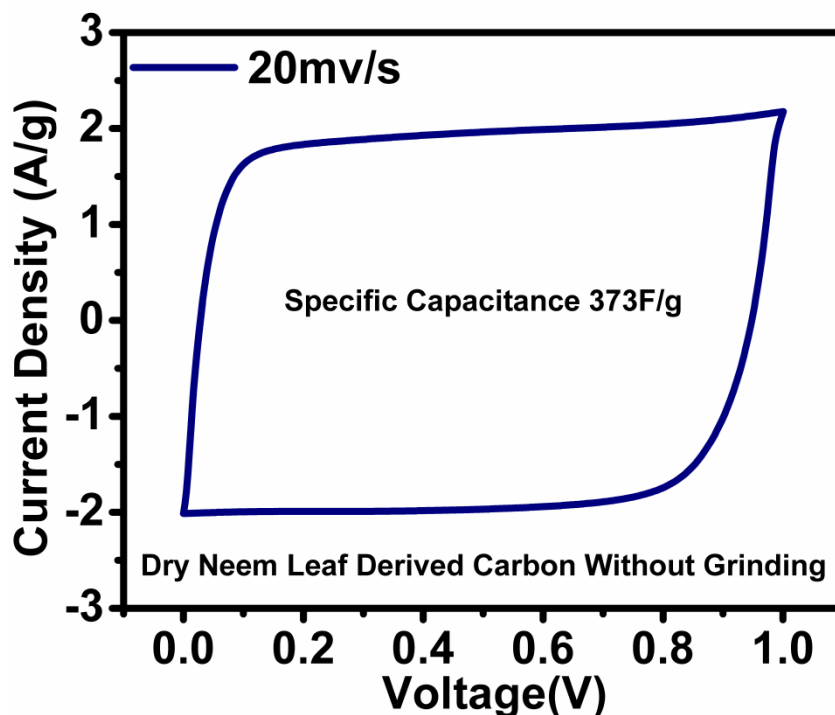


Figure S2 (D) : CV curve of Neem dry leaf without grinding at 20mv/s in 1M H_2SO_4 . The specific capacitance was calculated to be 373F/g.



ESI –III

Figure S3 (A) : Elemental mapping of (a) Neem Leaf (b) Ashoka Dry leaf.
Red- C, Green- O, Pink- Ca, Blue- Mg, Yellow- Al

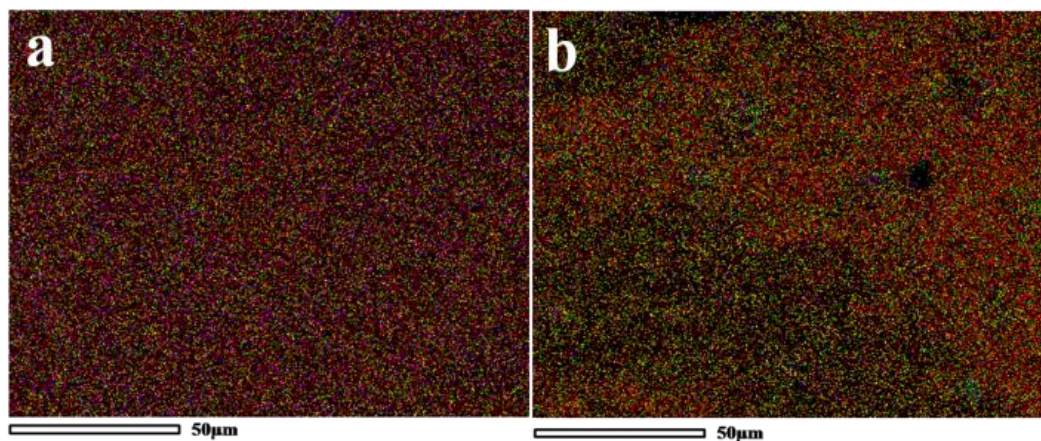


Figure S3 (B) : BET surface area measurements of Ashoka leaf derived carbon. It shows a surface area of $705\text{m}^2/\text{g}$ and a average pore radius of 0.2nm .

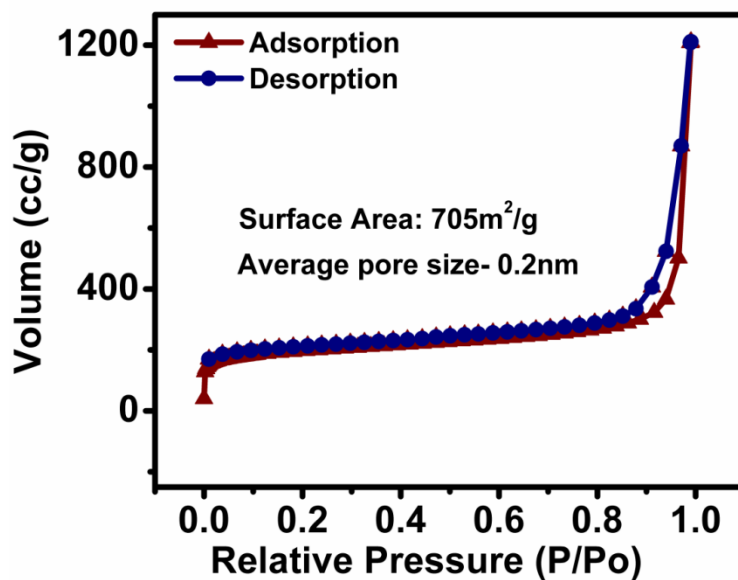


Figure S3 (C) : Charge discharge data of Ashoka leaf derived carbon at 2A/g current density in organic electrolyte. From the above curve the specific capacitance of Ashoka leaf derived carbon is calculated to be 21F/g which is less than the neem leaf derived carbon.

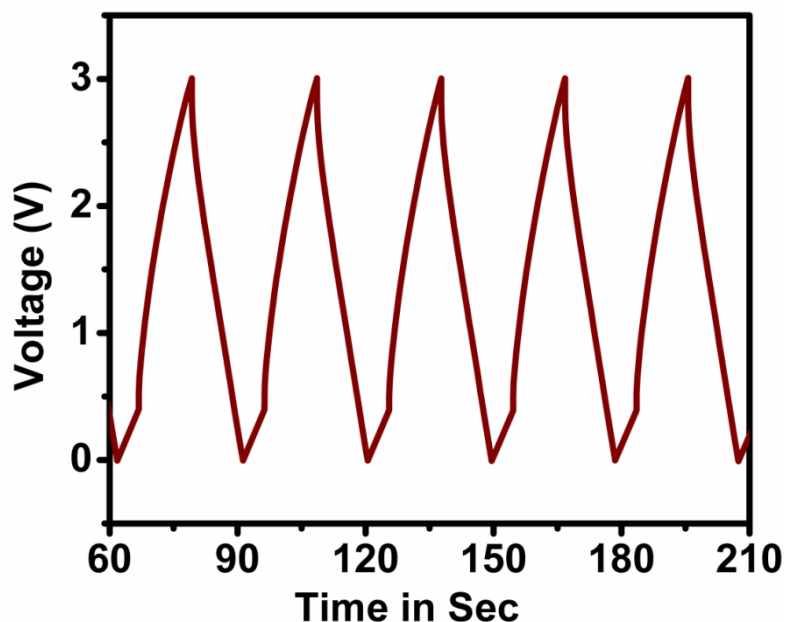


Figure S3 (D) : Nyquist plot for Neem leaf derived carbon carbon electrode in 1M LiPF₆ in EC: DEC (organic).inset shows magnified high frequency region

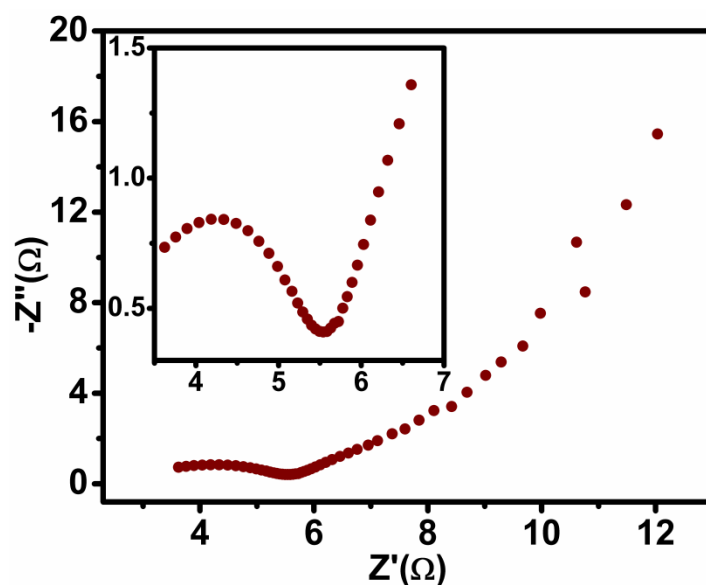


Figure S3 (E) : Comparison of Nyquist plot for carbon carbon electrode in 1M H_2SO_4 (aqueous) and 1M 1M LiPF₆ in EC: DEC (organic) for Neem leaf derived carbon.

